A SEMANTIC ANALYSIS OF KIKUYU TENSE AND ASPECT

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of the Ohio State University

By

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1977

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ABSTRACT

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The major goal of this dissertation is to propose a model-theoretic treatment of tense and aspect, and to test the theory by applying it to Kikuyu, a Bantu language of Kenya with a particularly large and complex inflectional system for distinctions of this sort. The analysis of tense and aspect is based upon Reichenbach's theory of natural language time reference. Reichenbach claimed that time reference in a natural language involves three distinct time points: the "point of speech", the "point of reference", and the "point of the event". This basic analysis is translated into model-theoretic terms by proposing a semantic system in which the truth of a sentence is evaluated relative to an index consisting of a world, and three times: a moment of time, corresponding to the time of speaking; an interval of time, corresponding to the "reference-time"; and a set of intervals of time, which constitute "episode-time". The categories of tense and aspect - as these are expressed by particular classes of morphemes in Kikuyu - are characterized

within this system as follows. First, it is shown that the aspect categories of Kikuyu ("completive", "progressive" and "perfect" aspect) can be analyzed with a set of sentence operators which specify the relation of episode-time to reference-time. Secondly, the categories of tense are shown to specify the relation of reference-time to the time of speaking; in addition, it is demonstrated that the analysis accounts for the semantics of deictic time adverbs which co-occur with different tense forms. Finally, it is shown that the third logically possible set of relations in Reichenbach's system - namely, relations of episode-time to speaking-time - also play a role in the analysis of Kikuyu. The semantic categories which involve such relations are called existential status categories, because they describe the stage of development of an episode, viewed in relation to the time of speaking. In Kikuyu, there are two such categories, which are designated "manifest action" and "imminent action". These categories are not expressed by any particular morphemes, but rather by a fundamental division in the formal organization of the verbal paradigm. Members of the "manifest action" sub-paradigm of the verb share the feature that episode-time begins at least several hours earlier than the time of speaking. Hence, forms within this sub-paradigm describe episodes which are "manifest", in the sense that they have reached a relatively advanced stage of development. Forms in the "imminent action" sub-paradigm, on the other hand, describe episodes which either begin just before the time of speaking, or later than this time.

Hence, these forms describe episodes which are still in an early stage of development.

The last part of the thesis provides a grammar of Kikuyu, based upon the grammar of English presented in Richard Montague's "The proper treatment of quantification in ordinary English". The purpose of this grammar is to show how sentences of Kikuyu can be related in a systematic way to formulae of intensional logic, thus demonstrating the relation between the semantic analysis of tense, aspect and status categories, and the syntax and morphology of Kikuyu.

ACKNOWLEDGMENTS

I am pleased to acknowledge my gratitude to the many people and institutions who have contributed to the completion of this dissertation - to Arnold Zwicky, who has been my adviser and supporter for three years at Ohio State; to David Dowty, who taught me Montague Grammar and gave me many hours of advice on the present work; to Bill Harper, for his help in mastering formal semantics; to the members of the logic and language group at the University of Western Ontario, especially Chet Creider and Peter Denny, for their interest and encouragement in my research; to the Department of Philosophy at Western Ontario, for providing office space during my dissertation year; to the Canada Council, for two years of support as a doctoral fellow, and for a travel grant to do field-work in Kenya; to the government of Kenya, for permission to do research there; to George Mathu, director of the Institute of African Studies in Nairobi, for his support of my project; to the Department of Linguistics at the University of Nairobi, for its hospitality; and to Kevin Ford of that department, for his invaluable practical aid.

Most of all, I want to thank all of the Kikuyu people whom I have encountered in the course of this project, for their exceptional kindness and hospitality. I am indebted above all to Macaria and Gĩtaũ, who worked with me during the summer of 1976, and to Nyĩka and Tony, who worked with me in North America, for their patience and their persistent intellectual honesty in teaching me about the facts of their language.

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INTRODUCTION

This dissertation provides a semantic analysis of tense and aspect in terms of temporal relations among three separate times involved in an utterance, the time of speaking, the time referred to, and the time at which the episode described took place. An informal exposition of the ideas is given, followed by an analysis in terms of the model-theoretic semantics developed by Richard Montague. This analysis is carried out for the tense and aspect inflectional system of Kikuyu, a Bantu language spoken primarily in Kenya. This language was chosen because it has a particularly large and interesting system, with considerable differences from certain features of the simpler English system.

Some idea of the themes of the dissertation can be gathered if three of the main points are mentioned:

a) aspect categories are separated from tense, by defining aspect in terms of relations between reference-time and episode-time, while tense is defined as relations between reference-time and the time of speaking;

b) in addition to tense and aspect, a third set of relations - those between speaking time and episode-time - are shown to play a role in the Kikuyu system; these relations are called existential status categories, because they involve the stage of development of an episode (that is, whether it is yet "manifest");

c) a unitary definition of progressive aspect is proposed, which embraces all three of the semantic interpretations of progressive forms which are found not only in Kikuyu, but are also commonly found together in various other languages (these interpretations are the "continuous/imperfective", the "iterative/habitual", and the "futurate" meanings of progressive aspect).

This introduction gives some background to the project by describing how I approached my semantic research in Kikuyu, and why I used Montague Grammar for this project.

1. Why Kikuyu?

Kikuyu is a particularly suitable language for tense and aspect research, because the system is an unusually large one. Not only are there several future and several past tenses, but in addition, all three of the aspect classes found in other languages are marked separately in Kikuyu - completive aspect (sometimes known as "perfective"), progressive aspect (sometimes known as "imperfective"), and perfect aspect. Most important, perhaps, is the fact that Kikuyu makes an additional set of distinctions, which may be analyzed in terms of the relations between episode-time and speaking-time, thus completing the triad of possible relations among the three times in an utterance. With a total of sixteen inflected forms, representing eleven marked categories in the language, Kikuyu must be near to some kind of upper bound on the potential complexity of such a system

in a natural language (in comparison, English makes a poor showing, with a mere five categories).

2. Gathering the data

I worked with a total of four informants during my research on Kikuyu. However, the bulk of the data used in the dissertation derives from the work I did with two informants during a field-trip to Nairobi, Kenya, in the summer of 1976. All of the informants were young men who grew up in Kikuyu-speaking homes, and were educated to a university level (in English). For my two main informants, Kikuyu was definitely the language of every-day life, with English playing a secondary role in specialized contexts, mainly of an academic sort.

My research began in Columbus, Ohio, in the fall of 1975. At that time, I worked with David Nyĩka Kiromo, a Kikuyu from Nyeri, who was a student at Ohio State University. From June to August of 1976, I worked intensively in Nairobi with John Gĩtaũ Mũigai and Shem Kimani Macharia. Both Gĩtaũ and Macharia were commerce students at the University of Nairobi. Macharia grew up in the Kiambu district. Up to the age of seven, Gĩtaũ lived in the Embu and Mũranga districts; his family later moved to the coast, although Gĩtaũ returned to Nyeri district for his high school education. There were no dialect differences between these two informants which affected the work I was doing. My most recent informant was

Anthony Kinoru Gachinga, whose parents came from the Kiambu and Nyeri areas. I worked with Tony briefly in the spring of 1977 in London, Ontario. Since he had been in Canada for many years, he had the least current contact with his native language of all my informants. Nevertheless, his semantic judgements were congruent with the others, and his excellent command of idiomatic English was a definite advantage.

Many people (including some linguists) wonder how it is possible to do semantic research in a language which one does not speak. In my opinion, foreign language semantics has both its advantages and its disadvantages. On the one hand, the researcher in a foreign language must rely on the native speaker's reports of his intuitions about meaning; consequently, considerable ingenuity is sometimes needed to elicit the appropriate semantic judgements, and to recognize what related judgements are needed (in terms of the problem studied). On the other hand, work in a foreign language brings the researcher closer to the naive speaker's point of view. This is especially helpful for those of us whose "intuitions" are just a little over-educated! Inevitably, of course, the researcher has to use her own judgement (tempered with common sense) in deciding what a judgement means in particular cases. I feel that this is not a problem, if we keep two considerations in mind. First, all semantic work, including work on one's own intuitions, has proceeded on a trial and error basis in determining just what "semantic facts" are to be accounted for. Second, I believe

that the semantic systems of natural languages are as highly structured and integrated as their phonological systems, and that this structure can be discovered through empirical investigation. Without such a conviction, of course, this dissertation project would have been impossible. However, I hope that the dissertation itself provides some evidence that this point of view on semantics is justified.

3. The orthography

All Kikuyu forms cited in this dissertation are written in the standard orthography. The one peculiarity of this system is the use of the diacritic "˜", which distinguishes the mid vowels ĩ (= [e]) and ũ (= [o]) from the low vowels e (= [ɛ]) and o (=[ɔ]), respectively. Otherwise, the symbols have their standard values. The Kikuyu orthography does not represent phonemic tone or vowel length; consequently, these are not marked in the forms cited. The spelling used is exactly that used by my informants, except for the occasional form in which an underlying long vowel is spelled with a double vowel (even though the informant originally spelled it with a single vowel). This normalization of the spelling facilitates the morpheme-by-morpheme break-down in the inter-linear glosses; vowels are recovered in this way only when convenient, and not on a consistent basis.

4. Why Montague Grammar?

This question is a little difficult to answer, especially because I hope that my research will interest many Bantuists, as well as many semanticists, who may have little or no interest in formal theories like Montague's. The reason I have chosen to use Montague Grammar is that it provides a very powerful tool for making precise and thorough analyses. The attempt to formalize all of my ideas on tense and aspect has been, in my opinion, an indispensable tool in understanding and clarifying these ideas for myself.

To accommodate the non-formalist in my audience, I have attempted to explain all of my analyses in ordinary language, so that the conceptual content of each definition can be understood independently of its logical formulation. Consequently, chapters one through five presuppose only a slight acquaintance with the techniques of semantic analysis using symbolic logic. Chapter six presents complete formalizations of the content of the preceding chapters, and so will be of interest only to a specialized audience. This last chapter presents a grammar of Kikuyu which is based closely upon Montague's grammar of English in "The Proper Treatment of Quantification in Ordinary English" (Montague: 1973), and presupposes familiarity with that system.

For the occasional reader who might wonder whether Montague Grammar is, after all, applicable to any language other than English, I would like to end with the following observation. When I began working on Kikuyu, I discovered very quickly that

every classical problem in the syntax and semantics of English, which motivated the creation of formalist theories like Montague's, has an exact parallel in the grammar of Kikuyu. I am thinking, for example, of problems like the ambiguous scope of negative markers over subject noun phrases, the potential opacity of object noun phrases, and the ambiguous scope of time adverbs with some classes of verbs. It seems obvious that these problems will be solved in essentially the same way for both languages. On the other hand, the semantic categories of Kikuyu are sufficiently unusual to make the extension of Montague Grammar into the domain of Bantu linguistics a uniquely fascinating experience.

I. GOALS OF THE DISSERTATION

1. An approach to tense and aspect
2. The Kikuyu inflectional system
3. Some further considerations

0. The major goal of this dissertation is to propose a model-theoretic treatment of tense and aspect, and to test this theory by applying it to one of the most elaborate natural language inflectional systems concerned with distinctions of this sort. The semantic theory presented here is a model-theoretic version of Hans Reichenbach's theory of natural language tenses (Reichenbach: 1947). The formalization is based upon the development of model theory in Montague (1968; 1970; 1973). (References to particular passages of these papers will be to the pages on which they occur in the collected edition of Montague's papers (Montague: 1974).) The treatment of aspect in this thesis is a development of earlier work on interval-based semantics, for example, in Bennett and Partee (1972), Dowty (1977), and Taylor (1977). The over-all approach is particularly focused on the task of showing that a compositional theory of meaning for natural languages is possible That is, the theory is designed to show that the meaning of a complex expression of a language (in this case, Kikuyu) is a function of the meanings of its parts.

Throughout this dissertation, I have attempted to present the major ideas in a manner which is clear to readers who are not familiar with model theory. However, because of the difficulty of the task, I have not attempted to give a general introduction to Montague Grammar, or an explanation of its basic assumptions and techniques of analysis. Readers who would like such background material are referred to Montague's own papers (cited above), and also to Richmond Thomason's introduction to Montague's linguistic papers (in Montague: 1974). An introduction to Montague Grammar which is tailored to an audience of linguists is available in Partee (1975).

In this first chapter, I begin by outlining the general theory of tense and aspect which is to be developed in the dissertation. The second part of the chapter describes the Kikuyu system to which the theory is to be applied. The latter part of the chapter outlines some syntactic issues which touch upon the treatment of tense and aspect, and which have influenced the approach taken to the problems in this dissertation.

Because of the enormous complexity of the Kikuyu system for tense and aspect inflection, the number of operators proposed in this dissertation is unusually large. Moreover, there is a great deal more which could be said about some of these operators than I have been able to say within the limits of one dissertation. This situation reflects a deliberate choice on my part to centre the thesis on the description of a complete linguistic system. I made this choice, because I believe that the categories of tense

and aspect (as linguistic entities) cannot be understood independently of each other. That is, in order to understand the meaning of a particular tense or aspect marker, it is important to consider its role in relation to other members of the same linguistic system[1]. This point of view is, of course, consistent with the structuralist claim that a semantic system is a set of oppositions which exhaustively cover a particular semantic domain. It is because I essentially agree with this position that I have made the description of a complete language system a fundamental goal. Where necessary, however, I have tried to make clear just how far I think that individual problems have been resolved, and what questions have had to be left for future exploration.

Considering the extensive use of Montague's formalizations throughout this dissertation, a word is appropriate here on how the aims of the present work relate to the original aims of Montague's semantic program. A major concern of this dissertation is to describe the semantic organization of a particular linguistic system - namely, the tense and aspect paradigm of Kikuyu. Baisc to my approach to this problem is the idea that such systems have a fixed structure, in which meanings are organized in relation to a particular semantic domain and in which certain "features" of meaning are considered to be fixed elements of the structure of particular classes of morphemes. For example, I claim in this thesis that each member of a class of infixes in Kikuyu realizes the meaning element "manifest action", while the members of a certain class of prefixes realize

the meaning element "imminent action". These are claims which are not necessarily inconsistent with the aims of a Montague Grammar, but they are definitely not a part of Montague's own claims about natural languages. Montague's goal was to give a complete account of logical entailment for a natural language such as English. This goal was to be pursued by translating sentences of English into formulae of intensional logic, and then interpreting these formulae model-theoretically. What is different in Montague's approach (from my own) is that Montague assigned no theoretical significance whatsoever to the particular formulae of intensional logic into which English sentences are translated. In other words, particular translations, as well as particular sentence operators, are not thought of as corresponding to anything which might be called "elements of the semantic structure of English", since such a level of structure did not exist as far as Montague was concerned.

The point which needs to be made clear is this. I have made use of Montague's formalizations in order to make precise certain claims about the semantic organization of the Kikuyu language. These claims make use of notions such as the "reference-time (of an utterance)", which from a linguist's point of view, has a certain intuitive as well as empirical content. However, the theoretical status of a notion such as "reference-time" in a formal theory like Montague's is problematic, because "reference-time" is clearly not something given automatically by a context of use. The only time which

is actually given automatically by a context is the time of speaking. Consequently, as far as the formalization is concerned, the use of the notion "reference-time" serves only as a technical device in making possible a strictly compositional semantic analysis for a class of Kikuyu sentences incorporating particular verb forms. The same thing can be said for "episode-time", another semantic notion adopted from Reichenbach. How this technical use of "reference-time" and "episode-time" in the formalization can be ultimately related to the basic claims about the linguistic role of such entities is a complex issue, and not one which I will attempt to answer within the limits of this dissertation.

1. An approach to tense and aspect

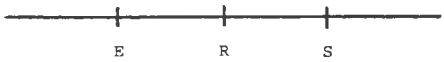
The informal, semantic conception of tense and aspect which is presupposed in this dissertation is, I believe, a currently standard point of view, which is expressed (for example) in Comrie (1976). Comrie identifies both tense and aspect as linguistic categories associated with distinctions of time. However, tense is specifically defined as a category which relates the time of a situation referred to, to the time of speaking, whereas aspect is defined as "different ways of viewing the internal temporal constituency of a situation" (Comrie: 1976, 3). (The precise formulation of this definition is attributed to Holt (1943).) As I understand it, this definition means that verb aspect involves any grammatical device which serves to

establish reference to one particular phase of a temporally complex episode. Hence, aspect involves not only the lexical difference between, for example, simple state and change-of-state verbs, but also inflectional differences between such categories as "progressive" and "perfect" aspect. The English verbs "know" and "realize" illustrate an aspect distinction of the first type: that is, the change-of-state verb realize serves to establish reference to the inceptive phase of an episode of knowing, whereas know establishes reference to any time within the duration of the knowing experience. The difference between English "he ran" and "he had run" illustrates an aspectual distinction of the second type. That is, the simple form, "he ran", establishes reference to the time of actual running, whereas the perfect form, "he had run", establishes reference to a later time, possibly a time when the effects of the running episode were still in force. Since these are aspectual distinctions of rather different types, it will be useful to distinguish in this thesis between the aspect class of a verb, and its aspect form. The aspect class of a verb is the lexical classification which is made according to what type of episode a verb names. The aspect classes of Kikuyu play only a secondary role in the semantic issues which I am concerned with in this thesis. That is, I will not attempt to give a theory of aspect classes. However, since aspect class interacts in several important respects with aspect form in Kikuyu, I will be concerned with aspect classes in so far as they affect the interpretation

of an aspect form. The aspect form of a verb is any modified form of the basic verb, which establishes the location of the time which is talked about in relation to the time of the particular episode named by a verb. The particular aspect categories of Kikuyu which are expressed by such verb forms are introduced in the next section of this chapter.

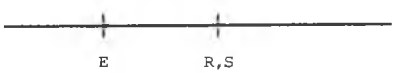
For further discussion of the terminological problems associated with the term "verb aspect" (for both historical and linguistic reasons), the reader is referred to Comrie (1976), and also to Scheffer (1975). My concern in what follows will be to introduce a model-theoretic interpretation of the semantic distinctions expressed by tense inflection, aspect class and aspect form, based upon the above general view of the meanings of these terms, and in particular, based upon the approach to meanings of this type which was originally proposed in Reichenbach (1947). Reichenbach argued that, in order to understand natural language systems of time reference, we need to distinguish three distinct temporal reference points in an utterance: the "point of speech" (S), the "point of reference" (R), and the "point of the event" (E). The reason for distinguishing these three can readily be seen from the English past perfect form (as in, "he had run"), because in this case all three times are clearly separate. That is, a past perfect sentence describes a situation in terms of the following ordering of the three time points :

he had run



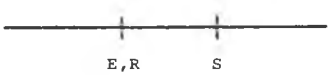
The sentence, "he had run", asserts that it was true at some time in the past (the reference-time), that at a time prior to that (the event-time), "he ran". For a present perfect sentence, on the other hand, reference-time is identified with speech-time. Thus, we have the situation shown below:

he has run



The present perfect may thus be contrasted with a simple past tense, in which event-time and speech-time have the same relative positions, but reference-time is associated with the time of the event, rather than the time of speaking. That is:

he ran



Finally, the simple present tense may be characterized in this

system as the one for which all three time points are the same. That is:

he runs

E,R,S

Turning now to the relation of model theory to the study of tense and aspect, I propose to use Reichenbach's theory in the following way. I present in this thesis a semantic system in which the truth of a sentence is determined relative to an index which is an ordered quadruple, consisting of a world and three times: a moment of time (corresponding to the time of speaking), an interval of time (corresponding to the reference-time of an utterance), and a set of intervals of time (which constitute event-time). The world plays the same role as it plays in Montague's semantic system in "The Proper Treatment of Quantification in Ordinary English" (Montague: 1973). (Henceforth, this article will be referred to as PTQ.) The important innovation in my system is, of course, the introduction of three time indices. These time indices are involved in distinct ways in defining truth conditions for different types of sentence operators in my semantic system. For example, speaking time and reference-time are involved in the definition of a set of tense operators in my system, while reference-time and event-time are involved in the definition of a set of aspect operators.

When neither tense nor aspect is at issue, however, event-time is the only time in the index which plays any role in determining the truth of a sentence, and in particular, in determining the interpretations of "ordinary" predicates such as red or arrive. (See Chapter VI for the technical details of this theory.)

At this point, some terminological clarification is called for. Following a suggestion in Nordenfelt (1976), I have adopted the term episode as a generic name for classes of events in the world, such as "states" and "activities". The use of the term episode in place of event for this purpose avoids confusion with a common, narrower use of the term event in the theory of aspect classes (for certain kinds of episodes). Hence, the fourth member of an index, corresponding to Reichenbach's notion of event-time, will be referred to as episode-time. For reasons given later in the discussion, we take episode-time to be a set of intervals of time, rather than a point in time. An interval of time is understood as any set of moments that is continuous; that is, there are no "gaps" between members in the set (given that time itself is a continuously ordered set of moments). Reference-time in this system is also viewed as an interval of time. However, speaking time is taken to be an individual moment in the model.

The major advantages in using an index with three separate time components in evaluating the truth of a sentence in a model may be summarized as follows:

(a) This approach makes it possible to give an explicit characterization of the semantic notions "tense", "aspect form", and "aspect class", as well as characterizing (in an intuitively natural way) the categories of "existential status" which are found in Kikuyu (see below for an explanation of this term).

(b) Distinguishing reference-time from speaking-time allows us to give a uniform semantic treatment of tenses and deictic time adverbs for ordinary language, while taking account of the semantic redundancy of a tensed form co-occurring with an explicit time adverb. Thus, this analysis solves a problem in the application of ordinary tense logic to natural languages. (See Chapter IV for discussion.)

(c) This approach makes it possible to give a complete, compositional semantic analysis for the verb forms in the Kikuyu tense and aspect inflectional system, a system which is not only unusually large, but one which is unusually replete with (apparent) semantic anomalies.

Point (a) above requires further elaboration in this introductory chapter. The three times in Reichenbach's system may be used to specify three types of pairwise relations. These three relations correspond to the three semantic categories "tense", "aspect form", and "existential status", in the manner indicated by Figure 1 below. ("Aspect class", which involves relations between episodes and episode-time, does not fit into this particular analytical schema.)

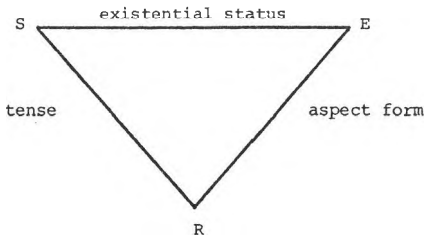


Figure 1: Relations among the temporal indices

The information represented in Figure 1 is that tense distinctions involve relations between speech-time (S) and reference-time (R), aspect form involves relations between reference-time (R) and episode-time (E), while existential status distinctions involve relations between speech-time (S) and episode-time (E). I will briefly outline the nature of each of these in turn.

Tense

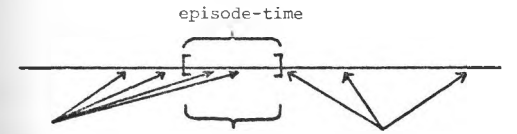
Tense is of particular interest in Kikuyu, because of the sheer number of obligatory tense categories. These include: remote past (typically, two or more days ago), near past (yesterday), immediate past (earlier on the day of speaking), extended present (an unusual tense, referring most often to times within the day of speaking), simple present, near future (an "indefinite" future, which may refer to any time which is at least a few hours ahead of the time of speaking), and the remote future (designating tomorrow,

or any later time).

One of the most fascinating aspects of the Kikuyu tenses is the way that they interact with the existential status categories "manifest" and "imminent" action. This is fully explained in Chapters IV and V.

Aspect form

The aspect distinctions expressed by different forms of a verb involve relations between episode-time and reference-time. In Kikuyu, there are three aspect distinctions of this type, which I designate "progressive", "completive", and "perfect" aspect[2]. The basic relations expressed by each of these categories are illustrated in Figure 2 below.



progressive aspect | completive aspect | perfect aspect

(arrows point to the possible range of reference-times)

Figure 2: Relation of episode-time to reference-time for the three aspect form categories

The only possible location for the reference-time of a sentence in completive aspect is an interval of time which coincides with episode-time. With a perfect or progressive sentence, however,

there is a range of possibilities: in the case of perfect aspect, the reference-time may be any time later than episode-time, while in the case of progressive aspect, the reference-time may be any time either just before, or else contained within, episode-time. The details of this general analysis are given in Chapters II and III.

Existential status

There are two semantic categories of Kikuyu which express relations between speech-time and episode-time. These categories I have named "manifest action" and "imminent action", because "manifest action" includes all episodes which have come fully into existence, while "imminent action" includes all episodes which are still coming into existence, or about to come into existence, but are not yet fully realized. In other words, the category of manifest action means that episode-time is of relatively remote origin in relation to speaking time, whereas the category imminent action means that episode-time is either of very recent origin, or it lies in the future (relative to speaking time). This manifest/imminent distinction does not correspond directly to any morpheme(s) of Kikuyu, but rather to a basic division in the formal organization of the verb paradigm. The idea of interpreting this formal pattern as a reflection of an underlying category distinction of this type was inspired by the distinction which Benjamin Whorf pointed out in his analysis of Hopi verbs (Whorf: 1950).

Whorf defined this category distinction as follows:

> "The objective or manifested comprises all that is or has been accessible to the senses; the historical physical universe, in fact, with no attempt to distinguish between present and past, but excluding everything we call future. The subjective or manifesting comprises all that we call future... This realm of the subjective or of the process of manifestation... includes also - on its border but still pertaining to its own realm - an aspect of existence that we include in our present time. It is that which is beginning to emerge into manifestation; that is, something which is beginning to be done, like going to sleep or starting to write, but is not yet in full operation." (quoted from Whorf: 1956, 59-60)

It will become apparent as the discussion develops that Whorf's insight into a certain type of semantic distinction in natural language has striking applicability in the case of Kikuyu. (Perhaps as more and more tense/aspect systems of the world are described, we will find that the manifest/manifesting distinction plays a much broader role than has hitherto been realized.)

To end this discussion, a word is appropriate on the nature of aspect classes. Aspect class is here viewed as a relation between an episode and episode-time; hence, it does not fall within the range of temporal relations which are the main topic of this dissertation. Nevertheless, some account must be taken of the aspect classes of Kikuyu, because aspect form categories such as "progressive" or "perfect" appear to have different meanings in relation to different classes of verb stems. For example, certain verbs in progressive aspect have an "imperfective" (that is, a "non-completion") meaning, as in the English sentence, "he was building a house (but he hadn't finished it)", whereas

other verbs lack this implication in their progressive form (essentially, because they lack an implication of "completion" in their basic meaning; for example, "he was running" implies nothing about the potential for "completing" the act of running). Another interesting case of the same phenomenon is the class of Bantu inchoative verbs, which appear to require an analysis for completive and perfect aspect which is distinct from the analysis of these categories for ordinary (that is, non-inchoative) verbs. Because of these problems, much of the discussion of verb aspect in this thesis is given over to showing that there is a core meaning for each of the aspect form categories of Kikuyu, but this core meaning may interact in different ways with the properties of different classes of verbs to which these meanings are applied.

Table 1 on the following page summarizes the four types of time-related meanings which are to be analyzed in this thesis, and indicates the form in which these meanings are expressed in the grammar of Kikuyu (that is, whether each type of meaning is expressed within the inflectional morphology, or the lexical structure of the language). In the next section of this chapter, I outline the particular inflectional system which is to be analyzed in this dissertation.

TABLE 1: Summary of time-related distinctions

Type of distinction	Semantic interpretation
a) inflectional categories	
tense	relation of reference-time to the time of speaking
existential status	relation of episode-time to the time of speaking
aspect form	relation of episode-time to reference-time
b) lexical categories	
aspect class	relation of an episode to episode-time

2. The Kikuyu inflectional system

The morphology of the Kikuyu verb is exceedingly complex. The categories of inflection include tense, aspect, status, negation, modality, and dependent tense. In addition, a verb form must express concord with a governing subject noun (which belongs to one of a great many noun classes), and sometimes expresses concord with an object noun as well. In this dissertation, I will be concerned only with verb forms which are inflected for tense and aspect, which express concord with a subject noun, and which function as independent main verbs in a sentence. The verb forms thus included are illustrated in Tables 2 and 3, presented later in this section. (Readers are warned in studying these tables that glosses using the much smaller set of aspect and tense forms available in English may blur additional distinctions made in the larger Kikuyu system.)

Subject concord is always marked by the first morpheme in a verbal string. In the tables, I have illustrated only the concord for Class 1 nouns (the human class), which is normally a-, but may be altered to e- for morphophonemic reasons. Concord for other classes is marked analogously. For convenience, I have consistently used the verb stem hanyũka "run" to illustrate various possible combinations of tense and aspect marking in Tables 2 and 3.

The inflected forms which express distinctions of tense, aspect, and status may be arranged into two sub-groups, according to the number and position of elements in the verbal string. I will begin by describing the members of the sub-paradigm which I designate as "manifest action". The forms in this group

are characterized morphologically by the presence of an aspect infix (-ag-, -ir-, or -īt-) within the verb stem, and a tense prefix (which may be "zero") immediately preceding the stem. Thus, the schematic structure of these verb forms is: Subject - (tense)Prefix - Stem/(aspect)Infix. The infixes in this pattern, -ag-, -ir-, and -īt-, mark progressive, completive and perfect aspect, respectively. The prefixes -kū-, -ra-, and -a- mark immediate, near and remote past, respectively (these names are based upon Barlow (1960), although I have used "remote" in place of Barlow's term, "remoter past tense"). The eleven verb forms which result from the possible combinations of these various markers are shown in Table 2 on the next page. (Note that one logically possible combination, the co-occurrence of -kū- with -ir-, is missing in this table, for reasons discussed below.)

There are a number of interesting semantic problems in attempting to analyze the forms in Table 2. Note, first of all, that there is an asymmetry in the tense meaning of the "zero tense" forms. In the case of progressive and perfect aspect, this unmarked form has a simple present tense meaning, but in the case of a completive aspect marker, the unmarked form has an "immediate past tense" meaning (that is, "earlier on the same day"). However, there is no such asymmetry in the near and remote past tense forms of the three aspects: for example, with each aspect, the near past form refers (typically) to a time on the preceding day. This is, I think, a fairly astonishing feature of the Kikuyu system,

TABLE 2: The manifest action sub-paradigm

	"zero"-tense (ø)	Immediate Past (-kū-)	Near Past (-ra-)	Remote Past (-a-)
Completive (-ir-)*	a-hanyūk-ir-e "he ran (earlier today)"	------	a-ra-hanyūk-ir-e "he ran (yesterday)"	a-a-hanyūk-ir-e "he ran (before yesterday)"
Progressive (-ag-)	a-hanyūk-ag-a "he is habitually running"	e-kū-hanyūk-ag-a "he was running (earlier today)"	a-ra-hanyūk-ag-a "he was running (yesterday)"	a-a-hanyūk-ag-a "he was running (before yesterday)"
Perfect (-īt-)*	a-hanyūk-īt-e "he has run (some ago)"	e-kū-hanyūk-īt-e "(earlier today) he had run"	a-ra-hanyūk-īt-e "(yesterday) he had run"	a-a-hanyūk-īt-e "(before yesterday) he had run"

*this morpheme changes the final vowel a of a verb stem to e

and one that serves as a key motivation for the particular semantic analysis which I present in this thesis.

Another interesting fact about Table 2 is that the unmarked progressive form has a habitual action meaning, whereas each of the past tense forms has several interpretations (described in Chapters II and III), only one of which is habitual action. The semantic analysis must somehow predict the fact that, in the absence of a past tense marker, the meaning of the progressive marker (in this sub-paradigm) is restricted to habitual action. In addition to this, note that the present perfect form means, "he has run some time ago"; the past perfect forms, however, are more general in meaning, and in particular, are consistent with the interpretation, "he had just run".

Finally, it is interesting to note in regard to Table 2 that there is no immediate past completive form (combining -kū- with -ir-), although it is obvious what such a form would mean - namely, "he ran earlier today" (parallel to the meanings of the other past tense forms). However, if you suggest such a form to a native speaker, he generally reacts with surprise (and perhaps some politely guarded amusement at your naïvete), without venturing a translation. The problem with this combination seems to be that its meaning is "pre-empted" by the unmarked completive form, which means what we expect the immediate past completive form to mean. Other cases of morphological "gaps" in a system have been described on a similar basis. However, these other cases have involved derivational morphology,

and in particular, the "pre-emption" of a morphophonemically regular formation (such as the missing English form *cooker), by an irregular form (such as the noun cook). Some cases of this sort are discussed in Thompson (1974). The present case is unexpected, however, because it involves two forms separately derived by regular formation rules, competing for the same meaning. There is further discussion of this problem in Chapter IV.

The second sub-paradigm, which I call the "imminent action" paradigm, of Kikuyu is characterized by the presence of a prefix before the verb stem, but no infix. Thus, the schematic structure of forms in this group is: Subject - Prefix - Stem. The prefixes in this pattern express certain fixed combinations of tense and aspect meanings, as illustrated in Table 3 on the following page. Note how closely the five forms in this group fit the semantic range of the category "manifesting" which Whorf described - from episodes which lie in the indefinitely remote future, to episodes which have just come into existence.

The imminent action sub-paradigm presents very few semantic problems, in comparison to all the apparent anomalies of the manifest forms. In fact, the analysis of these forms is fairly straightforward once we have successfully completed the analysis of the manifest action forms. The imminent action forms are described in Chapter V.

TABLE 3: The imminent action sub-paradigm

	Simple Present	Extended Present	Near Future	Remote Future
Completive	-----	e-kũ-hanyũka "he runs (today)"	a-rĩ-hanyũka "he will run (soon)"	a-ka-hanyũka "he will run (tomorrow or later)"
Progressive	a-ra-hanyũka "he is running (right now)"	-----	-----	-----
Perfect	a-a-hanyũka "he has just run"	-----	-----	------

There remains one important form in the Kikuyu inflectional system, which has not appeared in Table 2 or Table 3. This is the uninflected form, which consists only of a subject prefix and a stem; for example, a-hanyũka "he runs" (no specific time mentioned). The meaning of this form is analyzed in Chapter II. This form has an important role to play in the syntactic analysis of Kikuyu, given in Chapter VI, because of the way inflected forms of a verb are to be introduced syntactically in the grammar. Like Montague in PTQ, I employ rules which form new meaningful expressions (of a fragment of a natural language), by replacing the verb in a verb phrase with one of its alternative forms, inflected for an additional morphological category (or categories). (I am alluding here to the "Rules for Tense and Sign" which appear in Montague (1974: 252).) In order to include such rules in the grammar, we must allow the semantic translation of a less marked verb form to serve as input to the semantic translation of a more marked form (see Chapter VI for details). In the present grammar of Kikuyu, the meaning of the uninflected form is used as the basis for determining the meaning of all of the other inflected forms in the system.

All that is left to be done in the present chapter is to add a few comments on some additional aspects of the over-all analysis, mainly concerning syntactic issues.

3. Some further considerations

The reader will find that there is particular emphasis in my analysis on finding a unitary meaning for each morpheme of the tense and aspect system of Kikuyu. In several instances, a plausible case for the ambiguity of a particular inflectional marker might have been made, but I have deliberately chosen to reject this strategy in the analysis. In some cases, I have indicated independent evidence for treating conceptually distinct "interpretations" of a form as instances of lack of specification, rather than ambiguity (cf. the discussion of progressive aspect in Chapter III). In other cases, there is no independent motivation for my approach. However, in treating certain morphemes as vague in these cases, a compositional semantic analysis is possible, and this would be quite problematic otherwise (I have in mind here the semantic analysis of inchoative verbs, given in Chapter II). This is, of course, not an argument that every grammatical morpheme of a language must be unambiguous. However, my personal view on such matters is that linguists in recent years have been too easily persuaded that cases of genuine ambiguity, as opposed to lack of specification, are involved in various constructions. There is a helpful discussion of this problem available in Zwicky and Sadock (1975). Zwicky and Sadock show that many of the standard semantic and syntactic tests for ambiguity give problematic results. In light of this, I think it is reasonable to begin to investigate the case for considerably greater vagueness in the semantic systems of natural languages than has

previously been acknowledged. My position on this problem is not, of course, unique. It originated in the nineteenth century in the search by German scholars for a Grundbedeutung for every morpheme of a language. A similar point of view still finds expression within various contemporary linguistic traditions, for example in Jessen (1974), Bennett (1975), and Waugh (1976).

In order to avoid confusion in the later discussion, I will henceforth use the terms reading and interpretation as technical terms, defined as follows. An ambiguous sentence is one which has two or more readings, corresponding to two or more semantically distinct analysis trees (the analysis tree gives the syntactic structure of a sentence in Montague Grammar; in standard generative theory, a reading would correspond to distinct underlying syntactic - or semantic - representations). A sentence which is vague, on the other hand, is one which has no syntactic analysis tree which is semantically distinct from any other one; however, a vague sentence may have two or more conceptually distinct interpretations, corresponding to two or more ways that the sentence may be understood. In other words, an interpretation of a sentence is a description of one typical way that the world might be if the sentence happened to be true. Each of the aspect categories of Kikuyu produces sentences which have at least two such interpretations, depending in part on which verb stem is involved in the sentence. These distinct interpretations form the basis for the classification of verb stems which is given in Chapters II and III.

Another important terminological point concerns the use of the term semantic representation in this thesis. Unlike syntactic theories such as Generative Semantics, Montague Grammar does not assign any theoretical status to the term semantic representation. Every sentence generated by a Montague Grammar has multiple "semantic representations", corresponding to equivalent ways that the translation of a sentence (into intensional logic) may be represented. What is important about the semantic translation of a sentence is its model-theoretic interpretation, and not the particular formula of intensional logic which is used to represent the translation. Nevertheless, it will be convenient to talk about the "semantic representation" of a sentence in the exposition, in the following way. The semantic representation of a sentence is to be thought of as a logical formula which represents the systematic features of the meaning of a particular sentence. Since this is a fairly standard use of the term, it should not create any misunderstanding.

The syntactic use of markedness in this thesis is also worth mentioning in this introduction. As I indicated above, there are morphologically unmarked (or "zero") tense forms in Kikuyu, which I treat as semantically unmarked in my analysis. In addition, I use a different notion of markedness in handling subject concord in the grammar. In Greenberg (1966: 30), it is pointed out that morphological systems which have no formally unmarked member may nevertheless have a (morphologically

marked) form which functions as the semantically unmarked form, whenever such a form is required. In Chapter VI, I assume this principle in treating class nine concords as the semantically unmarked members of the Bantu concord system (even though they bear a formal "mark"). That is, the class nine prefix is viewed as the one which is appropriate when there is no noun present to govern the concord position. (It is difficult to tell whether this would work as a factual claim about the Kikuyu concord system, because it is difficult to tell whether a concord is ever literally ungoverned - as opposed to being governed by a generic noun which happens to have been deleted.) This use of markedness makes it possible to build up verb phrases of varying degrees of complexity in the grammar, before introducing the term phrases which the bind the variables in a verb phrase. There are other ways to allow for this in the syntax. For example, we could use an abstract subject marker, which is introduced by a syntactic rule, and "spelled out" later when the governing noun is introduced. I have preferred my own approach, because it makes use of an established linguistic principle, and because it ensures that the output of every syntactic rule is an expression of Kikuyu. However, I do not have an argument to give as to why one or the other approach ought to be taken in Montague Grammar.

Two additional introductory points need to be made, which concern the syntax of Kikuyu. First, the particle nĩ occurs in every Kikuyu sentence cited, and sometimes the particle no is also found. The function of nĩ is to indicate what is asserted in a sentence, and no signals that a particularly strong assertion is being made. The main evidence for this interpretation of nĩ is the fact that sentence (1) below is an assertion if nĩ is included, but can only be used as a question if nĩ is omitted.

1. mwana (nĩ) a-ra-hanyũk-ir-e
   child he-NP-run-Comp

   "the child ran"

   (see below for an explanation of the abbreviations used in the inter-linear gloss)

However, if an adverb such as ira "yesterday" is added to (2), then the sentence can be an assertion without nĩ: in this case, the focus of the assertion is on the time of running, rather than the act of running per se. On the basis of such facts, Myers (1971) has suggested that nĩ is used when its whole clause is asserted, and omitted when some part is presupposed. Since issues like these clearly lie outside the domain of tense and aspect, I will not attempt to give any more detailed description of the function of this particle. As far as no is concerned, its use appears to be triggered, at least sometimes, by the fact that a speaker is making an assertion contrary to the expectations of his addressee (based upon the previous discourse). Hence, I have generally glossed this particle as "yet" (which can have a similar function in English), but I have not included it in the grammar of Chapter VI.

The use of temporal extent adverbs (such as, "for an hour") should also be noted. Throughout the thesis, important points are made which involve temporal extent adverbs, although I do not give an explicit semantic analysis of such expressions. However, I assume that this could be done in a straightforward way, so that (for example), a sentence such as, "he ran for an hour", is true if and only if there is a period of time in the past which is an hour long, and "he runs" is true for that time. In the particular sentences in which temporal extent adverbs appear in this thesis, there is no motivation for treating them as any more complex semantically than this.

This chapter ends with a list of the morphological categories of tense, aspect and status in Kikuyu, the abbreviations for each category which are used in the inter-linear glosses, and the name of the particular sentence operator which is used to represent the meaning of that category. This information appears in Table 4 on the following page.

TABLE 4: Correspondance of semantic categories and sentence operators

Category name		Abbreviated name	Operator
Aspect:	Progressive	Prog	PROG
	Completive	Comp	COMP
	Perfect	Perf	PERF
Status:	Manifest	M	MNF
	Imminent	I	IMM
Tense:	Remote Past	RP	RP
	Near Past	NP	NP
	Immediate Past	IP	IP
	Extended Present	EP	EP
	Near Future	NF	NF
	Remote Future	RF	RF

Notes to Chapter I:

[1] I am not claiming, of course, that the meaning of an inflectional marker in a sentence depends upon the particular item which it combines with. This is a different sort of claim, and is fundamentally opposed to the principle of compositionality which Montague semantics is based upon. That is, if we want a compositional theory of meaning, then we cannot let the analysis of any category depend upon whether the category applies to a particular class of verbs.

The point made in the text is, that it is helpful (in finding out about the meaning of a category) to consider similar but distinct categories, because one category in a system of related distinctions is likely to cover whatever part of the relevant domain is not covered by any other category in the system.

[2] My use of the terms "progressive" and "perfect" corresponds to the use of these terms in Comrie (1976). The term "completive" corresponds to Comrie's use of "perfective"; I prefer the term "completive" because it is less confusing.

II. VERB ASPECT

1. Background to the problem

2. Interval-based semantics

3. The uninflected form of the verb

4. Completive aspect

5. Perfect aspect

0. In this chapter and the following one, I begin the analysis of the Kikuyu inflectional system with an examination of the semantics of aspect classes and aspect forms. As I indicated in Chapter I, aspect classes are to be explicated in terms of relations between episodes and "episode-time", while aspect forms are to be explicated in terms of relations between "episode-time" and "reference-time". The discussion begins with a brief consideration of the theoretical background to the problem. In the second section of this chapter, I present some definitions needed in an interval-based semantics, and I discuss the notion of truth relative to an interval of time, in relation to three aspect classes of Kikuyu (states, activities, and accomplishments). The chapter continues with a semantic analysis of the uninflected form of a Kikuyu verb, followed by an analysis of completive and perfect aspect. The category of inchoative verbs is also discussed in relation to completive and perfect aspect.

In Chapter III, the last (and most complicated) aspect form, progressive aspect, is described and analyzed.

None of the morphemes of the Kikuyu inflectional system is a pure aspectual marker, since each of them functions in addition as a marker of a status category (manifest or imminent), and sometimes also of tense. However, in order to simplify the presentation in this chapter and the following one, I will confine attention to the meanings of the three infixes -ag-, -ir- and -it-, strictly in so far as these mark distinctions of aspect form. This does not create problems for the description of Kikuyu, as long as examples are restricted to past tense forms. (The reason is that the contribution of the category "manifest" is effectively neutralized by the presence of an explicit past tense marker. See Chapter IV for further explanation.)

There are other important respects in which the exposition in Chapters II and III has been simplified from the full presentation of the semantics of aspect given in Chapter VI. This simplification involves putting off certain technical details of the formal model until the last chapter. This has been done in order to avoid confusion for the reader, and does not affect the substantive semantic claims made in these former chapters. The simplification involves two things. First, truth relative to an index (in a model) is defined directly for sentences with particular operators in them, throughout Chapters II to V. In Chapter VI, however, we begin by defining recursively the extension of a formula in a model, relative to an index, and we then define the notion

of truth for an arbitrary formula in terms of its extension. Because of this difference, the "truth conditions" given in the earlier chapters would be viewed more accurately as conditions of adequacy on the definition of truth for intensional logic, rather than as definitions of truth per se. That is, the definitions ought to follow as a consequence from the actual definition of truth given in Chapter VI. This is a technical point, which will not concern many readers.

The second way in which the discussion of verb aspect has been simplified in Chapters II and III concerns the definition of an index. In Chapter VI, the extension of a formula is defined relative to an index consisting of four things: a world, a moment of time (corresponding to the time of speaking), an interval of time (corresponding to the reference-time), and a set of intervals of time (which constitute episode-time). Unless there is an explicit tense or status operator, however, the time of speaking plays no role in determining the truth of a sentence. Therefore, it has simply been omitted from all statements of truth conditions in these two chapters. Unless there is an explicit aspect operator, there is likewise no role for the reference-time to play. The truth of "ordinary" predicates such as red or arrive (applied to some entity) involves only an instance of episode-time. For this reason, it will be convenient to talk about sentences which are true relative to an index <w,i,J> (where i is the reference-time interval and J is the set of episode-time intervals), as well as sentences which are true_e relative to a two-place index <w,j>,

consisting only of a world and an interval of episode-time. Another way to look at this is to say that truth for formulas with aspect operators in them is defined only relative to a three-place index, while truth for formulas with no aspect operators is defined in two ways, relative to a three-place index or a two-place index. Formally, what we are doing is to define a subsidiary notion of truth, true$_{-}$, for an aspectless language which is embedded within the language containing aspect operators for which true is defined. This will, hopefully, make the definitions easier to follow.

1. Background to the problem

There have been numerous attempts in the philosophical and linguistic literature, beginning with Aristotle, to identify the aspectual classes of verbs - or, to speak more precisely, the aspectual classes of the sentences formed by different classes of verbs; for example, "he runs" as against, "he dies". A review of the major proposals is available in Nordenfelt (1976). One of the most influential analyses in recent linguistic work on verb aspect has been Zeno Vendler's "Verbs and Times" (in Vendler: 1967). Vendler distinguishes four categories of verbs,[1] which are "states", "activities", "achievements", and "accomplishments". In my analysis of Kikuyu, I will be particularly concerned with Vendler's distinction between "accomplishment" and "activity" verbs. For the purposes of this dissertation, I will follow Nordenfelt in viewing achievements as a special sub-class of accomplishments, and for the

sake of simplicity, I will not offer any explicit treatment of achievements. Returning to the question of activities and accomplishments, the crucial difference according to Vendler is that activities (like running) "go on in a homogeneous way", while accomplishments (like writing a letter) "proceed toward a terminus which is logically necessary to their being what they are. Somehow this climax casts its shadow backward, giving a new color to all that went before" (Vendler: 1967, 101). This difference determines certain differences in the ways that it is appropriate to talk about activities as against accomplishments. For example , it is appropriate to ask, "For how long did he run?", but rather odd to say, "For how long did he write the letter?". The latter question would be better phrased as, "How long did it take him to write the letter?" Similarly, it is always sensible to say, "He finished writing the letter", but "He finished running" is odd, unless the context makes it clear that some goal-directed sense of run is intended (which makes it meaningful to talk about "finishing running").

The key consequence of these differences is, that when the truth of a sentence (in a model) is evaluated relative to an interval of time, rather than a moment of time, the entailments of a sentence like "he runs" differ significantly from those of a sentence like, "he writes a letter", or "he runs a mile". The difference, as Vendler formulates it, is as follows:

> "If it is true that someone has been running for half an hour, then it must be true that he has been running for every period within that half hour. But even if it is true that a runner has run a mile in four minutes, it cannot be true that he has run a mile in any period which is a real part of that time..." (Vendler: 1967, 101).

Considerations such as these led Bennett and Partee (1972) to analyze English tense and aspect in a model which takes intervals of time as points of reference, rather than moments of time (as in Montague: 1973). Their analysis distinguishes among three types of verb phrases: stative verb phrases, sub-interval verb phrases (activities), and non-sub-interval verb phrases (accomplishments). Stative verb phrases are those (like know, believe, be happy) which fail to take the progressive in English. (No explicit temporal characterization of these verb phrases is given.) Sub-interval verb phrases "have the property that if they are the main phrase of a sentence which is true at some interval of time I, then the sentence is true at every subinterval of I including every moment of time in I" (Bennett and Partee: 1972, 17). Examples which they give are walk, breathe, and push a cart. Finally, non-sub-interval verb phrases are simply "wholistic" verb phrases, in the sense that when a sentence with a non-sub-interval verb phrase is true for an interval of time, it is not true at any (proper) sub-interval of that time.

In what follows, I propose a taxonomy of sentence types for Kikuyu which is very similar to the one proposed by Bennett and Partee for English. However, my analysis is more directly based upon a somewhat different proposal, which appears in Taylor (1977). Taylor

is particularly interested in accounting for the semantic differences among the three classes of verbs, as these were viewed by Aristotle. Aristotle called these classes "state-verbs", "energeia-verbs" (which are like Vendler's activities), and "kinesis-verbs" (which are like Vendler's accomplishments). Taylor's strategy in analyzing the verb classes is to set up a series of meaning postulates which specify the entailments of the three classes of predicates. Informally, these entailments may be paraphrased as follows:

(a) If P is a stative predicate and P(x) is true at an interval i, then P(x) is true at every moment in i.

(b) If P is an "energeia" (activity) predicate, and P(x) is true at an interval i, then i is not a moment of time, i falls within an open-fronted interval of time[2], and every sub-interval of i which is not a moment of time is also a time at which P(x) is true.

(c) If P is a "kinesis" (accomplishment) predicate and P(x) is true for an interval i, then it is not the case that P(x) is true for some proper sub-interval of i.

In the latter part of his paper, Taylor extensively refines this initial characterization of the classes of verbs. However, since I am not concerned with the theory of aspect classes per se, only with the interaction of aspect class with aspect form, I will restrict attention to this basic formulation of the properties of each class. The important difference between Taylor's taxonomy, and that found in Bennett and Partee (1972), is that only stative verb phrases are treated as strict sub-interval predicates: all non-stative

predicates are true at periods (or intervals) of time which are not individual moments of time. This characterization of the state/non-state distinction is an intuitively appealing one, because it captures the idea that non-stative episodes "fill time", or "take up time", in a way that states do not. Moreover, it is consistent with Vendler's original conception of the state/activity distinction, as indicated by the following quote: "the concept of activities calls for periods of time... states involve time instants" (Vendler: 1967, 107; emphasis mine). There are problems in accepting this as the exclusive way of characterizing the state/non-state distinction found in natural languages[3]. As a working hypothesis, however, it is sufficient to distinguish a class of stative sentences in all of the ways that are crucial to the concerns of this thesis. With this in mind, I will now move on to apply this interval semantics approach to defining the aspect classes of Kikuyu.

2. Interval-based semantics

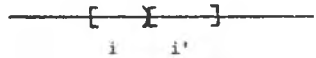
This section begins with some preliminary definitions, which we need to have available if we wish to use intervals of time as points of reference in a model-theoretic semantics. Time is viewed in the model as a set of moments, which are linearly ordered by the relation $\leq$ (= "earlier than or equal to"). Thus, every moment of time t in the set of times T is either earlier than, equal to, or later than every other moment in T. An interval may therefore be defined as any sub-set of T which is "without

interruptions", in the sense that if two times t_0 and t_1 are in the interval, then every time between t_0 and t_1 is also in the interval. (A precise set-theoretic definition of the notion "interval", and of the other terms introduced below is given in Chapter VI.) The symbol I will henceforth be used to stand for the set of (non-empty) intervals of time. The first moment of an interval i is defined as the moment (if any) which is earlier than every other moment in i; and similarly, last moment is defined as the moment which is later than every other moment. A closed interval from t_0 to t_1 is an interval which includes t_0, t_1, and every moment of time between them (but no other time). By a standard convention, I represent a closed interval from t_0 to t_1 as $[t_0,t_1]$; and closed intervals in diagrams will be represented by square brackets. An open interval from t_0 to t_1 is an interval which contains every time between t_0 and t_1 (but not t_0 or t_1, and not any other time). Thus, an open interval differs from a closed one in that it excludes the "end-points" t_0 and t_1. An open interval from t_0 to t_1 is written as (t_0,t_1), and represented diagrammatically with round brackets. An interval is half-open if it includes one end-point but not the other; this is written as $[t_0,t_1)$ or $(t_0,t_1]$, depending upon which end-point is to be excluded.

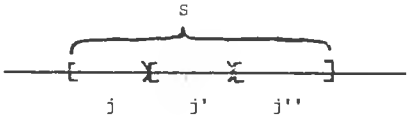
The members of I are ordered by the "earlier-than" relation <, which is defined as follows for intervals of time: an interval i is earlier than i' ($i < i'$) if and only if every moment of time in i is earlier than every moment of time in i'. This means that the earlier-than relation is undefined for intervals

which partially (or fully) over-lap. No theoretical claims are implicit in this way of defining the relation for intervals. The reason for restricting the relation to disjoint intervals is that these are the intervals which we will be interested in when it comes to defining various tense and aspect operators. Hence, it is convenient to build this restriction into the definition of <.

The notions sub-interval and proper sub-interval have their intuitively natural (and standard mathematical) definitions. That is, an interval i is a sub-interval of i' if and only if every moment in i is included in i'; and i is a proper sub-interval of i' if and only if every moment in i is included in i', but there is some moment in i' which is not in i (thus, i must be "smaller" than i'). We will also make use of the terms initial boundary interval and final boundary interval, which have previously been proposed and defined in Dowty (1977). An interval i is an initial boundary interval for i' if and only if i is earlier than i', and the union of i and i' is an interval. In other words, i must be adjacent to i', and ahead of it. Final boundary interval is defined analogously. In the diagram below, i illustrates an initial boundary interval for i', while i' illustrates a final boundary interval for i.



Finally, I will add to the above definitions the notion of an interval sequence, informally defined as a set of consecutive (and disjoint) intervals. For example, in the diagram below, S is the interval sequence consisting of the set containing j, j', and j''.



At this point, a few comments on technical matters are in order. The definition of an interval does not exclude the possibility that an interval is an empty sub-set of T; that is, an interval may be the sub-set of T which contains no members of T. However, it seems bizarre to talk about a sentence that is true relative to an empty interval of time. Hence, I was defined as the set of non-empty intervals of T, and the truth of a sentence is subsequently defined relative to I, rather than to the set of all interval sub-sets of T. Similarly, we later use the symbol J to stand for any member of the set of non-empty sub-sets of I; that is, $J \subset I$ and there is some i in I such that i is in J. (J is used to represent the fourth member of an index, which is the set of intervals of episode-time.) A further point worth noting is that we have assumed only a linear ordering of T. This ordering is consistent with a model in which time is discrete or non-discrete, but no assumption about discreteness has been built into the present model.

Turning now to the specific analysis of Kikuyu, we need to include in our analysis the following three sentence types, corresponding to three verb classes:

(a) strict sub-interval sentences (states)

(b) partial sub-interval sentences (activities)

(c) non-sub-interval sentences (accomplishments)

The inclusion of these three sentence types is motivated principally by differences in the interpretation of the progressive aspect forms of different verbs, but also in part by other considerations. I will discuss each type in turn.

States

Only a small number of Kikuyu verb stems fall into the category of stative predicates. The ones that do can be readily identified by the fact that they are morphologically "defective"[4] - that is, they do not combine with the full range of tense and aspect inflectional markers. Verbs in this class have invariable stems, which may combine with past tense markers, but not with any aspect morpheme. Some examples given in Barlow (1960) are: ūī "know", rī "be", rūngiī "be upright", tariī "be similar", koniī "be concerning, relating to"[5]. As I indicated earlier, states are to be thought of in my analysis as "strict sub-interval predicates"; hence, if a stative sentence is true in a world relative to some interval of time i, then that sentence is true relative to every moment of time within i.

Since stative verbs are defective in exactly those morphological properties which are the topic of this dissertation, I will not deal with them further in the discussion of aspect. However, the informal characterization of states just given is relevant to the later discussion of the class of inchoative state verbs in Kikuyu (which have a full inflectional paradigm).

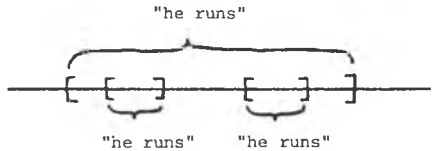
Activities

The activity verbs of Kikuyu include hanyūka "run", igua "hear", perceive", rūa "fight", erera "oscillate, float, loiter", and hūra "beat (someone, as with a stick)". Verbs (or more precisely, verb phrases) of this class are characterized by Condition A below.

Cond. A If δ translates an activity verb phrase of Kikuyu, then for all worlds w, and intervals j, all x are such that if $\delta(x)$ is true_e at $\langle w,j \rangle$, then there is no t in T such $j = \{t\}$

Note that, since reference-time is not involved in defining activities, this condition is given in terms of true_e. Condition A functions as a constraint on the possible translations into intensional logic of activity verbs in Kikuyu. Its role is thus very similar to that of a meaning postulate (we could readily state this condition as a meaning postulate, if we added an appropriate set of object language symbols). What the condition says is that a sentence formed with an activity verb is never true at an individual moment of time, but only at some longer interval. Note that this allows for an activity sentence to be true for

various sub-intervals of some of the intervals for which it is true. This possibility is represented schematically below for the activity sentence, "he runs".



The main property of activity verbs which we need Condition A to account for is the fact that their progressive forms have the potential[6] for three distinct interpretations, which I will refer to as the "continuous action", "iterative/habitual", and "futurate" interpretations, respectively. In using the terms "continuous", "iterative", and "habitual", I have in mind conceptually defined degrees of "spacing" among the sub-episodes of an episode which involves repetition of the same activity. This repetition is <u>continuous</u> if the sub-episodes are non-discrete and occur without interruption, <u>iterative</u> if the sub-episodes are discrete but closely grouped together, so that they may be viewed as part of a single episode, and <u>habitual</u> if the sub-episodes are discrete and widely spaced, in a series of individual episodes (cf. Comrie (1976), for a helpful discussion of such terminology). The three interpretations of the progressive form of the verb <u>hanyūka</u> "run" are, then, as follows:

1) nī a-a-hanyūk-ag-a
he-RP-run-MProg

i) (continuous action) "he was (continually) running"

ii) (iterative/habitual) "he was (repeatedly/habitually) running"

iii) (futurate) "he was going to run (but he hadn't started yet)"

It is the "continuous action" interpretation of progressive aspect for activity verbs which is dependent upon the fact that these verbs are interpreted as "partial sub-interval" predicates. In regard to the "iterative/habitual" interpretation shown above, it should be stressed from the outset that (unlike the English progressive), the iterative/habitual meaning of progressive aspect is quite salient for speakers of Kikuyu. In fact, a progressive marker can create a non-specific reading for an object noun phrase, on the basis of this interpretation. For example:

2) nī a-a-igu-ag-a ngengere
he-RP-hear-MProg bell

"he repeatedly/habitually heard a bell" (not necessarily the same bell every time)

(other possible interpretations not illustrated)

These facts about activity verbs are to be contrasted with the facts about accomplishment verbs which are treated as "non-sub-interval" predicates.

Accomplishments

Some Kikuyu verbs in the accomplishment class are aka "build", ringa "strike (someone)", tonya "enter", and kinya "reach as far as (a place or an object)" (if we had a separate achievement class, we would probably want to put the last example in that class). This class of verbs is subject to Condition B below:

Cond. B If δ translates an accomplishment verb phrase of Kikuyu, then for all worlds w and intervals j, all x are such that if $\delta(x)$ is true_e at $\langle w,j\rangle$, then there is no $j' \subset j$ such that $\delta(x)$ is true_e at $\langle w,j'\rangle$.

The important fact about accomplishment verb phrases which we need Condition B to account for is that accomplishment verbs in progressive aspect lack the "continuous action" meaning of activity verbs, but have in its place an "imperfective" meaning. For example:

3) nĩ a-a-ak-ag-a nyũmba
he-RP-build-MProg house

i) (imperfective) "he was in the midst of building a house" (but he hadn't finished it yet)

ii) (iterative/habitual) "he repeatedly/habitually built a house"

iii) (futurate) "he was going to build a house" (but he hadn't started yet)

At this point, we need to make a brief digression into the topic of non-specific readings for an object noun phrase when a progressive form is taken on an iterative/habitual interpretation.

A non-specific reading for "a house" in sentence (3) appears to be possible in principle, since it is recorded at least once in my notes for this particular verb. (A specific reading is ruled out for an obvious pragmatic reason, of course.) However, this reading is somewhat problematic. At a different time, my informants told me that a plural noun phrase must be used, if (3) is to mean, "he used to build houses". The inconsistency leads me to think that the non-specific reading for (3) is not ruled out by the semantics, although it may be ruled out in many particular instances by conversational principles (perhaps of the Gricean sort). This problem is not limited to Kikuyu, for note that in English, the past habitual sentence, "John used to sing a song", would not imply that he sang the same song every time necessarily; however, "John used to build a house" seems to have only the (improbable) meaning that John repeatedly built the same house. This is an intriguing problem, but not, I think, one which directly involves the semantics of progressive aspect. Since a non-specific reading for (3) is recorded at least once, I will hereafter assume that this meaning is possible in principle for all transitive verbs in progressive aspect, although it may often be disregarded for conversational purposes (on independent grounds).

To return to the main discussion, I have introduced the semantic differences between activity and accomplishment verbs, as general background to the problems of verb aspect, and also as a demonstration of how interval-based semantics is to be approached

in this dissertation. The specific problems involving the progressive forms of activity and accomplishment verbs will be taken up again in Chapter III.[7] For now, however, the discussion turns to a consideration of particular aspect forms of Kikuyu, beginning with the uninflected form.

3. The uninflected form of the verb

There are two reasons for my treatment of episode-time as a set of intervals, rather than just one interval of time. One reason is the meaning of progressive aspect, and in particular, the interaction of this meaning with the existential status categories (manifest and imminent). The other reason is the semantic analysis of the uninflected verb form of Kikuyu. The uninflected verb form consists (morphologically) of a subject concord followed by a verb stem. This form cannot be used to refer to any specific time, but it may be used to talk about some "prevailing condition" in a non-specific way. An example of this use is sentence (4) below, which might be asserted in reply to the question, "Is that door merely ornamental?".

4) mũrango no ũ-hing-wo
door yet it-close-passive

"the door does close" (lit.: "definitely, the door is closed at times by someone")

I interpret (4) to mean, "there is a set of times at each of which someone closes the door; hence, the door is in fact close-able". The appropriateness of this analysis is especially

clear if we consider the direct negation of this form (which is, judging by Barlow's comments, much more commonly used than the non-negative form). According to Barlow, the negation of the uninflected form "is specially used as a negative of refusal, disability, etc." (Barlow: 1960, 129). For example:

5) n-di-hota
I-not-be/able

"I cannot"

Given the above semantic analysis of the uninflected form, sentence (5) is true if and only if there is a set of times (which may be identified with the set I), and "I am able (to do some particular thing)" is untrue at each of those times. This seems to be an adequate characterization of the meaning of (5).

While on the topic of the meaning of an uninflected form, it is worth noting that (again, according to Barlow), there are a few verbs for which the uninflected form is commonly used to express a general state of the world (but not a case of habitual action, which is always expressed by the infix -ag-). One of these verbs is enda, which is used in its uninflected form to express the stative idea that someone loves someone else.

6) nĩ tũ-mw-enda
we-him-love

"we love him"

My own research on this particular verb shows decisively that it means "feel love or desire for", and that it is not a stative verb in Kikuyu. (In fact, there is no stative stem which means

"to love" in Kikuyu.) The method illustrated by (6) for getting a stative meaning out of enda is therefore interesting, because it follows rather well from the semantic analysis of the uninflected form which I have proposed. According to my proposal, (6) is true if and only if there is a set of times at each of which "we feel love (or desire) for him" is true. Clearly, this is a way of conversationally conveying that we are in a permanent state of love toward him, independently of our conscious feelings about him at a particular times.

In order to make precise the analysis of the meaning of an uninflected form, we now introduce the notion of truth relative to an index <w,i,J>, where w is a world, i is a reference-time (not necessarily specified in a conversation), and J is a non-empty set of intervals of time (constituting episode-time). Assume that we have a notion of $true_e$ for all the formulas of a particular aspectless language. That is, for every formula of the language, we know whether or not it is $true_e$ relative to each interval of time in a given world. Then the notion of true relative to a three-place index may be introduced as follows:

> A formula ϕ is true in a model relative to an index <w,i,J> if and only if ϕ is $true_e$ for all <w,j> such that j is a member of J.

It is a consequence of this definition that if, for example, "love(x,y)" (representing sentence (6)) is a formula of the aspectless language, then the following statement is true:

[love(x,y)] is true relative to <w,i,J> if and only if (J is non-empty and) for each interval j in J, "x loves y" is true$_e$ at j in w.

In the next two sections of this chapter, I show how the operators COMP and PERF are used to specify the relation of the reference-time i in an index to the set of episode-times J.

4. Completive aspect

The completive aspect form of a verb in Kikuyu is used to mean that there is a single interval of time (in episode-time), that this interval coincides with reference-time, and the episode named by the verb is true at that interval. For example:

7) nĩ a-a-hanyũk-ir-e
he-RP-run-MComp

"he ran (two or more days ago)"

8) nĩ a-a-ak-ir-e nyũmba
he-RP-build-MComp house

"he built a house (at a time ending two or more days ago)"

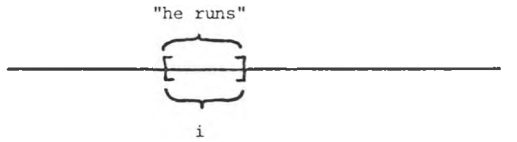
The operator COMP may therefore be defined as follows:

Definition of COMP

COMPϕ is true relative to <w,i,J> if and only if J = {i} and ϕ is true$_e$ relative to <w,i>.

This definition says that reference-time is the same as episode-time, and the embedded sentence is true at that particular time. Thus, for example, sentence (7), which apart from tense has the

semantic representation: COMP[run(x)], is true in the situation represented schematically below.



This definition of completive aspect gives the right results for all activity and accomplishment verbs. However, there is an additional class of verbs which, when combined with the completive marker -ir-, appear to require a different semantic analysis for this aspect marker. Following a suggestion made in Fortune (1949), I will refer to these verbs as "inchoative verbs", because their completive forms usually describe the coming-about of a state or an activity. For example:

9) noga: nĩ a-ra-nog-ir-e
he-NP-become/tired-MComp

"he became tired"

10) rũara: nĩ a-ra-rũar-ir-e
he-NP-fall/sick-MComp

"he fell sick"

11) koma: nĩ a-ra-kom-ir-e
he-NP-fall/asleep-MComp

"he fell asleep"

12) nyita: nĩ a-ra-nyit-ir-e
he-NP-take/hold-MComp

"she took hold of the child"[8]

13) akana: mwaki nĩ ĩ-ra-akan-ir-e
fire it-NP-ignite-MComp

"the fire ignited"

Curiously, however, when a temporal extent adverb is added to the above sentences, the meaning of the completive verb form appears to shift, from the initiation of a state or activity, to the state or activity itself. For example:

14) noga: nĩ a-ra-nog-ir-e kiumia kĩmwe
he-NP-become/tired-MComp week one

"he was tired for a week"

15) rũara: nĩ a-ra-rũar-ir-e kiumia kĩmwe
he-NP-fall/sick-MComp week one

"he was sick for a week"

16) koma: nĩ a-ra-kom-ir-e ithaa rĩmwe
he-NP-fall/asleep-MComp hour one

"he slept for an hour"

17) nyita: nĩ a-ra-nyit-ir-e ithaa rĩmwe
he-NP-take/hold-MComp hour one

"she held the child for an hour"

18) akana: mwaki nĩ ĩ-ra-akan-ir-e ithaa rĩmwe
fire it-NP-ignite-MComp hour one

"the fire burned for an hour"

What these examples show is that the completive form of an inchoative verb can refer either to the inception of a state or activity, or to the state or activity itself. Rather than attribute this ambivalence of reference directly to the meaning of the completive marker, I propose to analyze verbs of this class as lexically complex, in that they refer to episodes with two

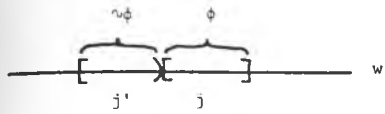
temporally distinct phases - an inceptive phase and a durational phase. Thus, the meaning of noga might be more fully explicated as "to become and be tired", and that of akana as "to ignite and burn". In order to show this complex lexical structure in the formal analysis, we need to "decompose" the meaning of an inchoative verb with some sort of semantic operator. This can be done in Montague Grammar, by adding a meaning postulate which describes the internal structure of a particular class of verbs.
I propose to decompose inchoative verbs in this way with the following postulate (this meaning postulate appears in a somewhat different form in Chapter VI, where it is stated separately for transitive and intransitive verbs):

M.P.1 If δ translates an inchoative verb, then there is some predicate P such that for all x, $\Box[\delta(x) \leftrightarrow \text{INCHO}[P(x)]]$

The operator INCHO is defined as follows (since reference-time is not involved, the definition is stated in terms of true_e):

Definition of INCHO
INCHOϕ is true_e relative to <w,j> in a model if and only if ϕ is true_e at <w,j> and there is an initial boundary interval j' for j, j' is longer than a moment, and ϕ is not true_e at <w,j'>.

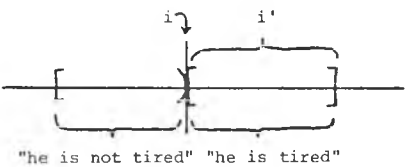
According to this definition, the sentence INCHOϕ is true at j in the the following situation:



Thus, for example, if ϕ is "he is tired", then INCHOϕ, meaning "he becomes and remains tired", is true at j (in w) above. Note that the definition does not require that ϕ be any particular type of sentence. In fact, inchoative verbs may involve either states or activities, but they do not appear to involve any accomplishments. (This might be true because all accomplishments have a well-defined beginning, whereas ordinary states and activities do not.) Note that the definition of INCHO says that the boundary interval for which ϕ is untrue must be longer than a moment. This condition is included because activity sentences are all false for individual moments in the model; we want to be sure, therefore, that j' is long enough that the embedded sentence ϕ might have been true of this interval.

The operator INCHO is similar to the operator COME ABOUT, which was proposed for the analysis of English in Dowty (1972), and further discussed in Dowty (1977). The chief difference is that COME ABOUTϕ is thought of as applying to the smallest interval for which ϕ is initially true (however, Dowty (1977) suggests that this may be a pragmatic condition, rather than a semantic one). The two operators are not equivalent, because a sentence involving INCHO is true for any interval for which the embedded sentence is true, so long as this interval is bounded initially by an interval

at which this sentence is false. The point of stating the definition in this way is to ensure that the time of an inchoative sentence always includes the coming-about phase of the episode described by the sentence embedded under INCHO, and may in addition include the time for which this sentence remains true. The reason that the second, durational phase of the episode may or may not be included in the time for which an inchoative sentence is true is that both states and activities are described by sub-interval type sentences. Thus, for example, INCHO[he is tired] is true for the first moment that "he is tired", and for that moment plus any part of the ensuing interval for which "he is tired" continues to be true. This is shown in the diagram below, in which both i and i' are times for which INCHO[he is tired] is true.



It is this aspect of the definition of INCHO which accounts for the ambivalence of an inchoative verb in completive aspect. If a temporal extent adverb occurs with such a verb form, then a durational state (or activity) interpretation of the completive form is the only permissible one (as in examples (14)-(18)). However, if there is no temporal extent adverb (as in examples (9)-(13) above), then an inceptive interpretation of the

completive form is generally favoured, especially for inchoative state verbs. For example, aranogire (the near past completive of noga "become (and remain) tired") is typically interpreted as "he became tired", rather than "he was tired". In other words, this form is understood as a reference exclusively to the coming-about phase of the stative episode. There seems to be a straightforward conversational reason for this fact. The reason is that there are two other ways to say, "he was tired", in Kikuyu (one involving an adjective, the other involving perfect aspect - see the next section of the chapter), but no other way to say, "he became tired". It is not surprising, therefore, that the completive form of an inchoative state verb tends to be reserved for a change of state meaning, while the alternative structures are used for a straightforward stative meaning.

5. Perfect aspect

The perfect form of a verb in Kikuyu is used to refer to a situation in which reference-time is later than episode-time. This is illustrated by the forms below:

19) nĩ a-a-hanyũk-ĩt-e
he-RP-run-MPerf

"he had run"

20) nĩ a-a-ak-ĩt-e nyũmba
he-RP-build-MPerf house

"he had built a house"

The operator PERF may therefore be defined as follows:

Definition of PERF

PERFϕ is true in a model relative to <w,i,J> if and only if there is some j in J such that j < i, and ϕ is true_e at <w,j>.

This definition says that there must be some instance of episode-time j in J which is earlier than the reference-time i, and the episode described by ϕ is true at the time j (in w). This formulation allows for there to be other times in J which are not earlier than i, at which ϕ is also true. Thus, for example, if the embedded sentence is "he runs", then "he has run" is consistent with a situation in which "he is still running" is true (although the fact of someone's continued running is never directly implied by the perfect form of the Kikuyu verb meaning "to run").

Turning now to a consideration of inchoative verbs in perfect aspect, we find that, again, there is an ambivalence in the meanings of these verbs when they combine with a particular aspect marker. The ambivalence of the perfect form of these verbs also depends upon the basic ambivalence of the verb stem, which was described in the last section of the chapter. In the first interpretation of this form, which I will call the "anterior interpretation", episode-time j is taken to include both the inceptive and the durational phases of the episode described by the sentence embedded under the inchoative operator. Hence, the reference-time i is located at a time which is later than every instance of episode-time. In the second interpretation, however, the instance of episode-time which is said to be earlier than reference-time is taken to be only the inceptive phase of the

inchoative episode; hence, the reference-time may be thought of as falling within the durational phase of the episode, or in other words, within the time of the state or activity which results from a particular change. This is what I will refer to as the "resultative" interpretation of perfect aspect for inchoative verbs. This meaning has been previously described by Fortune (1949) as follows: "Inchoative verbs always bear the significance of becoming, but in the perfect tense achieve a significance of perfect state because it is implied that the becoming, the process, is over and done with, the state arrived at" (p.132).

The two interpretations of perfect aspect for an inchoative verb are illustrated below, for the five verbs discussed in the last section of the chapter; note that in each example, (i) gives the anterior interpretation, while (ii) gives the resultative interpretation.

21) noga: nĩ a-ra-nog-et-e*
he-NP-get/tired-MPerf

(i) "he had been tired"[9]

(ii) "he was tired"

22) rũara: nĩ a-ra-rũar-ĩt-e
he-NP-fall/sick-MPerf

(i) "he had been sick"[9]

(ii) "he was sick"

* ĩ → e / o C _

23) koma: nĩ a-ra-kom-et-e*
he-NP-fall/asleep-MPerf

(i) "he had slept"

(ii) "he was sleeping"

24) nyita: nĩ a-ra-nyit-ĩt-e mwana
he-NP-take/hold-MPerf child

(i) "she had held the child"

(ii) "she was holding the child"

25) akana: mwaki nĩ ĩ-ra-akan-ĩt-e
it-NP-ignite-MPerf

(i) "the fire had burned"

(ii) "the fire was burning"

*ĩ → e / o C _

Other inchoative verbs whose perfect forms also have this ambivalent interpretation are kuua "carry away", gucia "pull", ikara thĩ "sit down", ĩtĩkia "come to believe in", hora "go out (of fire)", and ritũha "become heavy". The explanation of the ambivalence is already given by the analysis of INCHO, in conjunction with the analysis of PERF. To see this, consider sentence (25), (literally, "it had ignited (and burned)"), which apart from tense has the semantic representation: PERF[INCHO[burn(x)]]. This sentence is true on the anterior interpretation ("it had burned") in the situation shown in (25i') below, and true on the resultative interpretation ("it was burning") in the situation diagrammed as (25ii').

inchoative episode; hence, the reference-time may be thought of as falling within the durational phase of the episode, or in other words, within the time of the state or activity which results from a particular change. This is what I will refer to as the "resultative" interpretation of perfect aspect for inchoative verbs. This meaning has been previously described by Fortune (1949) as follows: "Inchoative verbs always bear the significance of becoming, but in the perfect tense achieve a significance of perfect state because it is implied that the becoming, the process, is over and done with, the state arrived at" (p.132).

The two interpretations of perfect aspect for an inchoative verb are illustrated below, for the five verbs discussed in the last section of the chapter; note that in each example, (i) gives the anterior interpretation, while (ii) gives the resultative interpretation.

21) noga: nĩ a-ra-nog-et-e*
he-NP-get/tired-MPerf

(i) "he had been tired"[9]

(ii) "he was tired"

22) rũara: nĩ a-ra-rũar-ĩt-e
he-NP-fall/sick-MPerf

(i) "he had been sick"[9]

(ii) "he was sick"

*ĩ → e / o C _

23) koma: nī a-ra-kom-et-e*
he-NP-fall/asleep-MPerf

(i) "he had slept"

(ii) "he was sleeping"

24) nyita: nī a-ra-nyit-īt-e mwana
he-NP-take/hold-MPerf child

(i) "she had held the child"

(ii) "she was holding the child"

25) akana: mwaki nī ī-ra-akan-īt-e
it-NP-ignite-MPerf

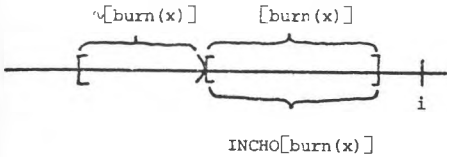
(i) "the fire had burned"

(ii) "the fire was burning"

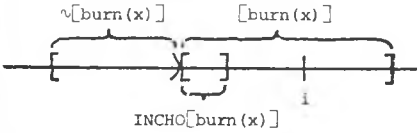
*ī → e / o C _

Other inchoative verbs whose perfect forms also have this ambivalent interpretation are kuua "carry away", gucia "pull", ikara thī "sit down", ītīkia "come to believe in", hora "go out (of fire)", and ritūña "become heavy". The explanation of the ambivalence is already given by the analysis of INCHO, in conjunction with the analysis of PERF. To see this, consider sentence (25), (literally, "it had ignited (and burned)"), which apart from tense has the semantic representation: PERF[INCHO[burn(x)]]. This sentence is true on the anterior interpretation ("it had burned") in the situation shown in (25i') below, and true on the resultative interpretation ("it was burning") in the situation diagrammed as (25ii').

25i') ("it had burned")



25ii') ("it was burning")



The difference between these two interpretations of the perfect form of the inchoative verb akana "ignite (and burn)" is that in the first case, the reference-time i is later than every time at which the sentence "x burns" (embedded under INCHO) is true, while in the second case, the reference-time i is included within the time for which "x burns" is true. The reason that the latter interpretation is possible is that "x burns" is an activity sentence, which can be true at sub-intervals of a longer time for which it is also true. Consequently, the sentence INCHO[burn(x)] is true for the interval shown in (25ii'), which is a sub-interval of the whole time for which "x burns" is true. Thus, reference-time actually falls within a portion of episode-time on this interpretation.

Before leaving the question of the perfect forms of inchoative verbs, it must be emphasized these forms constitute the normal way to talk about the occurrence of a great number of states and activities in Kikuyu. For example, the preferred way to say "he is dead" in Kikuyu is to use the perfect form of the inchoative state verb kua "die", as in the present perfect form, akuĩte, which is often translated as "he is dead", rather than, "he has died".

To end this discussion of perfect aspect, it is worth pointing out that my analysis also handles the scope ambiguity of a temporal extent adverb with an inchoative verb in perfect aspect.[10] This ambiguity is illustrated by sentence (26) below.

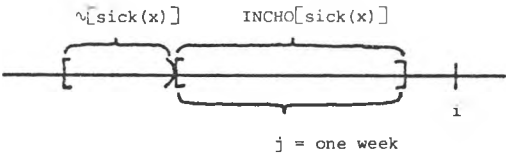
26) nĩ a-ra-rũar-ĩt-e kiumia kĩmwe
he-NP-fall/sick-MPerf week one

(a) "he had been sick for a week" (extent adverb has narrow scope)

(b) "he was sick for a week" (extent adverb has wide scope)

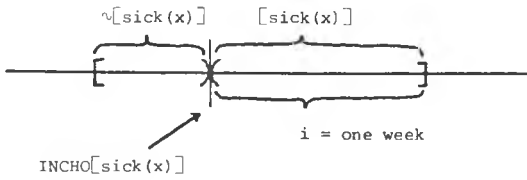
The reading (26a) is illustrated in the diagram below. In this case, there is an interval of episode-time one week long, and the reference-time i is later than this week.

26a') PERF[one-week[INCHO[sick(x)]]] ("he had been sick for a week")



In contrast to this, the reading (26b) is illustrated below. In this situation, reference-time is taken to be the half-open interval which bounds upon the interval containing the moment at which "x is sick" is true for the first time. Since this moment is a time for which INCHO[sick(x)] is true, the half-open interval is a time for which PERF[INCHO[sick(x)]] is true; moreover, this is precisely the interval for which "x remains sick" is true, and it is this interval which is said to be one week long.

26b') one-week[PERF[INCHO[sick(x)]]] ("he was sick for a week")



We have now accounted for all of the basic properties of completive and perfect forms of the Kikuyu verb. The interpretations of these forms which serve to characterize inchoative stems, as against the non-inchoative ones, are summarized in Figure 3 below.

	non-inchoative stems	inchoative stems
Completive aspect:		
a) non-inceptive interpretation	✓	✓
b) inceptive interpretation	-	✓
Perfect aspect:		
a) anterior interpretation	✓	✓
b) resultative interpretation	-	✓

Figure 3: Identification of inchoative verbs

In Appendix A of the dissertation, an additional test for membership in the category of inchoative verbs is discussed. This test involves a surprising anomaly in the paradigm of the auxiliary verb korwo (literally, "be found"), which occurs with a non-inchoative verb stem, but not an inchoative one.

In the next chapter, I complete the discussion of verb aspect with an analysis of the meaning of progressive forms in Kikuyu.

Notes to Chapter II:

[1]Note that, although Vendler used names for his categories which, in ordinary language usage, imply agency, the notion of agency is not intrinsic to any of his classes. Cf. Nordenfelt (1976) for a discussion of agency in relation to other ways of classifying episodes.

Dowty (1972) proposes a model-theoretic treatment of Vendler's four classes, in which activity verbs are lexically "decomposed" in terms of the operator DO, achievements are decomposed in terms of the operator COME ABOUT, and accomplishments are decomposed in terms of the operator CAUSE. See also Dowty (1976) for a treatment of accomplishments as causative episodes within the framework of Montague Grammar.

[2]The condition concerning "open-fronted" intervals is included in Taylor's analysis to ensure that "x is V-ing" entails "x has V-ed", whenever V is an energeia (i.e. activity) verb. This condition is irrelevant to my analysis, because this particular entailment is not considered to be valid.

[3]The problem is that, at least in English, stativity seems to be correlated with other factors as well, such as "non-agency" and "temporariness". See Dowty (1974) for a discussion of this problem.

Comrie (1976) suggests that the class of states might be characterized by their internal inertia. That is, "to remain in a state requires no effort, whether from inside... or from outside" (p.49). This seems like a promising approach to the problem, although I do not know what this would mean in model-theoretic terms.

[4]This is the term used in Barlow's grammar of Kikuyu, to describe verb stems with systematic gaps in their inflectional morphology. The term is a standard one among Bantu grammar writers.

[5]It is obvious that most (if not all) of these stems are the archaic perfect forms of non-stative stems. None of the speakers I worked with still used the suffix -ii as a perfect marker, although it is apparently still used this way in some Kikuyu dialects.

[6]Some interpretations may be ruled out for pragmatic reasons, which are discussed in Chapter III.

[7]A word of caution is appropriate here concerning a familiar problem with sub-classifying verbs, as opposed to sub-classifying predicates or sentences. It is well-known that English verbs often behave as if they had multiple class memberships, and Kikuyu verbs are no different in this regard. For example, "running" is clearly an activity with no inherent climax, and so it makes sense to classify the verb hanyūka "run" as an activity. Yet this verb sometimes behaves exactly like an accomplishment, in that informants find nothing strange in sentences like (a) and (b) below.

a) nī a-a-rīkia kū-hanyūka
he-IPerf-finish to-run

"he has just finished running"

b) nī a-ra-hanyūk-ir-e na ithaa rīmwe
he-NP-run-MComp with hour one

"he ran in an hour"

These sentences are well-formed for the simple reason that it is easy to imagine an episode of running which is directed toward a goal (or climax) which is intrinsic to that particular episode. On the other hand, (a) and (b) are special in that they require a context in which a certain set of assumptions is shared by speaker and addressee. This would not be the case if hanyūka were always an accomplishment verb. The point is this: even though we probably cannot give a definitive list of verbs which are lexically members of one aspect class or another, there is no problem as long as we keep in mind that the intended meaning of a verb in any example is the one requiring the fewest situational assumptions.

[8]Kikuyu men (like many others) do not hold babies; this accounts for the switch to feminine gender.

[9]When there is no further qualification, the resultative meaning is strongly preferred.

[10]The ambiguity is not ruled out in principle for non-inchoative verbs, but in this case, one meaning is pragmatically anomalous. For example, the Kikuyu sentence meaning, "he had run for an hour" would be true in my analysis if there is a period of time an hour long, and "he had run" is true for that time. However, "he had run" remains true for every time which is later than a time for which "he runs" is true. Hence, there would be no point in saying that there is a period of time exactly one hour in length for which this sentence is true. There is a similar anomaly in sentences like, "Toronto was in Ontario for an hour", even though this sentence is undoubtedly true.

III. PROGRESSIVE ASPECT

1. Interpretations of progressive aspect
2. Previous model-theoretic approaches
3. The progressive operator
4. Independent motivation for PROG

0. This chapter deals with the definition of the progressive operator, PROG. As I indicated in Chapter I, I treat the several distinct "interpretations" for the category of progressive aspect as instances of vagueness, rather than ambiguity. That is, all of these interpretations are to be accommodated within one statement of truth conditions for PROG. Apart from a general theoretical orientation toward recognizing less ambiguity in languages (cf. the discussion of ambiguity in Chapter I), I have two independent reasons for giving a unitary treatment of progressive aspect. First, in language after language, we find the same (or a very similar) configuration of meanings for the category "progressive aspect", involving such factors as "iterated", "habitual", "incomplete" or "anticipated" action. (A concise statement of the actual range of possibilities is available in Comrie (1976).) Although I will not look specifically at any language other than Kikuyu, I think that it is extremely unlikely that cross-language comparisons would indicate that the Kikuyu progressive category

is in any way atypical. This suggests to me that if progressive aspect is not in fact a language universal, then at least its meaning varies only in systematic ways across languages.[1] If we claim, then, that progressive aspect is semantically ambiguous, we will be committed to the dubious corollary that many unrelated languages just happen to share precisely the same lexical ambiguity (for the morpheme marking progressive aspect).

The second reason for viewing progressive aspect as unambiguous is that a unitary operator PROG is needed in the analysis of other meaningful elements of Kikuyu. In the fourth section of this chapter, I discuss the specific case of the Kikuyu verb tiga "stop", which I analyze semantically as, "it comes about that x is not V-ing" (where V stands for some verb embedded under tiga). An analysis which failed to treat progressive aspect as vague would be forced to claim that the verb tiga is likewise ambiguous. Multiplying ambiguities in this way is, I think, a definite disadvantage for any theory.

Readers with a particular interest in the grammar of Kikuyu are referred at this point to Appendix B, which discusses a minor syntactic point concerning the morpheme -ag-. What I show in this appendix is that the morpheme -ag- which may co-occur with a near or remote future tense marker is not the same as the -ag- which marks progressive aspect on manifest action forms. In other words, there are persuasive reasons for saying that there are two semantically and syntactically distinct -ag-'s in Kikuyu, even though they are homophonous and occupy the same position on

the verb. This chapter deals only with the -ag- which functions as a marker of progressive aspect.

1. Interpretations of progressive aspect

In the last chapter, I indicated a major difference in the ways that the progressive forms of activity and accomplishment verbs may be understood. Activity verbs have three conceptually distinct interpretations in their progressive forms, which are illustrated again below:

1) nī a-ra-hanyūk-ag-a
he-NP-run-MProg

i) (continuous action) "he was (continuously) running"

ii) (iterative/habitual) "he repeatedly/habitually ran"

iii) (futurate) "he was going to run (but he hadn't started)"

Because a futurate meaning is a viable interpretation for (1), sentence (2) can be uttered without contradiction.

2) nī a-ra-hanyūk-ag-a, na no nd-a-na-hanyūka[2]
he-NP-run-MProg and yet not-he-Past-run

"he was running, and yet he didn't run"

Not every activity verb, however, is equally open to a futurate interpretation in its progressive form. Progressive forms may be used felicitously (in the sense of Austin (1962)) with this intended meaning only when the meaning is applied to an episode whose later coming-about can be predicted with a high degree of accuracy under normal circumstances. That is, the episode must be one which is typically foreshadowed by various concrete indications

that it is likely to happen. Any agentive activity is of the right type, because human intentions provide prima facie evidence of the likelihood that an activity will come about. In fact, my informants accepted futurate interpretations for the progressive forms of all agentive verbs, such as ringa "strike (someone)", kinya "reach", and tonya "enter", but they generally rejected the possibility for such non-agentive verbs as bucia "blink", erera "float", and igua "hear, perceive". The problem with the latter group is that it is highly unlikely that a speaker would have sufficient grounds to assert, for example, "he was going to blink (but he didn't)".

Another interesting point came out in my investigation of the futurate meaning of progressive aspect: this interpretation favours first person forms over third person ones. For example, when I asked my informants whether sentence (3) could mean, "he was going to hear the bell", they were reluctant to admit this as a plausible possibility. However, as an example of the progressive appropriately used in this way, they spontaneously proposed (4) (in this case, (4) implies, "I haven't yet, and I'm not going to").

3) nĩ a-ra-igua ngengere
he-IProg-igua bell

"he is hearing the bell"*

*This gloss sounds odd in English, but the Kikuyu sentence is acceptable.

4) rūcinī nī n-gū-ūk-ag-a no n-di-r-oka
morning I-IP-come-MProg yet I-not-IProg-come

"this morning, I was coming, but now I'm not"

What makes the futurate interpretation viable for (4), although it is dubious for (3), is first, that an agentive verb is involved, in (4), and secondly, that the speaker is talking about his own intentions, a topic on which he has privileged knowledge. Consequently, he can assert with confidence that something was a likely circumstance at some earlier time, based upon his intentions at that time, even though the episode never subsequently materialized.

The major point I am making about the futurate interpretation of progressive aspect is this: my analysis does not discriminate between those verbs which have a viable futurate interpretation and those which do not. Indeed, the analysis predicts a possible futurate meaning for the progressive forms of all verbs. However, I do not think this need be considered a defect of the analysis, if we accept Searle's proposal (Searle: 1969) that a felicitous act of assertion requires that a speaker have evidence for the truth of the sentence he asserts. Thus, the extraneous interpretations may be thought of as filtered out at the pragmatic level.

In contrast to activity verbs, accomplishment verbs have the following three interpretations for their progressive forms:

5) nī a-ra-ak-ag-a nyūmba
he-NP-build-MProg house

i) (imperfective) "he was in the midst of building a house (but he hadn't finished yet)"

ii) (iterative/habitual) "he repeatedly/habitually built a house"

iii) (futurate) "he was going to build a house (but he hadn't started yet)"

The futurate interpretation of these verbs is subject to the same general pragmatic constraints as outlined above. The iterative/habitual is subject to the general constraint that the action described by the verb must be one which can be repeated on the same object and/or a different one (cf. the discussion of iterative meanings in Chapter II). The important feature of the imperfective progressive meaning is that it fails to entail eventual completion of the episode described; indeed, when an agent is involved, it fails to entail even the intention to complete the accomplishment episode. The failure of this entailment is demonstrated by the fact that sentence (6) is not contradictory.

6) nī a-ra-aka nyūmba no nd-a-r-enda kū-mī-rīkia
he-IProg-build house yet not-he-IProg-want to-it-finish

"he is building a house, yet he doesn't intend to finish it"

(lit.: "isn't wanting to finish it")

Another point worth noting about the semantic differences between activity and accomplishment verbs is that sentences like (7), with an activity verb, are acceptable, although sentences like

(8), with an accomplishment verb, are felt to be contradictory.

7) nĩ a-hanyūk-ĩt-e na no a-ra-hanyūka
he-run-MPerf and yet he-IProg-run

"he has (already) run, and yet he is running (now)"

8) nĩ a-tony-e*t-e nyūmba na no a-ra-tonya
he-enter-MPerf house and yet he-IProg-enter

"he has (already) entered the house, and yet he is entering (now)"

*ĩ → e / e C _

The reason for this is discussed later.

One other fact about progressive aspect which has not been mentioned yet is that it can have wide or narrow scope with respect to a temporal extent adverb. This is illustrated in sentence (9) below.

9) nĩ a-a-hanyūk-ag-a ithaa rĩmwe
he-RP-run-MProg hour one

a) "for an hour, he was running" (progressive has narrow scope)

b) "he was running-for-an-hour" (progressive has wide scope)

Consider first the reading (9a). According to our assumptions about the semantic interpretations of extent adverbs (cf. Chapter I), sentence (9) is true on this reading if and only if there is a period of time (in the remote past) an hour long, and "he is running" is true at that time. The most natural interpretation of the progressive marker in this case is that the runner engaged in repeated actions of running during that hour, with occasional interruptions for rest. However, the description is also consistent with a situation in which a runner with unusual stamina

runs non-stop for an hour. One interpretation of the progressive which is definitely ruled out, however, is the habitual action meaning, for the simple reason that an hour is too brief for habitual acts of running. The futurate interpretation also appears to be ruled out under normal circumstances, but it is not difficult to see why. If a speaker wanted to talk about an intention to run that lasted for an hour, he could readily find more direct and intelligible ways to express the thought. To assert (9) under the circumstances would be confusing, if not outrightly misleading.

In the second reading of (9), the progressive marker has wide scope. This situation results in three possible interpretations for the sentence, corresponding to the three interpretations which an accomplishment verb phrase has in progressive aspect. That is:

Possible interpretations for (9b):

i) (imperfective) "he was in the midst of running for an hour" (some running done, and some left to be completed)

ii) (iterative/habitual) "he repeatedly/habitually ran for an hour"

iii) (futurate) "he was going to run for an hour" (but he hadn't started yet)

In Chapter VI, I show how this type of ambiguity is handled by the syntactic rules of the Kikuyu grammar presented there.

Figure 4 below summarizes the possible interpretations of a progressive aspect form for the three basic aspect classes

of Kikuyu. (States are viewed here as the class lacking any progressive aspect interpretation.)

	State	Activity	Accomplishment
continuous action	-	✓	-
imperfective	-	-	✓
iterative/habitual*	-	✓	✓
futurate*	-	✓	✓

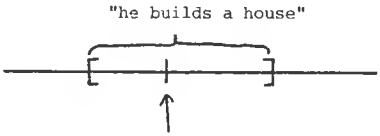
*subject to qualification on pragmatic grounds

Figure 4: Identification of state, activity and accomplishment verbs

In the next section of this chapter, I consider some of the model-theoretic approaches to English progressive sentences, which provide significant background to my own approach.

2. Previous model-theoretic approaches

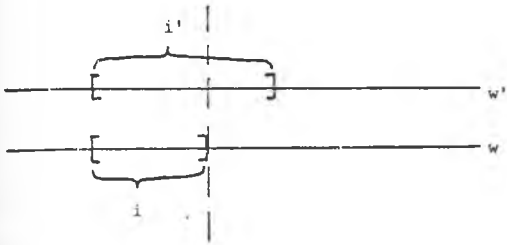
A standard approach to English progressive sentences has been to say that a progressive sentence is true at a time t if and only if t is contained in an interval for which the corresponding non-progressive sentence is true. This analysis may be illustrated diagrammatically as follows:



This is the basic analysis of progressive aspect which is found, for example, in Bennett and Partee (1972) and Taylor (1977), and this is also essentially the analysis given by Reichenbach. (Reichenbach says that the English progressive means that the reference-time of a sentence falls within an extended period of event-time.) The main problem with the analysis is that "he is building a house" entails "he will have built a house", although clearly this entailment fails. There may be any number of unexpected circumstances which prevent a person from completing the act of building, and it will nevertheless still be correct to say, "he was building a house (before something forced him to stop)".

This problem was solved in Dowty (1977) in the following way. Dowty formulated the definition of the operator PROG in terms of a branching-time model, with histories filling the role of possible worlds. To avoid confusion, I will give an informally equivalent description of his analysis in terms of possible worlds and a linear time structure. In Dowty's analysis, then, PROGϕ is true in a model relative to an interval i and a world w if and only if i is contained in some larger interval i'

and ϕ is true at i' in a world w' which is exactly like w up to the end of i. Diagrammatically:



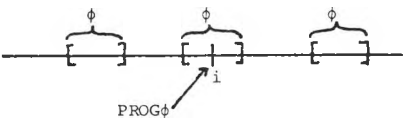
If "he builds a house" is true for <w',i'> then "he is building a house" is true for <w,i>.

The point of this analysis is that events in w and w' may diverge at times later than i: hence, the progressive sentence fails to entail that the corresponding non-progressive sentence ever comes to be true in the world in which the progressive sentence is evaluated. The only requirement is that the embedded sentence be true in some possible alternative world (w').

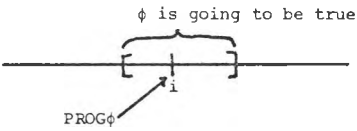
Dowty's analysis would work equally well for Kikuyu, if an imperfective progressive meaning was the only one at issue in this language. However, I have already demonstrated in detail that a partially completed episode is only one of the possible situations described by a progressive sentence in Kikuyu. In fact, what we need is a progressive operator which works roughly as follows. PROGϕ is true for an interval i (in a world w) if and only if i is contained within a longer interval, for which

latter interval one of three things is true: (i) ϕ is repeatedly true (for the iterative/habitual and continuous action interpretations), or (ii) ϕ is going to become true (for the futurate interpretation), or (iii) ϕ is not yet true for any interval in w, but various sub-episodes of the complete episode ϕ have already come to be true (for the imperfective interpretation with an accomplishment verb). These three possibilities may be represented schematically as below: in each case, the point labelled i stands for the reference-time of a progressive sentence, while the intervals represented with brackets correspond to instances of episode-time. (This representation is a first approximation to the meaning of PROGφ, which will be more precisely developed when the operator has been defined.)

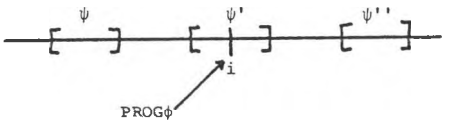
(i) iterative/habitual meaning (if there were no gaps, this would also be the continuous action meaning)



(ii) futurate meaning



(iii) imperfective meaning (ψ, ψ', ψ'' describe characteristic sub-parts of the episode ϕ)

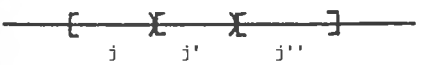


This is the range of meanings which my progressive operator is designed to capture.

3. The progressive operator

The definition of the operator PROG involves three important elements: (a) the notion of an interval sequence, (b) the sub-episode relation, represented by the symbol Δ, which is needed to identify (within the model) the "sub-parts" of an accomplishment, and (c) the epistemic future operator FUT. I will begin the exposition by explaining each of these constituent elements in turn.

The idea of an interval sequence was previously introduced in Chapter II. In ordinary language, an interval sequence is defined as a set of consecutive (non-over-lapping) intervals. For example, in the diagram below, the set {j, j', j''} is an instance of an interval sequence.



The sub-episode relation is introduced into the analysis as a means of identifying, relative to a model, which sentences describe episodes which are characteristic sub-parts of the episodes described by other sentences. For example, we want to be able to say that, "John builds part of a house" describes a sub-episode of the accomplishment described by, "John builds a house". Similarly, we want to say that the episode described by "John runs a quarter of a mile" is a sub-episode of, "John runs a mile"; and so on. In addition, we want to be able to say that, "John runs" describes an episode which is a sub-episode of itself, since the basic point about activities is that each sub-instance of an activity is a further instance of the same thing. In fact, because of the way that the sub-episode relation is to be used in the definition of the operator PROG, it will be convenient to define this relation in such a way that every sentence describes an episode which is a sub-episode of itself. As a first approximation, then, we may define the relation as follows (because this definition does not involve reference-time, it is stated in terms of $true_e$):

Initial definition of $\underline{\subset}$ ("include as a sub-part")

$[\phi \underline{\subset} \psi]$ (read: "ϕ includes ψ") is $true_e$ in a model relative to an index $\langle w,j \rangle$ if and only if for all w' and j' in that model, if ϕ is $true_e$ at $\langle w',j' \rangle$, then there is some $j'' \subseteq j'$ such that ψ is $true_e$ at $\langle w',j'' \rangle$.

This definition says that a sentence ψ describes a (characteristic) sub-episode of the episode described by ϕ if and only if ψ is always true at some sub-interval of a time at which ϕ is true.

the reason for saying that ψ must always be true at a sub-interval of the time at which ϕ is true is to ensure that the sub-episode relation only identifies the characteristic sub-parts of an episode - that is, the sub-parts which may be thought of as "characterizing" the whole. It is this aspect of the relation $\underline{\wedge}$ which allows us to use it in giving truth conditions for PROGϕ.

There is a serious problem with the definition as given above. The problem is that we do not want indefinite descriptions, such as "John runs some distance" or "John does something", to count as descriptions of the sub-episodes of accomplishment sentences, such as "John runs a mile", or activity sentences, such as "John runs". Moreover, we do not want tautologies such as, "John is tall or John is not tall", to count as sub-episodes of any episodes. However, by the definition above, tautologies describe sub-episodes of every episode, because it is always the case that a tautology is true of some sub-interval of a time for which some other sentence is true. In order to use $\underline{\wedge}$ in defining PROG, it must be a much more restricted relation.

Fortunately, this problem can be avoided by adding a simple condition to the definition of a sub-episode, which excludes the entailments of a sentence which involve less definite descriptions. The relation $\underline{\wedge}$ is therefore reformulated as follows:

Revised definition of $\underline{\wedge}$

$[\phi \underline{\wedge} \psi]$ is true$_e$ in a model relative to an index $\langle w,j \rangle$ if and only if

1) if ϕ is true_e at <w',j'>, then there is some j''$\subseteq$ j' such that ψ is true at <w',j''>, and

2) if $\phi \rightarrow \psi$, then $\phi = \psi$.

Condition (1) of this new formulation is the same as the condition of the previous formulation. Condition (2), however, adds the further requirement that the sub-episode sentence ψ is not an entailment of the including sentence ϕ, unless the sub-episode sentence is ϕ itself. The idea behind this condition is as follows. There is a one-way entailment relation between definite descriptions such as, "John runs a mile", and related indefinite descriptions, such as "John runs some distance"; that is, the more definite description entails the less definite description, but not vice versa. This fact may be used to restrict the sub-episode relation $\underline{\Lambda}$ simply by saying that the only entailment of ϕ which can also count as a description of a sub-episode of ϕ is ϕ itself. Hence, neither "John runs some distance" nor "John does something" can be said to be included in "John runs a mile"; however, "John runs a quarter of a mile" (which is not an entailment of "John runs a mile"[3]) is still included in the episode, "John runs a mile". Thus, this revised definition captures just the set of relations among sentences which we set out to identify.

To complete this introduction to the progressive operator, we need to define the epistemic future operator FUT. To do this, we introduce a world-selecting function $\check{E}$, whose role is to select, for each interval j in a world w, the set of worlds whose subsequent development is consistent with reasonable expectations (at j in w)

concerning the future. That is, E is a function whose domain is $W \times I$, and for all w in W and j in I, $E(\langle w,j\rangle) \subseteq W$. Intuitively, the set of worlds which is the function value of $E(\langle w,j\rangle)$ should contain just those worlds which are like w up to the end of j, and which validate all expectations concerning future developments which may be held by a well-informed person located at the time j in w. There are many problems, of course, in making these ideas precise, and especially in saying just whose expectations are to be fulfilled in the futures of the worlds that $E(\langle w,j\rangle)$ designates. I hesitate to say that merely the speaker's expectations are involved. The reason is that it would be possible then in the model for a sentence like "he is going to run" to be true relative to one speaker, but false relative to another. It is obviously true to say than in one speaker's estimation of the facts, "he is going to run" might be a correct description of a certain situation, although a different speaker would disagree. However, in this situation, I prefer to say that one speaker has expectations based upon misinformation about the world he is in, rather than say that both speakers believe something true (relative to their own belief systems). The point is that I think that $E(\langle w,j\rangle)$ should designate a set of worlds in which some objectively reasonable set of expectations are fulfilled, but not necessarily the expectations of a particular individual. In other words, the value of E needs to be relativized in some general way to a conversational context, although at present I do not know how this might be done.

The most important point concerning the value of $E(\langle w,j\rangle)$ for my purposes is that it need not include w itself. That is, we must allow in the model for worlds in which even well-founded expectations are over-turned by "surprises" in the actual course of events in that world. Thus, it will be the case that some epistemic future sentences are true in the model, even though the sentence embedded under FUT never comes to be true at any interval in the world in which it is predicted. This is the import of the truth conditions for FUT which are given below.

Definition of FUT

FUTϕ is true relative to an index $\langle w,i,J\rangle$ if and only if for all w' such that w' is a member of $E(\langle w,i\rangle)$, there is some j' such that $j' \in J$, $i < j'$ and ϕ is true_e at $\langle w',j'\rangle$.

What this definition says is that FUTϕ is true in a world w for a reference-time i if and only if every world which is consistent with reasonable expectations at i in w is a world in which ϕ comes to be true at a later time. If we consider what the meaning of this FUT operator might involve in a conversation, rather than just what it involves in a model, it is clear that a speaker could only use such a futurate meaning felicitously if he was aware of facts and circumstances at a particular period of time which provide evidence in a quite direct way of the impending coming-about of the particular situation he is talking about. That is, he would have to have some objective form of evidence that what he predicts from the perspective of i is one of the most likely outcomes of the situation at i.

Before leaving the definition of the operator FUT, it is worth noting that the meaning we have been attempting to capture corresponds exactly to what Comrie (1976) describes as "prospective aspect". Prospective aspect is the aspectual complement of perfect aspect, and means essentially that an episode is being viewed from a point earlier than the actual time of the episode itself. Comrie points out that languages are frequently asymmetric morphologically, in the sense that perfect aspect is expressed with an inflectional marker, whereas prospective aspect is expressed only through some lexical paraphrase, and not in the basic tense/aspect inflectional system. This is precisely the situation in Kikuyu, since there is no morpheme in the system I am analyzing which can be directly translated with the operator FUT. Nevertheless, this operator has a role to play in the meaning of PROG, which is now to be introduced. Before doing so, it should be pointed that my analysis of the Kikuyu progressive cannot be stated except in terms of the simpler aspectual notions completive and prospective aspect. At present, I am not sure why this is so. However, I do think that if my analysis is leading in the right direction, and if this feature of it turns out (after further investigation) to be inescapable, it could turn out to be an important fact in understanding what are the possible ways that aspect systems can be organized in natural languages. However, this point runs far ahead of the present state of knowledge. My immediate goal is to make the definition of PROG in its present form

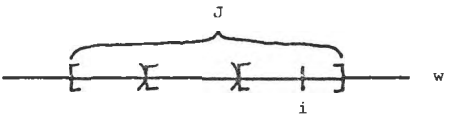
understandable to my readers.

With this lengthy prologue in mind, the definition of the progressive operator may now be given as follows:

Definition of PROG

PROGϕ is true in a model relative to an index <w,i,J> if and only if J is an interval sequence, there is more than one member of J, i is a sub-set of the union of all intervals in J, and for all j in J, there is some J' $\subset$ I and some ψ such that $[\phi \ \underline{\wedge} \ \psi]$ and $[\text{COMP}\psi \vee \text{FUT}\psi]$ is true at the index <w,j,J'>.

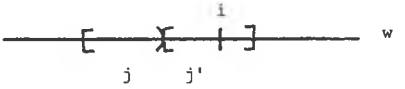
To understand this definition, it will be helpful to consider each part in turn. The definition begins by specifying that if PROGϕ is true for an index <w,i,J>, then episode-time J must be an interval sequence and the reference-time i must fall within this sequence. That is:



Next the definition tells us to consider separately each interval j in the sequence, and determine whether the following is true: taking j as a new reference-time, we look for a sentence ψ which describes a sub-episode of ϕ, and we look for a (non-empty) set J' (a sub-set of I) which makes either the sentence $\underline{\text{COMP}\psi}$ or the sentence $\underline{\text{FUT}\psi}$ true for the index <w,j,J'>. If an

appropriate ψ and an appropriate J' can be found for each j in the original set J, then the sentence PROGϕ is true for the original index <w,i,J>. What this amounts to is saying that a sentence PROGϕ is true if and only if its reference-time falls within a succession of intervals, and in reference to each of these intervals, it is true to say that a particular sub-episode of ϕ takes place, or that this sub-episode may be reasonably expected to take place later.

Perhaps another diagram, with an example, will clarify the analysis. Let i in the diagram below be the reference-time of an index, and let the episode-time in this index be the set {j, j'}. We want to know, then, whether the sentence PROG[run(x)] is true for the index <w,i,J> shown in this diagram.



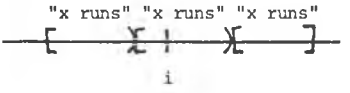
The sentence run(x) which is embedded under PROG in this example includes only itself as a sub-episode; hence, "he runs" is the only sub-episode sentence which we need be concerned about. First, we consider the interval j, which we take as a new reference-time for evaluating the sub-episode sentence run(x). Suppose that it is true that the individual denoted by x runs at time j in the world w. Then, COMP[run(x)] is true for the index <w,j,{j}>. The next step in the procedure is to consider j'. Suppose that in this instance, the individual x does not run

at j' in w. Then COMP[run(x)] is false for the index <w,j',{j'}>. However, there is still a possibility that FUT[run(x)] is true for some index <w,j',J'>. That is, we must look for a set of times J' which has the following property. In every world which is consistent with reasonable expectations at j' in w, there is an interval j'' in J' which is later than j', and the individual x runs at j'' in this expected world. If we succeed in finding such an interval set J', then we return to the original sentence, PROG[run(x)], and say that it is true for the original index <w,i,J>.

In order to demonstrate that the foregoing definition of PROG assigns the correct semantic interpretation to the progressive forms of both activity and accomplishment verbs in Kikuyu, we will consider in an informal way the specific examples of the verbs hanyūka "run" and aka "build". The sentence nī arahanyūkaga "he was running (in the near past)" is true in three typical situations, according to my analysis. First, since the sentence "he runs" includes as a sub-part "he runs", "he is running" is true in a world if there is a reference-time i which falls within a continuous series of intervals, at each of which "he runs" is true. This is the "continuous action" interpretation

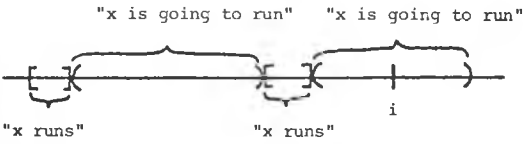
of progressive aspect, which is represented schematically below.

Continuous action interpretation of "x is running"



In addition, however, "x is running" is true if there is a non-continuous series of intervals at each of which "x runs" is true, interrupted by relatively long or short intervals during which x is not actually running, but may be reasonably expected to resume running at a later time. This is the iterative/habitual meaning of progressive aspect, represented diagrammatically below:

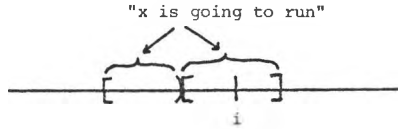
Iterative/habitual interpretation of "x is running"



If the duration of the whole sequence shown above is sufficiently long (relative to the activity of running), then this counts as habitual action; otherwise, it is simply iterative. Finally, the sentence "x is running" is true in my analysis if the reference-time i falls within a set of consecutive times in which no running has yet taken place, although it may be expected to begin at a

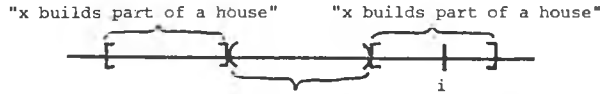
later time. This is, of course, the "futurate" interpretation of progressive aspect, which is diagrammed below.

Futurate interpretation of "x is running"



For an accomplishment verb, the "iterative/habitual" and "futurate" interpretations work analogously. The "imperfective" meaning which is special to these verbs works as follows. An accomplishment sentence such as "he is building a house" is true if the reference-time i falls within a succession of intervals at each of which some sub-part of the action of building the house is realized; the sub-parts of the building may be interrupted by periods of unspecified length when the work is temporarily suspended, but may be expected to resume. Diagrammatically, "x is building a house" is true at i in the following situation:

Imperfective meaning of "x is building a house"



"x is going to build part of a house"

Note that this way of handling the imperfective progressive makes sentence (10) consistent, because the progressive sentence within (10) below entails only that some parts of the action of building are realized or expected, but not that the whole action is a justifiable expectation.

10) nĩ a-ra-aka nyũmba no nd-a-r-enda kũ-mĩ-rĩkia
he-IProg-build house yet not-he-IProg-want to-it-finish

"he is building a house, yet he doesn't intend to finish it"

Clearly, however, without an explicit disclaimer such as the one illustrated, it is natural for progressive sentences to imply a speaker's expectation that the whole action named will be completed. The reason is obviously that actions are usually initiated with the intention of completing them. Moreover, if someone intends to do only part of an action, then it is normally more co-operative for a speaker to name the part that is to be done, than to name the whole activity.

Sentences (11) and (12) below are both semantically consistent in my analysis. However, it is easy to see why (12) is felt to be contradictory, whereas (11) is not.

11) nĩ a-hanyũk-ĩt-e na no a-ra-hanyũka
he-run-MPerf and yet he-IProg-run

"he has (already) run, and yet he is running (now)"

13) nĩ a-tony-et-e nyũmba na no a-ra-tonya
he-enter-MPerf house and yet he-IProg-enter

"he has (already) entered the house, and he is entering (now)"

Because sentence (12) contains an accomplishment verb, the perfect form used in the first conjunct of (12) implies that the

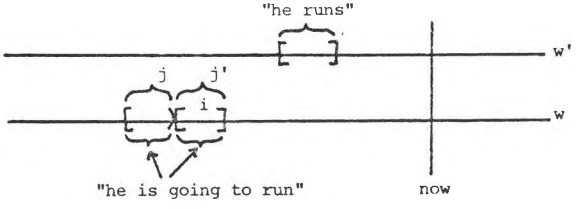
action of entering is complete, and its goal (of being in the house) is attained. It is therefore odd to assert in the same sentence that the person referred to is still pursuing the same goal, by repeating the action of entering. Ordinarily, such a goal does not need to be pursued more than once in a given situation. Sentence (11), on the other hand, is not felt to be odd, because running is not an activity which leads toward a particular goal. Therefore, it is entirely consistent to say that someone has previously run, and that he is presently engaged in further acts of running.

Finally, sentence (13) is consistent in my analysis, because the progressive form of a verb can have a strictly futurate interpretation.

13) nī a-ra-hanyūk-ag-a na no nd-a-na-hanyūka
he-NP-run-MProg and yet not-he-Past-run

"he was running, and yet he didn't run"

(13) would be true, for example, in the situation shown schematically below, in which no running takes place in the actual world w, but only in a world w' in which everything which happens at times later than j (or j') is consistent with what was expected at j (or j') in w.



In the last section of this chapter, I examine the independent evidence for treating progressive aspect in this complicated way, designed to allow a unitary treatment of the category "progressive aspect" in languages like Kikuyu.

4. Independent motivation for PROG

I think that there are probably quite a number of cases where the semantic category "progressive aspect" (represented by the operator PROG) can be used in simplifying the semantic analysis of words and expressions of Kikuyu. In order not to over-complicate the present discussion, I will restrict attention to the individual case of the verb tiga, meaning "leave off", "leave behind", or "stop". In combination with an activity verb such as hanyūka "run", the verb tiga has three potential interpretations, which correspond exactly to the three interpretations that are possible for a progressive sentence (based upon an activity verb). That is:

14) nī a-ra-tig-ir-e kū-hanyūka
he-NP-stop-MComp to-run

i) (continuous action) "he was (continuously) running, and stopped"

ii) (iterative/habitual) "he had run repeatedly/habitually, but he no long did"

iii) (futurate) "he had been intending to run, but changed his mind"

On the other hand, if tiga combines with an accomplishment verb, then the following three possible interpretations arise, with an

"imperfective" interpretation in place of the "continuous action" one for activity verbs.

15) nī a-ra-tig-ir-e gū-tonya nyūmba
he-NP-stop-MComp to-enter house

i) (imperfective) "he was in the midst of entering a house, and stopped"

ii) (iterative/habitual) "he had repeatedly/habitually entered a house, but he no longer did"

iii) (futurate) "he had been intending to enter the house, but changed his mind"

All of these interpretations of (14) and (15) follow automatically from the semantic representations (14') and (15'), respectively. (These representations are somewhat simplified, through obvious omissions.)

14') COMP[INCHO[~[PROG[run(x)]]]]

15') COMP[INCHO[~[PROG[enter(x,y)]]]]

That is, the meaning of tiga (in the lexical sense of "stop") may be completely and accurately analyzed as, "it comes about that x is not V-ing", where V stands for whatever verb phrase combines with tiga. (In Chapter VI, this semantic analysis is assigned to the verb tiga by meaning postulate (8).) Without a unitary operator PROG, such as the one I have just proposed, it would be impossible to capture this generalization in the semantic analysis of Kikuyu.

I will end the discussion of verb aspect in Kikuyu with a few further comments on the class of inchoative verbs. Thus far, I have said nothing about the meanings of inchoative verbs in progressive aspect. In fact, my analysis of PROG predicts two interpretations for the progressive forms of an inchoative verb - an "iterative/habitual" meaning and a "futurate" meaning. That is, for any sentence ϕ, PROG[INCHOϕ] is true if and only if the reference-time i of the sentence falls within a series of intervals, at each of which either ϕ itself is true, or ϕ is going to be true in some expected world. The reason for this prediction is that the only sub-episode sentence of the sentence INCHOϕ is the inchoative sentence itself. The prediction is correct for all of the inchoative state verbs, as illustrated by noga below.

16) nī a-ra-nog-ag-a
he-NP-become/tired-MProg

i) (iterative/habitual) "he repeatedly/habitually got tired"

ii) (futurate) "he was getting (= going to be) tired"

However, my analysis fails to predict a third interpretation, which is possible for all of the verbs which I have been calling inchoative activity verbs (such as koma "sleep", gucia "take and pull", kuua "carry away"). The progressive forms of these verbs have, in addition to the iterative/habitual and futurate interpretations shown above, a "continuous action" interpretation (like ordinary activity verbs). For example:

17) nī a-ra-kom-ag-a
he-NP-sleep-MProg

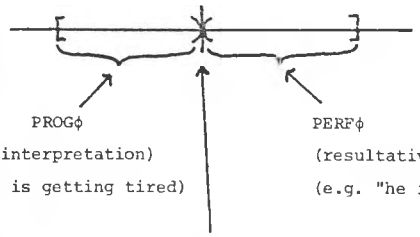
i) (iterative/habitual) "he repeatedly/habitually fell asleep"

ii) (futurate) "he was falling (= going to become) asleep"

iii) (continuous action) "he was (continuously) sleeping"
(without interruptions in the sleeping)

At present, I do not know how to accommodate the "continuous action" interpretation for inchoative activity verbs in my analysis.

The final point I want to make in this discussion of verb aspect concerns a rather neat way in which possible meanings are distributed over the three aspect forms of an inchoative state verb such as noga "become (and remain) tired". If we restrict attention to particular possible interpretations of each aspect category, what we find is that the three forms of noga (with the three infixes -ag-, -ir-, and -īt-, respectively) correspond to a perfect division of a simple change of state episode into its three characteristic phases: the phase of its "coming-about", which is expressed in the futurate meaning of a progressive form; the event phase itself (that is, the change), which is expressed in the inceptive meaning of a completive form; and the result phase (that is, the enduring state), which is expressed in the resultative interpretation of a perfect aspect form. This division of the event may be represented schematically as follows:



In the following chapter, the discussion turns to a consideration of the tense categories, which involve relations between speaking time and reference-time, and the status categories ("manifest" and "imminent"), which involve relations between episode-time and speaking time. Thus, both of these category types contrast with verb aspect, which involves relations between episode-time and reference-time.

Notes to Chapter III:

[1]Clearly, this claim can only be established or refuted on the basis of careful investigations in the semantics of individual languages, leading to precise cross-language comparisons. The present analysis of Kikuyu is intended as a contribution to that larger, long-range goal.

[2]-na- is a past tense marker, used only in the negation of a near or immediate past tense form.

[3]The reason that this entailment fails is that "John runs a quarter of a mile" is true at sub-intervals of the times at which "John runs a mile" is true. The entailment relation is defined in such a way that $[\phi \rightarrow \psi]$ is true if and only if ϕ and ψ are both true when evaluated at the same time index (in a world).

IV. THE MANIFEST ACTION SUB-PARADIGM

1. Past tense and time adverbs
2. The category "manifest action"
3. Immediate past tense

0. What Whorf has said about his work on Hopi verb categories expresses rather well the progress of my own work on Kikuyu verbs: "It happens that Hopi categories are just enough like Indo-European ones to give at first a deceptive impression of identity marred with distressing irregularities, and just enough different to afford, after they have been correctly determined, a new viewpoint toward the, on the whole, similar distinctions made in many modern and ancient Indo-European tongues" (Whorf: 1956, 112). In this chapter, my task is to show that a number of "distressing irregularities" in the Kikuyu temporal reference system are in fact completely regular, when viewed from the right perspective. In other words, I will show that despite some apparent anomalies in the system, an analysis is possible which involves a uniform assignment of meanings to morphemes in the verbal string. Thus, it is indeed possible to show that the semantics of the Kikuyu verb is compositional at the morphological level.

The members of the manifest action sub-paradigm of Kikuyu were given in Table 2 of Chapter I. For the reader's

convenience, this table is presented again on the following page. The morphological characteristic which identifies this sub-paradigm is that each verb form is marked with an infix (-ag-, -ir-, or -īt-), and a tense prefix (-a-, -ra-, -kū-, or "zero"). I begin the analysis of these forms with a discussion of the past tense markers, -ra- (for "near past") and -a- (for "remote past"). I then discuss the meaning of the existential status category, "manifest action", and end with a discussion of the immediate past tense marker -kū-.

In order to understand where the argument in this chapter is leading, it will be helpful for the reader to keep in mind the following three problems, which a compositional analysis of the manifest action forms must take account of:

(a) The temporal reference of the "zero"-tense manifest action forms is asymmetric, in that the completive form has a past time reference ("earlier on the same day"), whereas the perfect and progressive forms have a simple present tense meaning. However, there is a symmetry of time reference for all three aspect forms when a near or remote past tense marker is added. This curious situation is a key consideration in motivating the present analysis of the "manifest action" category.

(b) The "zero" (simple present) progressive form in the manifest sub-paradigm has only a habitual action interpretation, although its past tense forms have a broader range of progressive interpretations.

(c) There is no immediate past completive form - that is, no form which combines the prefix -kū- with the infix -ir-.

TABLE 2: The manifest action sub-paradigm

	"zero"-tense (ø)	Immediate Past (-kū-)	Near Past (-ra-)	Remote Past (-a-)
Completive (-ir-)*	a-hanyūk-ir-e "he ran (earlier today)"	------	a-ra-hanyūk-ir-e "he ran (yesterday)"	a-a-hanyūk-ir-e "he run (before yesterday)"
Progressive (-ag-)	a-hanyūk-ag-a "he is habitually running"	e-kū-hanyūk-ag-a "he was running (earlier today)"	a-ra-hanyūk-ag-a "he was running (yesterday)"	a-a-hanyūk-ag-a "he was running (before yesterday)"
Perfect (-īt-)*	a-hanyūk-īt-e "he has run (some ago)"	e-kū-hanyūk-īt-e "(earlier today) he had run"	a-ra-hanyūk-īt-e "(yesterday) he had run"	a-a-hanyūk-īt-e "(before yesterday) he had run"

*this morpheme changes the final vowel a of a verb stem to e

1. Past tense and time adverbs

Kikuyu is typical of the Bantu languages in that it distinguishes between a "near" and a "remote" past tense. The most usual time reference for the near past is the day preceding the day of speaking (i.e. yesterday), while the time reference of the remote past is any time two or more days ago. This fact can be demonstrated by the co-occurrence restrictions of the two past tenses with temporal adverbs. For example, in sentences (1) and (2) below, ira "yesterday" must co-occur with a near past tense form, whereas iyo "two days ago" must co-occur with a remote past tense form.

1) nĩ a-ra-hanyūk-ir-e ira/*iyo
he-NP-run-Comp

"he ran yesterday/*two days ago"

2) nĩ a-a-hanyūk-ir-e iyo/*ira
he-RP-run-Comp

"he ran two days ago/*yesterday"

However, the boundaries of the near and remote past are not so clear-cut as these initial examples suggest. If habitual acts of running are at issue, rather than an individual act (which takes a relatively short period of time), then the time reference of the near past tense is an interval of time ending yesterday, whereas the remote past tense designates an interval of time ending two or more days ago. For example (only the relevant interpretations of (3) and (4) are given):

3) nī a-ra-hanyūk-ag-a
he-NP-run-MProg

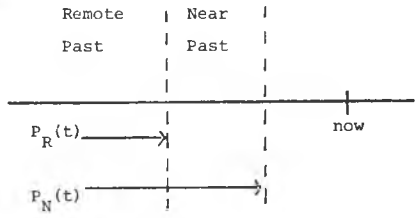
"he used to run (until very recently)"

4) nī a-a-hanyūk-ag-a
he-RP-run-MProg

"he used to run (but this habit ended at least two days ago)"

What these latter two examples indicate is that near and remote past do not refer to disjoint time periods, but rather to time periods which end relatively near to or far from the time of speaking. In order to translate this fact into model-theoretic terms, we now introduce the temporal functions, P_N and P_R, whose role is to designate the time periods "near past" and "remote past", respectively. The domain of each of these functions is the set of times (T), and the value of each for a moment of time (corresponding to the time of speaking) is an interval of time (that is, a member of I). In other words, for all times t in T, $P_N(t)$ and $P_R(t)$ are members of I. The symbol $P_N(t)$ may thus be thought of as standing for the time period which is the "near past of t", while $P_R(t)$ may be thought of as standing for the time period which is the "remote past of t". The relative positions of these two time periods are to be constrained as follows. Both the near past and the remote past are to stretch back into the indefinitely far past. We allow for this by specifying that there is no moment of time which is earlier than every time in the near or remote past; that is, there is no t' in T such that $\{t'\} < P_N(t)$ or $\{t'\} < P_R(t)$[1]. On the other hand, the remote past ends at a time earlier than the end of the near past, which ends earlier than "now". We can build this second constraint

into the model by saying that there is some t_0 which is the last moment of the remote past, and some t_1 which is the last moment of the near past, and t_0 is earlier than t_1, which is earlier than t (the time of speaking). The situation thus described may be represented as in the diagram below:



In addition to the constraint concerning the ordering of the last moments in the near past and the remote past (with respect to each other and to "now"), we could build other sorts of constraints into the possible denotations of these time periods. For example, since the near past typically corresponds to yesterday, we might specify that the last moment of the near past coincides with the end of the day before the day of speaking, while the last moment of the remote past coincides with the end of the day once removed from the day of speaking. I hesitate to add this constraint, however, because the notion of near and remote past is not intrinsically tied to days (in any of the Bantu languages). In fact, there is no fixed unit for evaluating past time periods, but instead a "sliding scale" whose values appear to be determined by such features of context

as speaker and topic. Unfortunately, there is very little information currently available on this interesting aspect of the Bantu tenses. Barlow is fairly non-committal on this point, although he does say that the near past can be used either to refer to "yesterday", or more generally, "in reference to an event which is relatively recent, although it took place prior to yesterday" (Barlow: 1960, 62). Some other Bantu grammar writers, however, have reported quite extensive variation along particular dimensions. For example, in her grammar of Luyia (a language closely related to Kikuyu), Appleby makes the following suggestive remarks:

> "As there are far more verb tenses in Luyia than in English, the meaning of each is more restricted. There is no general past tense; any one of the past tenses indicates roughly how long past you are referring to. This indication is sometimes relative rather than absolute;e.g. the Near Past tense indicates the near past period of time, usually within the preceding 24 hours or so; but in speaking of years, it would be used of last year; in speaking of generations, it would be used of the last generation; of wars, of the last war; and so on." (Appleby: 1947, 40)

It can hardly be doubted from evidence of this sort that important semantic and/or pragmatic principles govern the interpretation of the Bantu tenses. Since these principles are largely unknown, it seems futile to build into the model as yet any further constraints on the designation of the near or remote past.

Returning now to the problem of giving a model-theoretic interpretation for the past tense markers of Kikuyu, we need in addition to the temporal functions P_R and P_N a corresponding pair of sentence operators, which we will call RP (for "remote past") and NP (for "near past"). The function of

these operators is to specify the relation of the reference-time of an index to the time of speaking. (Hence, we now define truth for a sentence relative to a "full" index, <w,t,i,J>; recall that t in this index is the time of speaking, i is the reference-time, and J is a set of intervals of time which jointly constitute episode-time.) The operators RP and NP are defined, then, as follows:

Definitions of RP and NP

a) RPϕ is true in a model relative to an index <w,t,i,J> if and only if $i \subseteq P_R(t)$ and ϕ is true at <w,t,i,J>.

b) NPϕ is true in a model relative to an index <w,t,i,J> if and only if $i \subseteq P_N(t)$, $i \not\subseteq P_R(t)$ and ϕ is true at <w,t,i,J>.

Note that the definition of NP specifies that the reference-time i is not contained in the remote past; that is, i is not a sub-set of $P_R(t)$. This condition is needed because of the over-lap between near past and remote past: in fact, the whole of the remote past is actually a sub-set of the near past, according to the analysis we have given. However, if a sentence occurs in near past tense, then we want to be sure that its reference-time coincides at least in part with that portion of the near past which is later than every part of the remote past.

In order to see the import of these definitions, consider the meanings of (5) and (6) below, which have the (somewhat simplified) semantic representations (5') and (6'), respectively.

5) nī a-ra-hanyūk-ir-e
he-NP-run-Comp

5') NP[COMP[run(x)]]

"he ran (in the near past)"

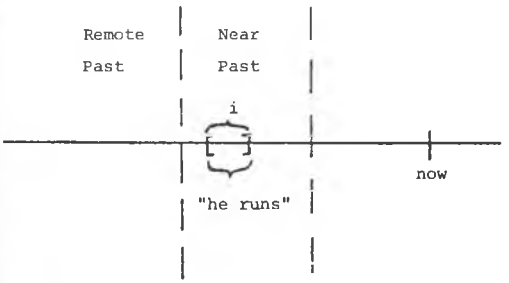
6) nī a-a-hanyūk-ir-e
he-RP-run-Comp

6') RP[COMP[run(x)]]

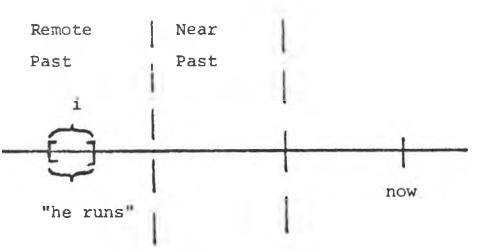
"he ran (in the remote past)"

Recall that a sentence of the form COMPϕ is true if and only if the episode-time (in an index) is the same as the reference-time (that is, J = {i}, and the embedded sentence ϕ is true$_e$ for i in w). Hence, (5') and (6') are true in the situations represented as (5'') and (6'') respectively, below.

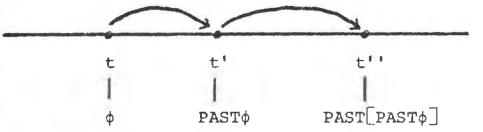
5'') ("he ran in the near past")



6'') ("he ran in the remote past")



There is a major advantage to this formalization, in that it can handle all deictic time adverbs referring to past time, in addition to the near and remote past inflectional markers. Thus, it solves a problem which was previously pointed out in Dowty (1977) concerning the relation of ordinary tense logic to natural language tenses. Dowty remarked (in footnote 12, page 73) that the meaning of a sentence with multiple past tense marking does not involve an iteration of past time reference, in the way that several past operators in a formula of tense logic involve iteration of the meaning of past time. That is, suppose we have an ordinary tense logic in which truth is defined relative to moments of time, and PASTϕ is true at a time t if and only if ϕ is true for some t' which is earlier than t. Then PAST[PASTϕ] is true at t in such a system if and only if there is a time t' earlier than t, and a time t'' earlier than t' such that ϕ is true at t''. This can be represented diagrammatically as follows:



However, the Kikuyu sentence (7) - which has the two past time markers -ra- and ira - does not work like the ordinary tense logic example above: the meaning of (7) involves a simple past time reference, and the not the "past of a past".

7) nĩ a-ra-hanyũk-ir-e ira
he-NP-run-Comp yesterday

"he ran yesterday"

Dowty suggested that this problem could be solved in Montague Grammar by introducing tense forms and time adverbs simultaneously in a syntactic rule. However, an even better solution is available within the present approach to tense, because this approach has built into it the possibility of multiple tense marking which is semantically redundant (as in (7)). To see this, consider how the time adverb meaning "yesterday" can be accommodated in our system. First, we add a new member, Ys, to the set of temporal functions of Kikuyu. The value of this function (for all times t) can easily be defined in model-theoretic terms as the day immediately preceding the day of speaking (see Chapter VI for a precise way of doing this). Next, we add the operator YEST, which is defined analogously to the previous tense operators. That is:

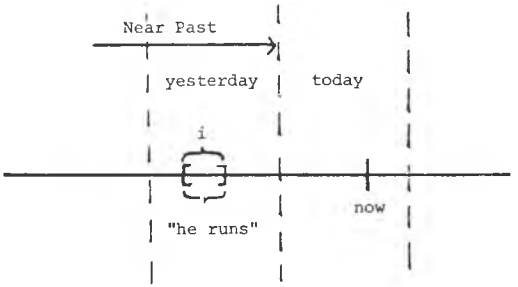
Definition of YEST

YESTϕ is true in a model relative to <w,t,i,J> if and only if $i \subseteq Ys(t)$ and ϕ is true at <w,t,i,J>.

We can now assign to (7) the (simplified) semantic representation (7'), which is true in the situation represented by (7'').

7') YEST[NP[COMP[run(x)]]]

7'') ("he ran yesterday")



What (7') says is that there is a time within the near past, which is also within yesterday, and "he runs" is true at that time. This is precisely the meaning of (7), and there is no need for a special syntactic treatment of tense marking in order to assign this meaning to (7). (See Chapter VI for the syntactic treatment of tense markers and time adverbs in this version of Montague Grammar.)

The discussion moves on now to the analysis of the exiatential status category, "manifest action".

2. The category "manifest action"

Judging by the following comment, Reichenbach himself believed that the relation of episode-time to speaking-time has little (if any) role to play in natural language semantics: "Further differences of form result only when the position of the event relative to the point of speech is considered; this position, however, is usually irrelevant" (Reichenbach: 1947, 296). For a long time in my work on Kikuyu, I implicitly agreed with this point of view, and as a consequence, I was unable to find a satisfactory way of defining an operator (to be called MNF) for the category "manifest action", even though I was convinced that such a category existed in the language. To give the reader an idea of just what sort of semantic distinction I wanted to represent by MNF, it is worthwhile here to compare the manifest forms of hanyūka "run" in their simple present tense forms, with the corresponding perfect and progressive forms of the imminent action sub-paradigm. That is:

8)	Imminent action	Manifest action
Perfect	a-a-hanyūka he-IPerf-run	a-hanyūk-ĭt-e he-run-MPerf
	"he has just run" (within the last few hours)	"he has run" (some time ago)
Progressive	a-ra-hanyūka he-IProg-run	a-hanyūk-ag-a he-run-MProg
	"he is running" (he just started)	"he is running" (he began some time ago)

What is common to the imminent action forms is that the earliest possible instance (or "manifestation") of an episode is claimed to lie within the very recent past (typically, no more than two or three hours back). In contrast, the manifest action forms describe episodes which begin in the not-so-very-recent past (although they may continue right up to the present time). In the imminent action cases, the recentness of the episodes described implies that they are relatively unstable, in the sense that an observer cannot know yet exactly how they are likely to turn out in all of their consequences. In the manifest action cases, however, the episodes described have been in existence long enough to have been carefully observed, and to have manifested a clear pattern of development.

Another example which I think helps to demonstrate the manifest/imminent distinction is the difference between the two present perfect forms of the inchoative state verb kua "die". These forms are illustrated as (9) and (10) below.

9) nĩ a-a-kua
he-IPerf-die

"he is dead (but this is a recent development)"

10) nĩ a-ku-ĩt-e
he-die-MPerf

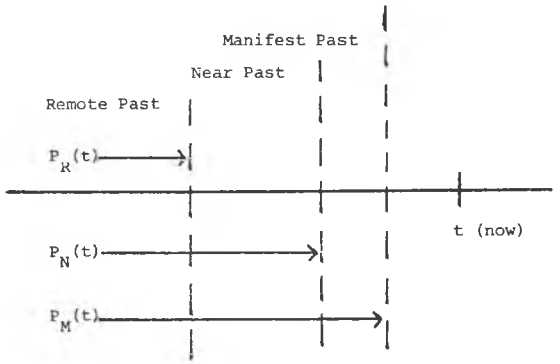
"he is dead (having died some time ago)"

I like this particular example, because I think it is obvious to everyone that the death of an individual is a social event with manifold implications, and these take a long time to untangle

themselves. Hence, it is reasonable to say that sentence (9) expresses not the recent perfection of an episode, in the sense of its recent completion, but instead the mere beginning of the episode, in terms of its important consequences. It is this consideration which prompted me to label the one sub-paradigm of Kikuyu as "imminent action", even though the English word imminent literally describes something which is yet to happen, whereas the Kikuyu imminent action paradigm includes descriptions of episodes which already begun to happen.

But to return to the major theme of this chapter, we need a model-theoretic characterization of the notion "manifest action", which will exclude from the semantic translations of forms in the manifest sub-paradigm all reference to episodes of recent origin. We can achieve this goal in the following way. First, we introduce an additional temporal function, P_M, corresponding to the notion of the "manifest past" - that is, the past which is at least a short time removed from the time of speaking, but not necessarily as far removed as the near past. To capture this idea, we let P_M be a function with domain T, and for all t in T, (a) $P_M(t)$ is an interval (i.e. member of I), (b) there is no time t' which is earlier than every time in $P_M(t)$, (c) there is some t_0 which is the last moment in $P_M(t)$ and some t_1 which is the last moment in $P_M(t)$, and t_1 is earlier than t_0, and (d) there is some time t_2 which is between t_0 (the last moment in the manifest past) and t (the time of speaking). This characterization of the manifest past interval says, first, that it

stretches back to the indefinite past, secondly, that it ends later than the near past, and thirdly, there is a "gap" between the end of the manifest past and the time of speaking (because whatever scale we might use to evaluate the position of the manifest past, there is always at least one time which lies between the end of this period and the time of speaking). We now have a triple partition of past time in the model, which may be diagrammed as follows:



With this in mind, the operator MNF may now be defined as follows:

Definition of MNF

MNFϕ is true in a model relative to <w,t,i,J> if and only if there is some j in J such that $j \subseteq P_M(t)$ and ϕ is true at <w,t,i,J>.

What this definition says is that at least one member of the set of times which constitute episode-time must lie within the manifest

past. Note that this definition is silent on the relative position of the reference-time i, or of the other possible members of J.

We are now in a position to account for the curious effect which the existential status category, manifest action, has on the time reference of the various aspect forms. First, however, it needs to be pointed out that I do not give an explicit semantic representation for "simple present tense" anywhere in my analysis. The manifest present tense forms - which happen to be morphologically unmarked forms - are treated here as semantically unmarked as well. That is, their tense significance is not assigned directly by an operator, but arises from a general rule to the effect that when reference-time is unspecified, it is to be taken to be the same as speaking time (that is, "unless otherwise specified, i = {t}, where i is reference-time and t is speaking time in an index). This approach allows us (in Chapter VI) to treat the meaning of an unmarked form as input to the meaning of a marked form; and this feature of the analysis is crucial in the syntactic handling of scope ambiguities involving adverbs and aspect markers. In fact, I think that this is really one of the nice features of my analysis, because it is traditional in morphology to consider the meaning of an unmarked form as whatever is not covered by the meanings of the marked forms in the same system.

Consider now the meanings of the unmarked manifest action forms in (11) - (13), which have the semantic representations

(11') - (13'), respectively.

11) nĩ a-hanyũk-ag-a
he-run-MProg

"he is (habitually) running"

11') MNF[PROG[run(x)]]

12) nĩ a-hanyũk-ir-e
he-run-Comp

"he ran (earlier today)"

12') MNF[COMP[run(x)]]

13) nĩ a-hanyũk-ĩt-e
he-run-MPerf

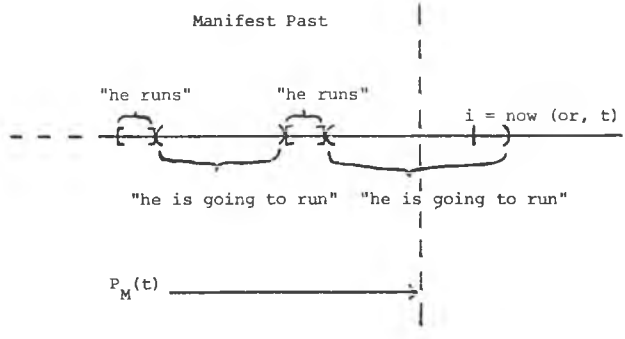
"he has run (some time ago)

13') MNF[PERF[run(x)]]

(11') is true in a situation in which the reference-time i (which, for lack of other specification, we identify with the time of speaking) falls within an interval sequence which (a) has at least one member in the manifest past, and (b) is composed of times at which either "he runs" is true, or "he is going to run" is.

That is:

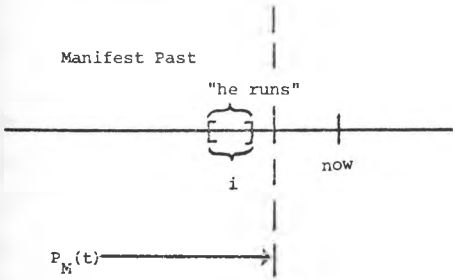
11'') ("he is habitually running")



It is the implication that episode-time begins in the past, and continues at least until the time of speaking (or later), which restricts the interpretation of the present manifest progressive form to a habitual action interpretation. Note, however, that there is nothing inconsistent between mainfest action and present tense with a progressive sentence, because a progressive sentence involves several instances of episode-time, and there is no requirement that all of these fall within the manifest past. Hence, the reference-time i (which is the time which determines tense reference) may coincide both with the time of speaking and with part of episode-time.

This situation contrasts with the manifest completive sentence (12/12'). Here, manifest action and present tense are incompatible, because there is only one instance of episode-time at issue, this time is located in the manifest past, and the reference-time i is identified with it. That is:

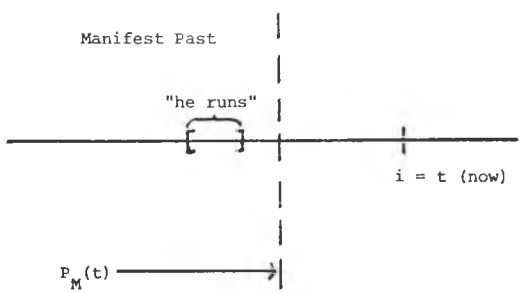
12''; ("he ran earlier today")



Thus, a manifest completive form automatically implies past tense, even though there is no explicit past tense marker. (Later in this chapter, there is some further discussion of the time reference of an unmarked completive form.)

Looking now at (13/13'), however, we again find that there is no incompatibility of manifest action and present tense. The reason is that even though episode-time must lie in the manifest past, this does not affect reference-time, because reference-time is said to be later than episode-time. Hence, it is entirely consistent to identify reference-time with speaking time. Thus, (13) is true in the following situation:

13'') ("he has run some time ago")



In this way, the operator MNF accounts for two problems cited earlier, the asymmetry in the time reference of the unmarked manifest action forms, and the restriction of a progressive form in this group to a habitual action meaning. There remains only some consideration of the effect of an explicit

past tense marker on a manifest action form. As I indicated earlier, a past tense marker eliminates the temporal asymmetry of the unmarked forms, thus effectively neutralizing the contribution of the category manifest action. To see why, we will consider the special case of the near past tense. (The remote past, of course, works analogously.)

Sentences (14)-(16) below illustrate the meanings of the three aspect forms of "run" in their near past form; (14')-(16') illustrate the corresponding semantic representations.

14) nĭ a-ra-hanyūk-ag-a
he-NP-run-MProg

"he was running"

14') NP[MNF[PROG[run(x)]]]

15) nĭ a-ra-hanyūk-ir-e
he-NP-run-MComp

"he ran"

15') NP[MNF[COMP[run(x)]]]

16) nĭ a-ra-hanyūk-ĭt-e
he-NP-run-MPerf

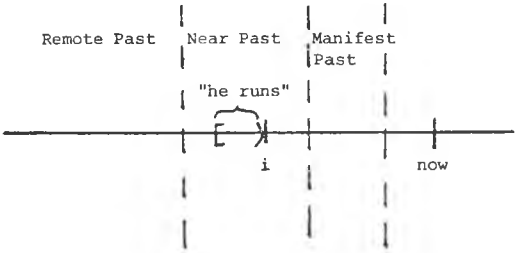
"he had run"

16') NP[MNF[PERF[run(x)]]]

The only difference between (14)-(16), and the previous examples (11)-(13), is that in the latter cases, the reference-time is shifted back into the near past. The shift has important consequences, however, for the interpretation of progressive and perfect aspect. Recall that the manifest operator says that part of episode-time must lie within the manifest past; if reference-time is identified with the time of speaking, then it follows that there is a time lag between the earliest manifestation of episode-time and the occurrence of reference-time. However,

if reference-time is located in the past, and in particular, anywhere earlier than the manifest past boundary, then the necessity for the time lag disappears. Hence, (14) is consistent with the interpretation, "he was running (having just begun)", and (16) is consistent with the interpretation, "he had just run". To illustrate this more precisely, (16'') below shows one situation in which (16/16') is true; note that reference-time i in this diagram is interpreted as an actual boundary interval for the time at which "he runs" is true.

16'') ("he had run")



There is one further point to be made concerning the time reference of the unmarked completive form. The three manifest completive forms of "run" are assigned the following literal meanings in my analysis:

17) Unmarked: ahanyūkīre "he ran in the manifest past"
Near Past: arahanyūkire "he ran in the near past"
Remote Past: aahanyūkire "he ran in the remote past"

Note that the unmarked form means literally, "he ran at any time in the manifest past". Hence, it is consistent with the further specification that the person referred to ran within the near past, or the remote past. However, as I have indicated earlier, when the unmarked form is used by itself, its reference is typically understood as more narrowly restricted than, "somewhere in the manifest past". The time reference signalled by this form is actually, "earlier on the same day". There is a consensus on this among speakers, according to their judgements on the co-occurrence restrictions of time adverbs with manifest completive forms. My analysis accounts for this time reference of the unmarked completive form as a conversational implicature, based upon the Gricean maxim of quantity. This maxim says that a speaker should make his contribution as informative as possible (Grice: 1974, 67). Within the inflectional system of Kikuyu, a speaker has the option of specifying near or remote past tense. If he fails to specify either, it may reasonably be inferred that neither is appropriate. Hence, it may be inferred that the time he is referring to lies within the only remaining portion of the manifest past, namely times on the same day but a few hours earlier than the time of speaking. It is worth noting in regard to this argument, a comment from the last informant I worked with. He agreed that the unmarked form implies a time earlier on the same day, but he also said that the emphasis of this particular form is on establishing that the action is already accomplished, rather than specifying the time at which it occurred.

3. Immediate Past tense

The tense prefix -kū- is etymologically related to the locative noun prefix kū-, which means "extended place, or area", in contrast to ha-, which means "a certain spot, a limited area" (Barlow: 1960, 26). Such correspondances between temporal and spatial locative systems are common in the languages of the world; numerous other cases are documented in Anderson (1973).

In the manifest action sub-paradigm, -kū- is used as an immediate past tense marker, and in the imminent action sub-paradigm, it functions as a present or immediate future marker (see the following chapter). Thus, the core meaning of this morpheme (on analogy with its meaning in the spatial system) appears to be, "around the time of speaking", or in other words, "within the same interval of time as the time of speaking (where the relevant "interval" is usually a day, but may be some larger unit)". In association with the class of past tense prefixes, -kū- takes on the more specific meaning, "earlier on the same day". Thus, this morpheme functions in the manifest paradigm as an immediate past tense marker. For example:

18) nī e-kū-hanyūk-ag-a
he-IP-run-MProg

"he was running (earlier today)"

19) nī e-kū-hanyūk-īt-e
he-IP-run-MPerf

"(earlier today) he had run"

Since we already have a temporal function (P_M) which identifies times which are at least a few hours earlier than the time of speaking, we can accommodate (18) and (19) in the analysis by defining an immediate past tense operator, IP, as follows:

Definition of IP

IPϕ is true in a model relative to an index <w,t,i,J> if and only if $i \subseteq P_M(t)$, $i \not\subseteq P_N(t)$ and ϕ is true at <w,t,i,J>.

This definition is parallel to the one given previously for the near past operator NP; note that the definition specifies that the reference-time i must not fall within the near past (that is, $i \not\subseteq P_N(t)$). In this way, we ensure that the actual time reference of the immediate past includes part of the day of speaking. The semantic representations (18') and (19') can now be given for (18) and (19), respectively.

18') IP[MNF[PROG[run(x)]]]

19') IP[MNF[PERF[run(x)]]]

As I mentioned in Chapter I, the fact that the immediate past tense marker -kū- does not combine with the completive marker -ir- seems to be motivated by the fact that such a form would be completely synonymous with the unmarked completive form. Thus, it appears that inflectional systems may contain a systematic gap, because the missing form serves no semantic function in the grammar.

Table 5 below summarizes the semantic representations which have been proposed for the members of the manifest action sub-paradigm. In the next chapter, I discuss the meanings of the forms in the other sub-paradigm of the Kikuyu verb, the imminent action sub-paradigm.

TABLE 5: Summary of the semantic representations of members of the manifest action sub-paradigm

(i) Progressive forms

Unmarked:	a-hanyūk-ag-a	MNF[PROG[run(x)]]
Immediate past:	e-kū-hanyūk-ag-a	IP[MNF[PROG[run(x)]]]
Near past:	a-ra-hanyūk-ag-a	NP[MNF[PROG[run(x)]]]
Remote past:	a-a-hanyūk-ag-a	RP[MNF[PROG[run(x)]]]

(ii) Completive forms

Unmarked:	a-hanyūk-ir-e	MNF[COMP[run(x)]]
Near past:	a-ra-hanyūk-ir-e	NP[MNF[COMP[run(x)]]]
Remote past:	a-a-hanyūk-ir-e	RP[MNF[COMP[run(x)]]]

(iii) Perfect forms

Unmarked:	a-hanyūk-īt-e	MNF[PERF[run(x)]]
Immediate past:	e-kū-hanyūk-īt-e	IP[MNF[PERF[run(x)]]]
Near past:	a-ra-hanyūk-īt-e	NP[MNF[PERF[run(x)]]]
Remote past:	a-a-hanyūk-īt-e	RP[MNF[PERF[run(x)]]]

Notes to Chapter IV:

[1]This condition is consistent both with a model in which there is no "first moment" of time (in which case, the near and remote past are both infinitely large), and also with a model in which there is a first moment, which must be included in both the near and remote past.

V. THE IMMINENT ACTION SUB-PARADIGM

Having completed the analysis of the manifest action sub-paradigm, it is a relatively easy matter to finish the task of describing the Kikuyu tense and aspect system. What remains is to give a semantic account of the five forms in the imminent action sub-paradigm. These forms were presented earlier in Table 3, which appears again on the next page. Recall that the morphological feature of this sub-system is that each verb form is marked only with a prefix, which expresses a fixed combination of tense and aspect meanings.

The underlying semantic unity of the forms in Table 3 is that in each case, episode-time does not co-incide with any part of the manifest past. It follows from this characterization that episode-time is either just before speaking time, or later than speaking time. Consequently, episodes described by forms in the imminent action group are ones which are just partially realized at the time of speaking. That is, these episodes have begun to develop, but they are not fully evolved, and in particular, they have not yet manifested a stable result phase.

We can capture this intuitive idea of imminent action by defining an operator IMM, as follows:

TABLE 3: The imminent action sub-paradigm

	Simple Present	Extended Present	Near Future	Remote Future
Completive	-----	e-kũ-hanyũka "he runs (today)"	a-rĩ-hanyũka "he will run (soon)"	a-ka-hanyũka "he will run (tomorrow or later)"
Progressive	a-ra-hanyũka "he is running (right now)"	-----	-----	-----
Perfect	a-a-hanyũka "he has just run"	-----	-----	------

Definition of IMM

IMMϕ is true in a model relative to an index <w,t,i,J>
if and only if there is no j in J such that $j \subseteq P_M(t)$,
and ϕ is true at <w,t,i,J>.

This definition says that no member of episode-time falls within the manifest past. This operator interacts with PERF and PROG in just the right way, to get a correct semantic interpretation for (1) and (2) below (which have the semantic representations (1') and (2'), respectively). Because -a- and -ra- express simple present tense, there is no need to give an explicit representation for their tense component .

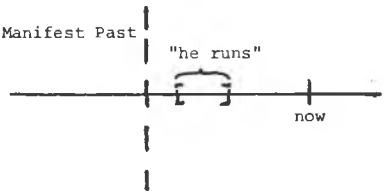
1) nī a-a-hanyūka
he-IPerf-run
"he has just run"

1') IMM[PERF[run(x)]]

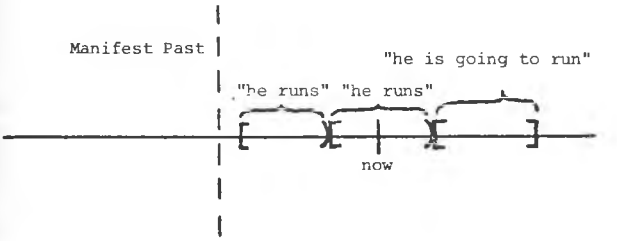
2) nī a-ra-hanyūka
he-IProg-run
"he is running (as of a short time ago)"

2') IMM[PROG[run(x)]]

Sentence (1) is true if and only if there is a time earlier than "now", but not contained in the manifest past, at which "he runs" is true. This is shown in the diagram below:



Similarly, (2) is true if and only if the time of speaking (which is taken to be the reference-time) falls within a continuous sequence of times at which either "he runs" or "he is going to run" is true, and all of these times are later than the manifest past. For example:



A word here is appropriate about the possible interpretations of an imminent progressive form. The usual interpretations of progressive aspect are somewhat restricted by the meaning of "imminent action". In particular, a "habitual action" interpretation is frequently ruled out. Nevertheless, there are at least some examples of every possible interpretation of progressive aspect involving the marker -ra-. A "continuous action" meaning is the most natural one for sentence (2) above. However, a "futurate" interpretation is also possible, and is the intended one if the time adverb o'rĭu "just now" is added. That is, nĭ arahanyūka o'rĭu "he is running just now" is understood to mean that the action of running is going to begin at any moment, but

has not yet in fact begun. An "imperfective" meaning of progressive aspect occurs, naturally, with an accomplishment verb. For example, nī araaka nyūmba "he is building a house" means that someone has recently become engaged in a house-building project, but has not completed it yet. The iterative/habitual meaning can also be expressed with this progressive marker, if the situation described is one of quite recent origin, that is contrasted with some different prior state of affairs. A sentence for which this sort of interpretation was spontaneously offered to me is (3) below.

3) nī a-ra-rīkia nyūmba
he-IProg-finish house

"(these days) he finishes a house (a short time ago, he didn't bother to do so)"

The prefix -kū- is one member of the imminent action paradigm whose meaning is still somewhat problematic. The only meaning recorded for this marker in my own field-notes is "immediate future completive", as illustrated in (4).

4) nī e-kū-hanyūka
he-EPComp-run

"he will run (later today)"

The immediate future meaning for this prefix is certainly the most salient one for young speakers of Kikuyu. However, Barlow reports that it can also express a present tense meaning, as in "I am taking hold", or a present perfect meaning, as in

"I have just taken hold"[1] (see Barlow: 1960, 129). Moreover, a simple negation of -kū- functions both as a present tense negative, or an immediate future negative. For example (these examples are taken from the section just cited in Barlow's grammar):

5) n-di-kw-enda*
   I-not-kū-want

   "I do not want"

   *u → w / _ V

6) n-di-kū-gwata
   I-not-kū-take/hold

   "I am not going to take hold"

It appears from this evidence that -kū- marks completive aspect in conjunction with what we might call "extended present tense". That is, the morpheme means (i) that reference-time coincides with episode-time, and (ii) that reference-time lies somewhere within an interval (usually a day[2]) containing the time of speaking. The tense component of this definition can be captured by the operator EP (for "extended present"), defined as follows:

Definition of EP

EPϕ is true in a model relative to an index <w,t,i,J> if and only if there is some interval sequence S such that every time is contained in a member of S, and there is some s in S such that t is in s, i≤s, and ϕ is true at <w,t,i,J>.

This definition says that a sentence in the extended present tense is true if and only if the set of moments of time can be partitioned into an interval sequence S in such a way that the

reference-time i falls within the same member of S as the time of speaking, and the embedded sentence is true at that time. Thus, sentence (4) above can be assigned the semantic representation (4'):

4') EP[IMM[COMP[run(x)]]]

(4') is true, for example, if its reference-time is a later time on the same day as the time of speaking, and "x runs" at that time. (4') would also be true if reference-time actually coincided with speaking-time, or if it was slightly ahead of speaking-time. However, perhaps these latter interpretations are already archaic. (It does seem that to express the idea, "he just ran", it would be preferable to use the imminent perfect form, rather than the -kū- form.) If -kū- has in fact narrowed its meaning to "immediate future", the operator EP could easily be replaced by an appropriately defined immediate future operator.

The near future marker -rī- of the imminent action group contrasts in two ways with the remote future marker -ka-. First, -rī- is used to refer to future times which are closer to the time of speaking than -ka-. In addition, -rī- is used to express less certainty on the part of a speaker that what he predicts for the future will definitely be the case; -ka-, on the other hand, expresses a confident assertion about the future. For example:

7) nī a-rĭ-kuua mūrigo
he-NFComp-carry/away load

"he will carry away the load"

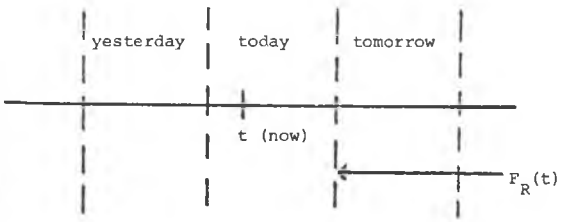
(i.e. "the occasion will arise for him to carry away the load")

8) nī a-gā-kuua* mūrigo
he-RFComp-carry/away load

"he will (definitely) carry away the load"

*k → g / _ V k

Since the remote future works exactly like a past tense marker, we will begin the analysis with it. To analyze -ka-, we need to add to the temporal functions of Kikuyu a new function, F_R, whose role is to designate the remote future. Since the remote future typically means "tomorrow or later", we will define it as the complement of the extended present tense. That is, F_R is to be a function such that (a) it has the domain T, (b) for all t, $F_R(t) \varepsilon I$, $F_R(t)$ extends into the indefinite future, (c) there is some interval sequence S which includes all of the moments in T, and (d) for all t in T, if t is in s (for some member s of the sequence S), then $F_R(t)$ is a final boundary interval for s. If we take the sequence S to be the set of days, then we have the following situation:



That is, the remote future designates the interval of time beginning with tomorrow and extending into the indefinitely remote future. The remote future operator, RF, may then be defined as follows:

RFϕ is true in a model relative to <w,t,i,J> if and only if $i \leqq F_R(t)$ and ϕ is true at <w,t,i,J>.

This definition is exactly parallel to the definition of the remote past operator given in the last chapter.

Consider now the near future marker -rī-. My informants commented several times that in using this tense, a speaker has no definite time in mind, and that consequently, an explicit time adverb is inappropriate with this tense form. However, they were not entirely consistent on this point, since they accepted sentences like (9):

9) nĭ tū-rī-hinga mūrango hwaī-inī
we-NFComp-close door evening

"we will close the door this evening"

(speaking very early in the day)

It is not clear to me just how or why the near future carries the meaning both of "indefiniteness" and of relative "nearness" to the time of speaking. However, I would like to venture the following hypothesis. Let us suppose that the near future is a generalized future tense, which means "later than now, although not immediately following now". We could then define the operator NF (for "near future") as follows:

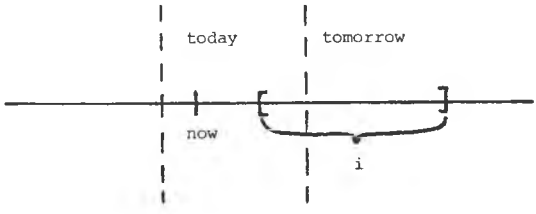
Definition of NF

NFϕ is true in a model relative to <w,t,i,J> if and only if {t} < i, i is not a final boundary interval for {t}, and ϕ is true at <w,t,i,J>.

What this says is that a sentence in the near future tense is true if and only if it is true for a reference-time which is later than "now", but not adjacent to "now"; that is, there must be some gap between reference-time and the time of speaking. (Thus, this interpretation amounts to treating near future as a "non-immediate future".) Consider now the temporal range of this operator in relation to EP and RF. The operators EP and RF actually cover the domain of future time in an exhaustive way, since EP covers times within the interval containing "now" (in some sequence), whereas RF covers times later than that interval. Suppose, however, that a speaker does not know just when a future episode is likely to take place, although he is reasonably sure that it will happen at some time. Neither extended present nor remote future tense would be appropriate, since both imply too specific a time. However, near future tense would be available, since this tense only implies some time later than the time of speaking, but does not narrow the time reference more than that. This semantic analysis would, then, account for the role of the near future marker as an indefinite future marker.

What about the role of the morpheme -rī- as a near future marker? Here there is, I think, at least one possibility for explaining the facts. The indefinite future -rī- would be needed

to fill a "referential gap" created by the mutual exclusiveness of the extended present and remote future tenses. That is, the near future would be needed to refer to episodes which begin in the present interval, and continue into the following one. In diagrammatic terms, the near future would be the only tense which could refer to the following situation:



In this situation, the near future would contrast with the remote future as a period of time which is relatively closer to the time of speaking. This contrast is completely parallel to the ordinary contrast between near and remote past, a parallellism which may serve to reinforce this aspect of the near future/remote future distinction.

This explanation works rather well, I think, but unfortunately, it does not account for the specific case of sentence (9) above. In (9) (and related examples which might have been given), we find that the near future is used to refer to a time which is entirely within the present interval, although this reference-time is at the further extremity of this interval, compared to the time of speaking. This situation is unexpected,

given the appeal to Gricean principles in analyzing the past tenses. That is, in the last chapter, I argued that a speaker is required to use the tense form which provides the maximal amount of information which is consistent with what he knows about an episode. This principle was used to account for the fact that the unmarked completive form implicates a time earlier on the same day, rather than just any time in the manifest past. However, in the cases where the near future is used (rather than the extended present tense) to refer to times within the present interval, it appears that this principle does not apply (or else, my analysis of the near future is simply wrong). For now, I do not know how to resolve this dilemma in my analysis. However, I do think that the application of Gricean principles in relation to the past tenses was legitimate, so that the problem here is more likely to involve some inadequacy in the semantic analysis of the near future tense.

This completes the discussion of the semantics of the Kikuyu tense and aspect forms. Table 6 on the following page gives a summary of the semantic representations which have been proposed in this chapter for the five forms of the imminent action sub-paradigm. In the last chapter of the thesis, I provide an explicit account of the semantic system which has been presented in these earlier chapters, and I show how this semantic system can be related to the syntax of Kikuyu within the framework of Montague Grammar.

Table 6: Summary of the semantic representations of members of the imminent action sub-paradigm

Simple present perfect:	a-a-hanyūka	IMM[PERF[run(x)]]
Simple present progressive:	a-ra-hanyūka	IMM[PROG[run(x)]]
Extended present completive:	e-kū-hanyūka	EP[IMM[COMP[run(x)]]]
Near future completive:	a-rī-hanyūka	NF[IMM[COMP[run(x)]]]
Remote future completive:	a-ka-hanyūka	RF[IMM[COMP[run(x)]]]

Notes to Chapter V:

[1]In my analysis, I interpret this as a past completive, rather than a perfect, meaning for -kū-; that is, "I just took hold", rather than, "I have just taken hold". This re-interpretation of this particular meaning of -kū- is necessary, if we want to accommodate the past meaning along with the present and future meanings.

[2]Barlow comments that -kū- "may be used as a future within the limits of the day of speaking, but also beyond it when the reference is to a stated unit of time already entered upon" (Barlow: 1960, 130).

VI. A MONTAGUE GRAMMAR OF KIKUYU

1. Intensional logic
2. The syntactic categories
3. The syntactic rules, and their translation rules
4. Examples

0. The grammar of Kikuyu presented in this chapter is closely modelled on Montague's grammar of English in PTQ, and the manner of presentation is also quite similar to Montague's. However, I have placed the description of intensional logic first, so that the syntactic rules may be given in conjunction with the corresponding translation rules.

The main points of interest in the syntax concern the treatment of verb paradigms. My approach is based upon Montague's "Rules of Tense and Sign" (Montague: 1974, 252). In these rules, Montague uses syntactic functions which replace one morphological form of a verb with another form; for example, syntactic function F_{11} (in S17) replaces the first verb in an IV expression by its "negative third person singular present". The corresponding translation rules assign a meaning to the syntactic string thus formed, based upon the meaning of the unmodified string. Many of my rules for Kikuyu are based upon this principle, which is developed here in somewhat greater detail.

The treatment of quantification in this grammar is exactly analogous to the treatment found in PTQ, with the qualification that fewer quantifiers are included (only singular noun phrases appear in this fragment). It does not follow, of course, that there are no interesting or unusual problems for quantification in this language. An independent treatment of quantification for Kikuyu, however, lies well outside the scope of this dissertation. I have adopted Montague's analysis without modification, because it appears to be adequate for the limited fragment of Kikuyu which is handled by this grammar.

1. Intensional logic

In line with Montague (1973), we let s be a fixed object distinct from e and t and not an ordered pair or triple. We then define the set of types as the smallest set Y such that (1) e, t are in Y, (2) whenever a, b are in Y, then <a,b> is in Y, and (3) whenever a is in Y, then <s,a> is in Y.

We employ denumerably many variables and constants of each type. If n is any natural number and a is in Type, then $v_{n,a}$ is understood as the n^{th} variable of type a, and Con_a is understood as the set of constants of type a.

By ME_a is understood the set of meaningful expressions of type a, which has the following recursive definition (except for clause (5), this definition is exactly the same as Montague (1975: 256-7):

(1) Every variable and constant of type a is in ME_a.

(2) If α is in ME_a and u is a variable of type b, then $\lambda u \alpha$ is in $ME_{<b,a>}$.

(3) If α is in $ME_{<a,b>}$ and β is in ME_a, then $\alpha(\beta)$ is in ME_b.

(4) If α, β are in ME_a, then $[\alpha = \beta]$ is in ME_t.

(5) If ϕ, ψ are in ME_t, and u is a variable, then $\sim\phi$, $\Box\phi$ $[\phi \wedge \psi]$, $[\phi \vee \psi]$, $[\phi \rightarrow \psi]$, $[\phi \leftrightarrow \psi]$, $[\phi \underline{\wedge} \psi]$, $\wedge u\phi$, $\forall u\phi$, INCHOϕ, COMPϕ, PERFϕ, FUTϕ, PROGϕ, MNFϕ, IMMϕ, RPϕ, NPϕ, IPϕ, EPϕ, NFϕ, RFϕ, YESTϕ, TDYϕ, TMWϕ are in ME_t.

(6) If α is in ME_a, then $[\hat{}\alpha]$ is in $ME_{<s,a>}$.

(7) If α is in $ME_{<s,a>}$, then $[\check{}\alpha]$ is in ME_a.

(8) Nothing is in any set ME_a except as required by (1)-(7).

By a meaningful expression of intensional logic is understood a member of $\bigcup_{a \in Type} ME_a$.

Let A, W, T be sets - intuitively, the set of entities, worlds, and times, respectively. $\leq$ is a linear ordering on T. An interval i is any sub-set of T such that the following condition holds: for all t_0, t_1, t_2, if t_0 and t_1 are in i and $t_0 \leq t_2 \leq t_1$, then t_2 is in i. In order to define the set of senses (of type a) in the model, we will only be concerned with intervals which are non-empty sub-sets of T. Therefore, we let the symbol I stand for the set of non-empty intervals of T; that is, $I = \{i$: for some t, $t \in i\}$. A moment t is the first moment of an interval i if and only if for all t' in i, if $t' \leq t$, then $t = t'$; a moment t is the

last moment in i if and only if for all t' in i, if $t \leq t'$, then $t = t'$. A closed interval from t_0 to t_1 (written as $[t_0,t_1]$) is an interval i such that for all t_2, t_2 is in i iff $t_0 \leq t_2 \leq t_1$. An open interval from t_0 to t_1 (written as (t_0,t_1)) is an interval i such that for all t_2, t_2 is in i iff $t_0 \leq t_2 \leq t_1$, $t_0 \neq t_2$, and $t_1 \neq t_2$. (A half-open interval from t_0 to t_1 may be defined analogously, and is written either as $[t_0,t_1)$, or $(t_0,t_1]$.) Note that, as a consequence of these definitions, for all times t in T, $[t,t]$ is a member of I, but (t,t) is not (because (t,t) is is empty). In addition, if we assume that time is discrete, then an open interval (t_0,t_1) is a member of I if and only if t_0 and t_1 are not contiguous; that is, there must be some time t_2 which is between t_0 and t_1. However, since we have assumed only a linear ordering of T, there is no requirement built into the model that time be either discrete or non-discrete.

The members of I are ordered by the relation <, which is defined as follows: for all i, i' in I, $i < i'$ if and only if for all times t in i and all t' in i', $t \leq t'$ and $t \neq t'$. The following definitions are also employed. If i and i' are members of I, then i is a sub-interval of i' iff $i \subseteq i'$; i is a proper sub-interval of i' iff $i \subset i'$; and (following a proposal in Dowty (1977)) i is an initial boundary interval for i' iff $i < i'$ and $i \cup i' \in I$. Final boundary interval is defined analogously. Finally, a sub-set S of I is an interval sequence iff $\bigcup_{i \in S} i \in I$, and for all i, i' in S and all t in T, if t is in i, then t is not in i'.

The next step in the presentation is to define the set of possible denotations of type a, for all a a type of intensional logic. At this point, the present approach diverges significantly from the theory given in PTQ. Montague defined the denotations of type a as they corresponded to three sets - A (entities), I (worlds), and J (times). The recursive definition of an interpretation was subsequently given relative to an index consisting of a world and a moment of time; and the definition of truth for formulas (relative to a model) was given relative to a context, also consisting of a world and a moment of time. In the present analysis, we begin by defining the notion of possible denotations of type a relative to five sets: (i) the set of entities, A; (ii) the set of worlds, W; (iii) the set of times, T; (iv) the set of (non-empty) intervals of time, I; and (v) the set of non-empty sub-sets of I, which for convenience we will designate J. The recursive definition of an interpretation is then given relative to an index consisting of four things: first, a world (which plays the same role as it does in Montague's theory), secondly, a moment of time (corresponding to the moment of speaking), thirdly, an interval of time (corresponding to the reference-time of an utterance), and fourthly, a set of intervals of time, which constitute episode-time. At the end of the recursive definition, truth for a formula, relative to a context, is defined in two steps. First, we define the notion $\underline{\text{true}}_d$ for a formula relative to a four-place index, consisting of a world, a moment, an interval and a set of intervals. Secondly, we define a more general notion

of true relative to a context, consisting only of a world and a moment of time (understood as the time of speaking). The reason for this second definition of truth is to ensure that truth is defined relative to an intuitively natural conception of a "context of use". That is, the standard conception of a context of use is that it includes only those features of a (conversational) situation which are automatically given by the situation itself (such as speaker and time of speaking), and which are used in determining the meaning of certain expressions of a language (such as "I" and "now"). Since neither "reference-time" nor "episode-time" is given in a context independently of what is said in that context, the notion $\underline{\text{true}}_d$ is viewed as an intermediary notion of truth, and true is defined relative to a standard context of use.

To return to the problem of defining the notion of of a possible denotation of type a, this notion is defined in the present system as follows:

$$D_{e,A,W,T,I,J} = A$$

$$D_{t,A,W,T,I,J} = \{0,1\}$$

$$D_{\langle a,b\rangle,A,W,T,I,J} = D_{b,A,W,T,I,J}^{D_{a,A,W,T,I,J}}$$

$$D_{\langle s,a\rangle,A,W,T,I,J} = D_{a,A,W,T,I,J}^{W \times I}$$

Note that if X and Y are any sets, then X^Y is the set of all functions with domain Y and values in X; and $X \times Y$ is the Cartesian product of X and Y. The truth values falsehood and truth are identified with the numbers 0 and 1, respectively. Denotations of type <s,a> are defined as functions from $W \times I$, into denotations of type a. $S_{a,A,W,T,I,J}$, or the set of senses of type a corresponding to A, W, T, I and J, is $D_{<s,a>,A,W,T,I,J}$, or $D_{a,A,W,T,I,J}^{W \times I}$. Senses are defined in this way (as functions from $W \times I$, into denotations of type a) because the extensions of "ordinary" predicates such as red or run depend only upon the world and the interval of time (in episode-time) at which these extensions are to be evaluated. The meanings of such predicate constants do not vary with the time of speaking, or with the reference-time. The latter two times affect only the interpretations of a restricted set of tense, aspect, and status operators.

An interpretation (or intensional model) is a septuple $<A,W,T,\leq,E,TMP,F>$ such that:

1) A, W and T are non-empty sets (as above), and $\leq$ is a linear ordering of T;

2) E is function with domain $W \times I$, and for all w in W and i in I, $E(<w,i>) \subset W$ (intuitively, E is a function which, for each world and interval of time, designates the set of worlds which are consistent

with reasonable expectations about what will happen at times later than i);

3) TMP = {P_M, P_R, P_N, F_R, Tdy, Ys, Tmw} and for all tmp in TMP, tmp is a function with domain T, for all t in T, tmp(t) is a member of I, and

a) for some t_0, t_1, t_2 in T, t_0 is the last moment in $P_R(t)$, t_1 is the last moment in $P_N(t)$, t_2 is the last moment in $P_M(t)$, and $\{t_0\} < \{t_1\} < \{t_2\} < \{t\}$;

b) there is no t' in T such that $[\{t'\} < P_M(t) \vee \{t'\} < P_N(t) \vee \{t'\} < P_R(t)]$;

c) there is some interval sequence S such that $\bigcup_{s \in S} s = \{T\}$ and some s in S such that t is a member of S, and $F_R(t)$ is a final boundary interval for s;

d) there is no t'' in T such that $F_R(t) < \{t''\}$;

e) for some interval sequence S_0 such that $\bigcup_{s \in S} s = \{T\}$, Tdy(t), Ys(t), Tmw(t) are members of S_0, t is a member of Tdy(t), Ys(t) is an initial boundary interval for Tdy(t) and Tmw(t) is a final boundary interval for Tdy(t);

4) F is a function whose domain is the set of all constants, and whenever a ε Type and $\alpha \varepsilon Con_a$, then $F(\alpha) \varepsilon S_{a,A,W,T,I,J}$.

Suppose that A is an interpretation having the form $\langle A,W,T,\leq,E,TMP,F\rangle$, and g is an A-assignment of values to variables;

that is, $g(u) \in D_{a,A,W,T,I,\mathcal{J}}$ whenever u is a variable of type a. If α is a meaningful expression, then $\alpha^{A,g}$ stands for the intension of α with respect to A and g; and if $\langle w,t,i,J\rangle \in W \times T \times I \times \mathcal{J}$, then $\alpha^{A,w,t,i,J,g}$ is the extension of α with respect to A and g. The intension $\alpha^{A,g}$ of α relative to A and g is that function h with domain $W \times T \times I \times \mathcal{J}$ such that whenever $\langle w,t,i,J\rangle \in W \times T \times I \times \mathcal{J}$, then $h(\langle w,t,i,J\rangle) = \alpha^{A,w,t,i,J,g}$. The extension of $\alpha^{A,w,t,i,J,g}$ of α with respect to A and g (or equivalently, $\alpha^{A,g}(\langle w,t,i,J\rangle)$) is that function h with domain I such that for all i_0 in I, $\alpha^{A,w,t,i,J,g}(i_0) \in D_{a,A,W,T,I,\mathcal{J}}$. These notions are introduced by the recursive definition given below. For convenience in defining the extensions of formulas with various operators, we let the symbol H stand for the set of functions from (non-empty) intervals into the values {0,1}; that is, $H = \{0,1\}^I$.

(1) If α is a constant, then for all t in T, i in I, and J in $\mathcal{J}$ $\alpha^{A,w,t,i,J,g}$ is that function h with domain I such that for all i_0 in I, $h(i_0) = F(\alpha)(\langle w,i_0\rangle)$.

(2) If α is a variable, then $\alpha^{A,w,t,i,J,g}$ is $g(\alpha)$.

(3) If α is a member of ME_a and u is a variable of type b, then $[\lambda u \alpha]^{A,w,t,i,J,g}$ is that function h with domain $D_{a,A,T,I,\mathcal{J}}$ such that whenever x is in that domain, h(x) is $\alpha^{A,w,t,i,J,g'}$, where g' is the A-assignment like g except for the possible difference that g'(u) is x.

(4) If α is a member of $ME_{<a,b>}$, and β is a member of ME_a, then $[\alpha(\beta)]^{A,w,t,i,J,g}$ is that function h with domain I such that for all i_0 in I, $h(i_0) = \alpha^{A,w,t,i,J,g}(i_0)(\beta^{A,w,t,i,J,g}(i_0))$.

(5) If α, β are members of ME_a, then $[\alpha = \beta]^{A,w,t,i,J,g}$ is that function h in the set H such that for all i_0 in I, $h(i_0) = 1$ if and only if $\alpha^{A,w,t,i,J,g}(i_0)$ is $\beta^{A,w,t,i,J,g}$, otherwise $h(i_0)=0$.

(6) If ϕ is a member of ME_t, then

(a) $[\sim\phi]^{A,w,t,i,J,g}$ is a function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $\phi^{A,w,t,i,J,g}(i_0) = 0$, - otherwise, $h(i_0) = 0$; and similarly for $\wedge$, $\vee$, $\rightarrow$, $\leftrightarrow$;

(b) $[\Box\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if for all w', t', i', J', $\phi^{A,w',t',i',J',g} = 1$, and otherwise $h(i_0) = 0$;

(c) $[\phi \underline{\wedge} \psi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if (i) for all intervals j in I, if $\phi^{A,w,t,i,J,g}(j) = 1$, then there is some $j' \leq j$ such that $\psi^{A,w,t,i,J,g}(j') = 1$, and (ii) if $[\phi \rightarrow \psi]$, then $[\phi = \psi]$ - otherwise, $h(i_0) = 0$.

(7) If ϕ is a member of ME_t and u is a variable of type a, then $[\forall u\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if there exists an x in $D_{a,A,W,T,I,J}$ such that $\phi^{A,w,t,i,J,g'}(i_0) = 1$, where g' is as in (3) - otherwise $h(i_0) = 0$; and similarly for $[\exists u\phi]$.

(8) If ϕ is a member of ME_t, then

(a) $[\text{INCHO}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $\phi^{A,w,t,i,J,g}(i_0) = 1$ and for some i_1, i_1 is an initial boundary interval for i_o, there is no t such that $i_1 = \{t\}$, and $\phi^{A,w,t,i,J,g}(i_1) = 0$ - otherwise, $h(i_0) = 0$;

(b) $[\text{PERF}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if for some j in J, $j < i$, and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(c) $[\text{COMP}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $J = \{i\}$ and $\phi^{A,w,t,i,J,g}(i) = 1$ - otherwise, $h(i_0) = 0$;

(d) $[\text{FUT}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if for all w' in $E(\langle w,i\rangle)$ there is some j in J such that $i < j$ and $\phi^{A,w,t,i,J,g}(j) = 1$ - otherwise, $h(i_0) = 0$;

(e) $[\text{PROG}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if J is an interval sequence, there is more than one member of J, $i \subseteq \bigcup_{j \in J} j$, and for all j in J, there is some ψ such that $[\phi \wedge \psi]^{A,w,t,i,J,g}(i_0) = 1$, and there is some $J' \subset I$ such that $[\text{COMP}\psi \vee \text{FUT}\psi]^{A,w,t,j,J',g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(f) $[\text{MNF}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if for some j in J, $j \subseteq P_M(t)$ and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(g) $[\text{IMM}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if there is no j in J such that $j \subseteq P_M(t)$, and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(h) $[\text{IP}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq P_M(t)$, $i \not\subseteq P_N(t)$, and $\phi^{A,w,t,i,J,g}(i_0) = 0$ - otherwise, $h(i_0) = 0$;

(i) $[\text{NP}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq P_N(t)$, $i \not\subseteq P_R(t)$, and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(j) $[\text{RP}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq P_R(t)$ and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(k) $[\text{EP}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if there is some interval sequence S such that $\bigcup_{s \in S} s = \{T\}$, for some s in S, t is a member of s, $i \subseteq s$, and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(l) $[\text{NF}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $\{t\} < i$, i is not a final boundary interval for {t}, and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(m) $[\text{RF}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq F_R(t)$ and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(n) $[\text{TDY}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq \text{Tdy}(t)$ and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(o) $[\text{YEST}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq \text{Ys}(t)$ and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$;

(p) $[\text{TMW}\phi]^{A,w,t,i,J,g}$ is that function h in H such that for all i_0 in I, $h(i_0) = 1$ if and only if $i \subseteq \text{Tmw}(t)$ and $\phi^{A,w,t,i,J,g}(i_0) = 1$ - otherwise, $h(i_0) = 0$.

(9) If α is a member of ME_a, then $[\hat{}\alpha]^{A,w,t,i,J,g}$ is that h with domain $W \times I$ such that whenever $\langle w,i\rangle \in W \times I$, $h(\langle w,i\rangle) = \alpha^{A,w,t,i,J,g}$.

(10) If α is a member of $ME_{\langle s,a\rangle}$, then $[\check{}\alpha]^{A,w,t,i,J,g}$ is that function h with domain I such that for all i_0 in I, $h(i_0) = \alpha^{A,w,t,i,J,g}(\langle w,i_0\rangle)$.

If ϕ is a formula (that is, member of ME_t), then

(a) ϕ is $\underline{\text{true}}_d$ with respect to A, w, t, i, and J if and only if $\phi^{A,w,t,i,J,g}(j) = 1$ for all j in J and all A-assignments g;

(b) ϕ is $\underline{\text{true}}$ with respect to A, w, t if and only if for some i and some J, ϕ is true_d with respect to A, w, t, i and J. Unless otherwise specified, i = {t}.

Definition (a) calls for further comment. If a formula ϕ contains no aspect operator, then this definition says that ϕ is true_d relative to A, w, t, i and J just in case the extension of ϕ is 1 whenever ϕ is evaluated relative to one of the members of J. What this means for the grammar of Kikuyu is that a Kikuyu sentence with an uninflected verb form is true just in case there is a set of times at each of which the sentence is true. This is the semantic analysis of such sentences which was proposed in Chapter II. If, on the other hand, ϕ contains one of the operators PERF, COMP, FUT or PROG, it will turn that either, for all intervals i in I, the extension of ϕ is 1, $\underline{\text{or}}$ for all intervals i, the extension of ϕ is 0. The reason is that once an aspect operator is introduced, the denotation of a formula for an interval i_0 no longer depends upon the particular interval at which it is evaluated, but rather on the reference-time i of the index, and some member(s) of J. Thus, for example, $\underline{\text{COMP}\phi}$ is true_d relative to A, w, t, i, and J (in a model) if and only if there is just one interval in J, which is equal to the reference-time i, and

the sentence ϕ is true for <u>that</u> particular interval.

The following symbolizations, which are viewed as exactly equivalent in PTQ, will be treated in the discussion that follows as equivalent:

$\gamma(\beta)(\alpha)$	$\equiv$	$\gamma(\alpha,\beta)$
$[\check{\gamma}](\alpha)$	$\equiv$	$\gamma\{\alpha\}$
$[\check{\gamma}](\beta,\alpha)$	$\equiv$	$\gamma\{\beta,\alpha\}$
$\lambda u\phi$	$\equiv$	$\hat{u}\phi$
$[\hat{}\lambda u\phi]$	$\equiv$	$\hat{u}\phi$
$\lambda P[P\{\hat{}\alpha\}]$	$\equiv$	α^*

In addition, the following symbols will be used for variables of the types indicated:

Symbol	Type	
x, y, x_0, ...	<s,e>	individual concept
P, Q	<s<<s,e>t>>	property of an indiv. concept
$\mathcal{P}$	<s<<s<<s,e>t>>t>>	property of properties of an individual concept
p	<s,t>	proposition
u, v, u_0, ...	<e>	individual
M	<s<e,t>>	property of an individual
S	<s<e<e,t>>>	two-place relation-in-intension between individuals

2. The syntactic categories

Following Montague (1973), we let e and t be two fixed objects that are distinct and neither ordered pairs nor ordered triples. Then Cat, or the set of categories of Kikuyu is to be the smallest set X such that (1) e and t are in X, and (2) whenever A and B are in X, then A/B and A//B are also in the set.

The categories of Kikuyu are not sets of expressions, but serve rather as indices of such sets. The categories e and t are regarded as the categories of entity and truth value expressions, respectively. The categories A/B and A//B play the same semantic role, but different syntactic roles. An expression of either category is such that when it is combined with an expression of category B, an expression of category A is produced.

By B_A is understood the set of basic expressions of the category A. A basic expression of the present fragment is any member of $\bigcup_{A \in Cat} B_A$. By P_A is understood the set of phrases of the category A. This set is characterized (in a sense to be made precise) by the syntactic rules S1-S12, given in the next section of the chapter. I will first discuss the individual syntactic categories which are used in this fragment of Kikuyu. These are listed (with the basic members of each category) in Table 7 on the following page.

TABLE 7: Syntactic Categories of Kikuyu

Category	Basic members	Translation type
A. Nouns		
CN (t/e)	{mwana$_{<1>}$, mũndũ$_{<1>}$, mũtumia$_{<1>}$, (child) (person) (woman)	<<s,e>t>
	mũkanda$_{<3>}$, mũrigo$_{<3>}$, ihuti$_{<5>}$, (rope) (load) (leaf)	
	nyũmba$_{<9>}$} (house)	
T (t/IV)	{Nairobi$_{<15>}$, yo$_{0,<0>}$, yo$_{1,<0>}$..}	<<s,f(IV)>t>
B. Verbs		
IV (t//e)	{hanyũka$_{<0,0>}$, erera$_{<0,0>}$, (run) (float)	<<s,e>t>
	rũgama$_{<0,0>}$, noga$_{<0,0>}$} (stand up) (get tired)	
TV (IV/T)	{aka$_{<0,0>}$, kinya$_{<0,0>}$, nyita$_{<0,0>}$, (build) (reach) (hold)	<<s,f(T)>f(IV)>
	kuua$_{<0,0>}$, gucia$_{<0,0>}$, caria$_{<0,0>}$} (carry away) (pull) (seek)	
EMB (IV//IV)	{tiga$_{<0,0>}$ (stop)}	<<s,f(IV)>f(IV)>
C. Adverbs		
IAV (IV/IV)	{kiumia kĩmwe, ithaa rĩmwe} (one week) (one hour)	<<s,f(IV)>f(IV)>
t/t	{ũmũthi, ira, rũciũ} (today) (yesterday) (tomorrow)	<<s,t>t>

Common nouns of Kikuyu are entered in their singular forms in the category CN, and sub-scripted with an index number corresponding to the concordial class of the noun. This index is referred to by the syntactic function (F_{13}) which puts a member of P_{IV} together with a term phrase to form a sentence, and effects grammatical concord between subject and verb (see S10). The numbers used are the standard indices for the Bantu noun classes in comparative reconstruction.

Syntactic function F_0 (in S1(b)) converts members of the category CN into term phrases, without effecting any change in the form of a noun. Thus, every member of B_{CN} is homophonous with a member of P_T. Inclusion of this syntactic function is motivated by consideration of how nouns and noun phrases would have to be analyzed in a natural extension of this grammar to a larger fragment of Kikuyu. For example, a larger fragment might include various demonstratives and/or numerals, which combine with nouns to form term phrases in the same way that "the", "every" and "a" combine with nouns in English. To provide a correct semantic analysis in these cases, it would be necessary for nouns to be entered in the category CN. Similarly, if adjectives and/or relative clauses were to be added, a correct semantic analysis would require that nouns be in the category CN. The rules for forming adjective and relative clauses would then work analogously to the ones which have been proposed for English.

In the category T (or "term phrases"), the class nine demonstrative yo "that one" fills the same role as the sub-scripted pronouns he_0, he_1, etc. in PTQ. Here (and elsewhere) the class nine form is viewed as the "unmarked" member of the Bantu concord system, and is assigned the index <0>. The reason for treating one set of Bantu concords as unmarked semantically (even though there is no formally unmarked set) was discussed in Chapter I. In brief, the reason is that it must be possible to allow a level of syntactic representation for verb phrases which is prior to the stage at which subject nouns are introduced, and subject concord is determined. I have chosen to allow for such intermediary syntactic representations by treating one set of concords as if these concords could be grammatically ungoverned in some cases. Thus, when these concords appear in their ungoverned role, they have the sub-script <0>, although when governed by a class nine noun, the sub-script <9> is used. I have chosen class nine concords as the unmarked ones, because loan-words are frequently assigned the concords of this class (but not necessarily the prefix) in all of the Bantu languages which I am familiar with. However, as I indicated in Chapter I, I am not claiming that this is more than a convenient way of handling concord in the present grammar.

The categories IV and TV in this grammar are semantically like the same categories in PTQ. They differ, however, in that each member of B_{IV} and B_{TV} is sub-scripted with the index <0,0>. The first member of this index is a number representing the

inflectional category of the particular form of the verb. For example, "0" stands for the category "verb stem"; "1" for "infinitive form"; "2" for the "uninflected form"; "3" for the "imminent perfect" form; and so on. The second member of the index represents the concord class of the subject marker (with "0" indicating a form which is not governed by a subject noun). The members of B_{IV} and B_{TV} (as well as B_{EMB}) serve as input to a set of (non-recursive) paradigmatic formation rules, which generate the inflectional paradigm for each verb of Kikuyu. The paradigm includes all of the verb forms which are marked for the various tense and aspect categories, as well as for subject concord. The paradigmatic formation rules are morphological rather than syntactic, and differ from the latter type of rule in four important respects. These are:

1) the formation rules take as input members of the morphological category "verb", rather than members of a syntactic category;

2) the formation rules assign to the input structure a modified morphophonemic structure (modified, for example, by adding a prefix or infix, altering tone, and/or effecting morphologically conditioned phonological changes);

3) the rules assign to their output a modified index, indicating the inflectional and concordial class of the output form (these indices are here represented with numerals, because these are less cumbersome than the traditional category names);

4) the formation rules do not correspond to any semantic translation rules, which assign a meaning to the output of the rule,

based upon its input.

The last point constitutes the most important difference between paradigmatic formation rules and the rules of syntax. The formation rules serve to attach various markers of tense and aspect to verb stems; but the meanings of the combinations thus formed do not depend upon the verb stem alone, but upon the whole verb phrase in which that verb form occurs, as well as the place in an analysis tree at which the form is introduced into a syntactic string. In other words, the formation rules create morphological units of the language, rather than semantic or syntactic units. These morphological units are introduced into syntactic units by various "replacement functions", which replace one form of a verb in a verb phrase with a different form of the same verb. The translation rules which correspond to these syntactic rules assign a meaning to the output structure, based upon the translation of the input structure. The syntactic rules which operate in this manner are S2, S3, S4, S11 and S12. The reader should note in regard to these rules that, because of the way the translation rules work, the replacement functions which are permissible in the language are just those which make semantically appropriate substitutions.

I will not attempt to describe the details of the paradigmatic formation rules needed for the present grammar. The reason is that the issues connected with these rules are phonological, rather than semantic. Moreover, these issues involve features such as tone, which are not even represented

in the orthography which I am using to transcribe Kikuyu. Those aspects of the formation rules which are represented by this orthography - such as the addition of infixes and prefixes - are obvious, and do not warrant a detailed description here. In Table 8, a complete list of the output of the paradigmatic formation rules for the verb hanyūka is given. The important information in this table is the list of index numbers which will be used in the syntactic rules to refer to different members of the verbal paradigm.

The replacement functions which appear in the syntactic rules of Kikuyu determine a mapping of forms within the verbal paradigm. This mapping is illustrated as Figure 5, on the page which follows the presentation of Table 8. Note that the functions F_2 to F_6 map the uninflected form of the verb onto the six members of the imminent action sub-paradigm, while the syntactic functions F_7 to F_9 map the uninflected form onto the three unmarked ("zero" tense) members of the manifest action sub-paradigm; functions F_{15} to F_{17} involve a secondary mapping in the manifest paradigm, in which each unmarked aspect form is mapped onto the corresponding past tense forms.

The syntactic functions (in S3 and S4) which introduce verb forms marked for particular aspect categories operate in a manner analogous to the predicate-modifier rule: that is, they take as input an expression of the category P_{IV}, and give as output a new member of the same category. This syntactic treatment is motivated by the fact that a progressive aspect

TABLE 8: Output of the paradigmatic formation rules for hanyūka "run"

	Unmarked concord	Class 1 etc.
Root	hanyūka$_{<0,0>}$	----
Infinitive	kūhanyūka$_{<1,0>}$	----
Uninflected form	īhanyūka$_{<2,0>}$	ahanyūka$_{<2,1>}$
Imminent action:		
Present perfect	yahanyūka$_{<3,0>}$	aahanyūka$_{<3,1>}$
Present progressive	īrahanyūka$_{<4,0>}$	arahanyūka$_{<4,1>}$
Extended present completive	īkūhanyūka$_{<5,0>}$	ekūhanyūka$_{<5,1>}$
Near future completive	īrīhanyūka$_{<6,0>}$	arīhanyūka$_{<6,1>}$
Remote future completive	īkahanyūka$_{<7,0>}$	akahanyūka$_{<7,1>}$
Manifest action:		
Progressive	īhanyūkaga$_{<8,0>}$	ahanyūkaga$_{<8,1>}$
Immediate past	īkūhanyūkaga$_{<9,0>}$	ekūhanyūkaga$_{<9,1>}$
Near past	īrahanyūkaga$_{<10,0>}$	arahanyūkaga$_{<10,1>}$
Remote past	yahanyūkaga$_{<11,0>}$	aahanyūkaga$_{<11,1>}$
Completive	īhanyūkire$_{<12,0>}$	ahanyūkire$_{<12,1>}$
Near past	īrahanyūkire$_{<13,0>}$	arahanyūkire$_{<13,1>}$
Remote past	yahanyūkire$_{<14,0>}$	aahanyūkire$_{<14,1>}$
Perfect	īhanyūkīte$_{<15,0>}$	ahanyūkīte$_{<15,1>}$
Immediate past	īkūhanyūkīte$_{<16,0>}$	ekūhanyūkīte$_{<16,1>}$
Near past	īrahanyūkīte$_{<17,0>}$	arahanyūkīte$_{<17,1>}$
Remote past	yahanyūkīte$_{<18,0>}$	aahanyūkīte$_{<18,1>}$

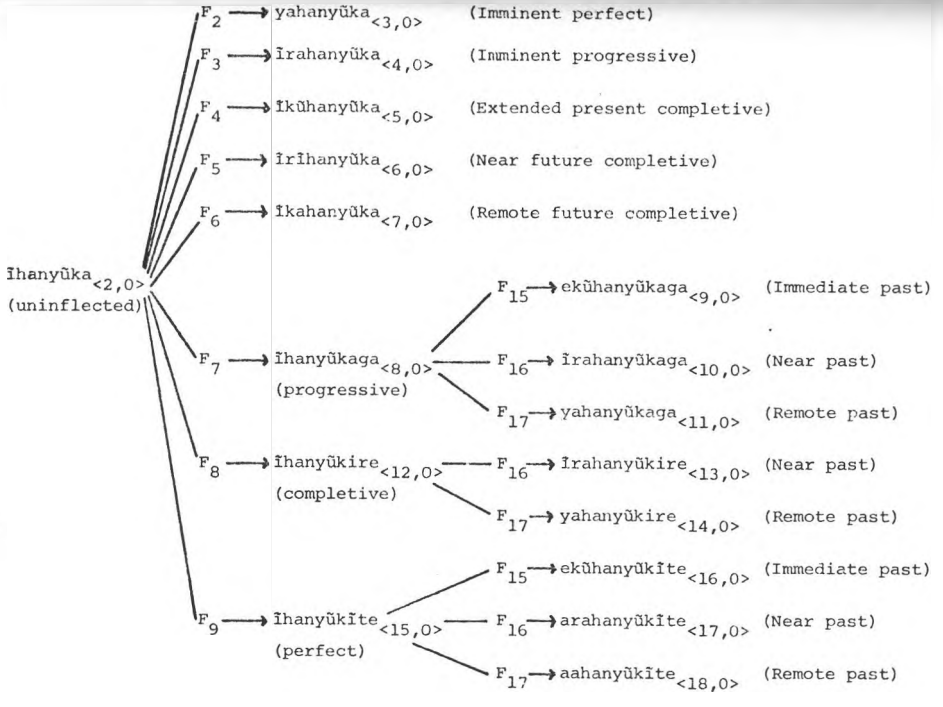


Figure 5: The syntactic mapping of forms in the tense and aspect paradigm

marker can never have wide scope over a subject quantifier. Thus, for example, sentence (1) below is correctly interpreted in the grammar as, "There was someone who was dieing", but not with the unacceptable reading, "Repeatedly, someone died".

1) mũndũ nĩ a-a-ku-ag-a
person he-RP-die-MProg

"someone was dieing" (i.e. "someone was about to die")

In contrast to this, the functions which introduce verb forms with past tense markers operate analogously to the sentence modifier rule: they take expressions of the category t into new expressions of the same category. This treatment is motivated semantically by the fact that perfect aspect must not have wide scope over a time adverb. That is, sentence (2) below (like its English counter-part) is unacceptable, even though there is one reading which might have been assigned by the syntactic rules which is not contradictory.

2) *mũndũ nĩ a-kiny-ĩt-e Nairobi ira
person he-reach-MPerf yesterday

*"someone has reached Nairobi yesterday"

By treating the aspect marker like a predicate modifier and the tense marker like a sentence modifier, we ensure that the only reading generated for (2) is the one which is contradictory (because the reference-time is said to be within yesterday and to be the same as the time of speaking).

The category EMB is the category of embedding verbs which must be followed by a verb in an infinitive form. The

members of P_{EMB} are introduced in the grammar by S6, which puts a member of P_{EMB} together with an IV-expression; this rule is only applicable if the verb in the IV-expression has the index <0,0>. This verb form is then changed to the corresponding form indexed <1,0>.

In the category of predicate modifiers, IAV, I have included two temporal extent adverbs, kiumia kĩmwe "for one week" and ithaa rĩmwe "for an hour". The translations of these adverbs contain the uninterpreted predicate constants one-week and one-hour, respectively. The intended interpretation of these operators is the intuitively obvious one (as discussed in Chapter I). However, in order to limit the complexity of the grammar, I have chosen not to analyze the syntax and semantics for extent adverbs in any greater detail. The main purpose in including them at all is to demonstrate how the syntactic rules handle a scope ambiguity involving an extent adverb and an aspect category.

In the category t/t, I have included the time adverbs ira "yesterday", ũmũthi "today" and rũciũ "tomorrow". These time adverbs are treated as sentence modifiers; thus, like the past tense markers, they always have wide scope over a perfect aspect marker.

The verb in an expression is defined as the first member of the category B_{IV}, B_{TV}, or B_{EMB} in a string.

The presentation turns now to the twelve syntactic rules of the grammar, and the corresponding translation rules.

3. The syntactic rules, and their translation rules

We now introduce a mapping f from the categories of Kikuyu to the types of intensional logic. f is a function with Cat as its domain and such that

$f(e) = e$,

$f(t) = t$,

$f(A/B) = f(A//B) = \langle\langle s, f(B)\rangle, f(A)\rangle$ whenever $A,B \in Cat$.

Kikuyu expressions of any category A translate into expressions of type f(A).

In what follows, we let g be a fixed biunique function such that (1) the domain of g is the set of basic expressions of the fragment of Kikuyu other than the members of B_T, B_{IAV} and $B_{t/t}$, and whenever $A \in Cat$, $\alpha \in B_A$ and α is in the domain of g, $g(\alpha) \in Con_{f(A)}$.

The syntactic rules of Kikuyu are, then, as follows:

Basic rules

S1 a) $B_A \subseteq P_A$ for every category A.

b) If δ is a member of P_{CN}, then $F_0(\delta)$ is a member of P_T, where $F_0(\delta) = \delta$.

T1 a) If α is in the domain of g, then α translates into $g(\alpha)$.

b) If δ is a member of P_{CN} and δ translates δ', then $F_0(\delta)$ translates into $\lambda P \forall x[\delta'(x) \wedge P\{x\}]$.

c) Nairobi$_{<15>}$ translates into $\lambda P[P\{n\}]$

d) yo$_{n<0>}$ translates into $\lambda P[P\{x_n\}]$

e) kiumia kĩmwe translates into $\lambda P \lambda x[\text{one-week}[P\{x\}]]$

ithaa rĩmwe " " $\lambda P \lambda x[\text{one-hour}[P\{x\}]]$

f) ũmũthi translates into $\lambda p[TDY[\check{}p]]$

ira " " $\lambda p[YEST[\check{}p]]$

rũciũ " " $\lambda p[TMW[\check{}p]]$

S2 If $\delta \in P_{IV}$ and the verb in δ has the index <0,0>, then $F_1(\delta) \in P_{IV}$, where $F_1(\delta) = \delta'$ and δ' comes from δ by replacing the verb in δ with the corresponding form indexed <2,0>.

T2 If $\delta \in P_{IV}$ and δ translates into δ', then $F_1(\delta)$ translates into $\lambda x[\delta'(x)]$.

S3 If $\delta \in P_{IV}$ and the verb in δ has the index <2,0>, then $F_2(\delta)$, ... $F_6(\delta) \in P_{IV}$, where

a) $F_2(\delta) = \delta'$ and δ' comes from δ by replacing the verb in δ with the corresponding form indexed <3,0>;

b) $F_3(\delta) = \delta''$ and δ'' comes from δ by replacing the verb in δ with the corresponding form indexed <4,0>;

c) $F_4(\delta) = \delta'''$ and δ''' comes from δ by replacing the verb in δ with the corresponding form indexed <5,0>;

d) $F_5(\delta) = \delta^*$ and δ^* comes from δ by replacing the verb in δ

with the corresponding form indexed <6,0>;

e) $F_6(\delta) = \delta^{**}$ and δ^{**} comes from δ by replacing the verb in δ with the corresponding form indexed <7,0>.

The syntactic functions F_2 to F_6 introduce the imminent action forms of a verb.

T3 If $\delta \in P_{IV}$ and δ translates into δ', then

a) $F_2(\delta)$ translates into $\lambda x[IMM[PERF[\delta'(x)]]]$

b) $F_3(\delta)$ " " $\lambda x[IMM[PROG[\delta'(x)]]]$

c) $F_4(\delta)$ " " $\lambda x[EP[IMM[COMP[\delta'(x)]]]]$

d) $F_5(\delta)$ " " $\lambda x[NF[IMM[COMP[\delta'(x)]]]]$

e) $F_6(\delta)$ " " $\lambda x[RF[IMM[COMP[\delta'(x)]]]]$

S4 If $\delta \in P_{IV}$ and the verb in δ has the index <2,0>, then $F_7(\delta)$, $F_8(\delta)$, $F_9(\delta) \in P_{IV}$, where

a) $F_7(\delta) = \delta'$ and δ' comes from δ by replacing the verb in δ with the corresponding form indexed <8,0>;

b) $F_8(\delta) = \delta''$ and δ'' comes from δ by replacing the verb in δ with the corresponding form indexed <12,0>;

c) $F_9(\delta) = \delta'''$ and δ''' comes from δ by replacing the verb in δ with the corresponding form indexed <15,0>.

T4 If $\delta \in P_{IV}$ and δ translates into δ', then

a) $F_7(\delta)$ translates into $\lambda x MNF[PROG[\delta'(x)]]$

b) $F_8(\delta)$ " " $\lambda x MNF[COMP[\delta'(x)]]$

c) $F_9(\delta)$ " " $\lambda x MNF[PERF[\delta'(x)]]$

Rules of functional application

S5 If $\delta \in P_{TV}$ and $\beta \in P_T$, then $F_{10}(\delta,\beta) \in P_{IV}$, where

$F_{10}(\delta,\beta) = \delta\ \beta$.

T5 If $\delta \in P_{TV}$, $\beta \in P_T$ and δ,β translate into δ',β' respectively,

$F_{10}(\delta,\beta)$ translates into $\delta'(\hat{}\beta')$.

S6 If $\delta \in P_{EMB}$, $\beta \in P_{IV}$ and the verb in β has the index <0,0>,

then $F_{11}(\delta,\beta) \in P_{IV}$, where $F_{11}(\delta,\beta) = \delta\ \beta'$ and β' comes from β

by replacing the verb in β with the corresponding form

indexed <1,0>.

T6 If $\delta \in P_{EMB}$, $\beta \in P_{IV}$, and δ,β translate into δ',β' respectively,

then $F_{11}(\delta,\beta)$ translates into $\delta'(\hat{}\beta')$.

S7 If $\delta \in P_{IAV}$ and $\beta \in P_{IV}$, then $F_{12}(\delta,\beta) \in P_{IV}$, where

$F_{12}(\delta,\beta) = \beta\ \delta$.

T7 If $\delta \in P_{IAV}$ and $\beta \in P_{IV}$, and δ,β translate into δ',β' respectively, then $F_{12}(\delta,\beta)$ translates into $\delta'(\hat{}\beta')$.

S8 If $\delta \in P_{t/t}$ and $\phi \in P_t$, then $F_{12}(\delta,\phi) \in P_t$.

T8 If $\delta \in P_{t/t}$, $\phi \in P_t$ and δ,ϕ translate into δ',ϕ' respectively, then $F_{12}(\delta,\phi)$ translates into $\delta'(\hat{}\phi')$.

S9 If $\alpha \in P_T$ and $\beta \in P_{IV}$, then $F_{13}(\alpha,\beta) \in P_t$ where $F_{13}(\alpha,\beta) = \alpha$ nī β', and β' comes from β by replacing the verb in β with the corresponding form whose second index number is the same as the index on the first word in α.

T9 If $\alpha \in P_T$, $\beta \in P_{IV}$, and α,β translate into α',β' respectively, then $F_{13}(\alpha,\beta)$ translates into $\alpha'(\hat{}\beta')$.

Note that the subject-predicate rule S9 inserts the particle nī between the subject and the verb of every sentence, thus ensuring that every sentence in the grammar is a well-formed assertion of Kikuyu. See Chapter I for some discussion of the function of nī.

Quantification

S10 If $\alpha \in P_T$ and $\phi \in P_t$, then $F_{14,n}(\alpha,\phi) \in P_t$, where $F_{14,n}(\alpha,\phi) = \phi'$ and ϕ' comes from ϕ by replacing each occurrence of $\underline{yo}_{n,<0>}$ in ϕ by α, and if α precedes the verb, changing the form of the verb to the corresponding form whose second index number is the same as the index of the first word in α.

Note that S10, like S9, effects grammatical concord between subject and verb (when the term phrase α happens to function as the subject in ϕ). This concord rule is relatively easy to formulate in the present very restricted fragment; there would be many problems, of course, in stating all of the concord rules for Kikuyu, if a larger fragment had been used, since there are a great many items of different syntactic classes which must concord in this language.

T10 If $\alpha \in P_T$, $\phi \in P_t$, and α,ϕ translate into α',ϕ' respectively, then $F_{14,n}(\alpha,\phi)$ translates into $\alpha'(\hat{x}_n\phi')$.

Rules for past tenses

S11 If $\phi \in P_t$ and the verb in ϕ is indexed <8,n> or <15,n> for some n, then $F_{15}(\phi) \in P_t$ where $F_{15}(\phi) = \phi'$ and ϕ' comes from ϕ by replacing the verb with the corresponding form indexed <9,n> or <16,n>, respectively.

T11 If $\phi \in P_t$ and ϕ translates into ϕ', then $F_{15}(\phi)$ translates into $IP\phi'$.

S12 If $\phi \in P_t$ and the verb in ϕ is indexed <8,n>, <12,n>, or <15,n>, for some n, then $F_{16}(\phi)$, $F_{17}(\phi) \in P_t$, where

a) $F_{16}(\phi) = \phi'$, and ϕ' comes from ϕ by replacing the verb with the corresponding form indexed <10,n>, <13,n>, or <17,n>, respectively;

b) $F_{17}(\phi) = \phi''$ and ϕ'' comes from ϕ by replacing the verb in ϕ with the corresponding form indexed <11,n>, <14,n>, or <18,n>, respectively.

T12 If $\phi \in P_t$ and ϕ translates into ϕ', then

a) $F_{16}(\phi)$ translates into $NP\phi'$.

b) $F_{17}(\phi)$ translates into $RP\varphi'$.

The syntactic rules S1-S12 may be regarded as constituting a simultaneous inductive definition of the sets P_A for any category A. The reader is referred to Montague (1974: 253) for an account of how this definition may be explicitly given.

Given T1-T12, the translation relation may be defined as the smallest binary relation satisfying them; that is, an expression ϕ is characterized as translating into an expression ϕ' if the pair $\langle\phi,\phi'\rangle$ is a member of every binary relation R such

that T1-T12 hold (with the condition that one expression translates into another replaced by the condition that the relation R holds between the two expressions).

The possible interpretations of intensional logic (into which Kikuyu sentences are to be translated) are to be restricted by the following meaning postulates:

(1) $\forall u \Box[u = n]$

(2) $\Box[\delta(x) \rightarrow \forall u[x = \hat{}u]]$, where δ translates any member of B_{CN}

(3) $\forall M \Lambda x \Box[\delta(x) \leftrightarrow M\{\check{}x\}]$, where δ translates any member of B_{IV}

(4) $\forall S \Lambda x \Lambda \mathcal{P} \Box[\delta(x,\mathcal{P}) \leftrightarrow \mathcal{P}\{\hat{}S\{\check{}x,\check{}y\}\}]$, where δ translates any member of B_{TV} other than caria ("seek")

(5) $\Lambda \mathcal{P} \forall M \Lambda x \Box[\delta(x,\mathcal{P}) \leftrightarrow M\{\check{}x\}]$, where δ translates caria ("seek")

(6) $\forall M \Lambda x \Box[\delta(x) \leftrightarrow \text{INCHO}[M\{\check{}x\}]]$, where δ translates noga ("get tired") or rũgama ("stand up")

(7) $\forall S \Lambda x \Lambda \mathcal{P} \Box[\delta(x,\mathcal{P}) \leftrightarrow \mathcal{P}\{\hat{}\text{INCHO}[S\{\check{}x,\check{}y\}]\}]$, where δ translates kuua ("carry away"), gucia ("pull") or nyita ("hold")

(8) $\Lambda x \Lambda P \Box[\text{tiga}'(x,P) \leftrightarrow \text{INCHO}[\check{}\text{PROG}[P\{x\}]]]$

Postulates (1)-(5) are parallel to postulates found in Montague (1974: 263). (1) guarantees that the individual constant n (which appears in the translation of Nairobi) is a rigid designator. (2) guarantees that all of the common nouns included in this fragment denote sets of constant individual concepts, while

(3) imposes the requirement of extensionality on all intransitive verbs. I have included among the transitive verbs of this fragment the intensional verb caria "seek"; hence, this one verb is excluded from postulate (4), which guarantees extensionality for all other transitive verbs of the fragment. (5) expresses the condition that "seek" is extensional with respect to subject position.

Postulates (7), (8), and (9) are unique to the present analysis. (7) and (8) give the "decomposition" of inchoative verbs (intransitive and transitive verbs, respectively). (9) gives the definition of the verb tiga "stop" in terms of the progressive operator; that is, (9) says that the Kikuyu sentence meaning, "he stopped V-ing" (where V is a verb embedded under tiga) is exactly equivalent to the sentence, "it came about that he was not V-ing".

In addition to the above postulates, the logically possible interpretations of intensional logic which may function as translations of sentences of Kikuyu are to be constrained by the following two conditions:

Condition A: If δ translates an activity verb phrase of Kikuyu (type $\langle\langle s,e\rangle t\rangle$), then for all $\langle w,t,i,J\rangle$, and all j in J, if $\delta(x)^{\mathcal{A},w,t,i,J,g}(j) = 1$, then there is no t in T such that $j = \{t\}$.

Condition B: If δ translates an accomplishment verb phrase of Kikuyu, then for all $\langle w,t,i,J\rangle$ and all j in J, if $\delta(x)^{\mathcal{A},w,t,i,J,g}(j) = 1$, then there is no $j' \subset j$ such that $\delta(x)^{\mathcal{A},w,t,i,J,g}(j') = 1$.

For present purposes, we define a logically possible interpretation as an interpretation in which formulas (1)-(8) are true (with respect to all worlds and moments of time), and in which Conditions A and B hold.

In what follows, if $\delta \in ME_{f(IV)}$, then δ_* is to be understood as the expression: $\lambda u \delta[\hat{}u]$. In addition, if $\delta \in ME_{f(TV)}$, then δ_* is to be: $\lambda v \lambda u \delta([\hat{}u],[\hat{}v^*])$. It was pointed out in Montague (1973), that as a consequence of postulates (2), (3) and (4) above, the following formulas are logically true:

$\Box[\delta(x) \leftrightarrow \delta_*(^\vee x)]$, where δ translates any member of B_{IV} or B_{CN}

$\Box[\delta(x,\mathcal{P}) \leftrightarrow \mathcal{P}\{\wp\delta_*\{^\vee x, ^\vee y\}\}]$, if δ translates any member of B_{TV} other than caria "seek"

In order to give a convenient translation in reduced form for inchoative verbs, the symbol $\delta^\dagger$ is defined as follows. If $\delta \in ME_{f(IV)}$, then $\delta^\dagger$ is to be the expression: $\lambda u[\text{INCHO}[\delta(\hat{}u)]]$. If $\delta \in ME_{f(TV)}$, then $\delta^\dagger$ is to be the expression: $\lambda v \lambda u[\text{INCHO}[\delta([\hat{}u],[\hat{}v^*])]]$. It is a consequence of postulates (6) and (7) that the following formulas are logically true:

$\Box[\delta(x) \leftrightarrow \text{INCHO}[\delta^{\dagger}(\check{}x)]]$, if δ translates noga ("get tired") or rūgama ("stand")

$\Box[\delta(x,\mathcal{P}) \leftrightarrow \mathcal{P}\{\hat{}\text{INCHO}[\delta^{\dagger}(\check{}x,\check{}y)]\}]$, where δ translates kuua ("carry away"), gucia ("pull"), or nyita ("hold")

Finally, in the examples given in the last section of this chapter, it will be convenient to adopt the convention of using English words to represent the predicate constants which translate individual words of Kikuyu.

4. Examples

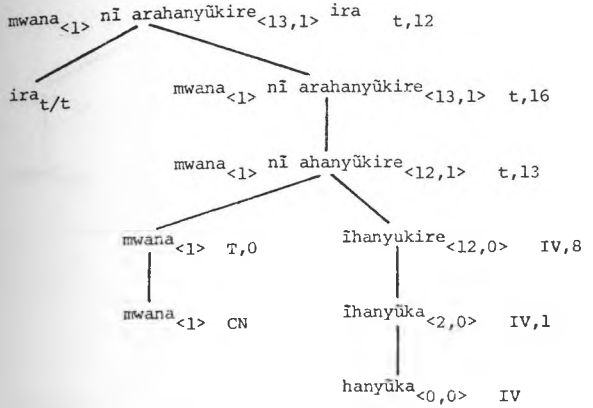
To illustrate how the rules work, a few sample analysis trees and their semantic translations (in reduced form) are given below. In each case, there are several other analysis trees for the same sentence, but none of these is semantically distinct from the one given. Where more than one semantically distinct analysis tree is possible, a representative tree for each reading of the sentence is given.

Sentence (1) below illustrates how verb forms with tense and aspect markers are introduced into a syntactic string by the rules I have given.

3) mwana nī a-ra-hanyūk-ir-e ira
child he-NP-run-MComp yesterday

"the child ran yesterday"

3a)



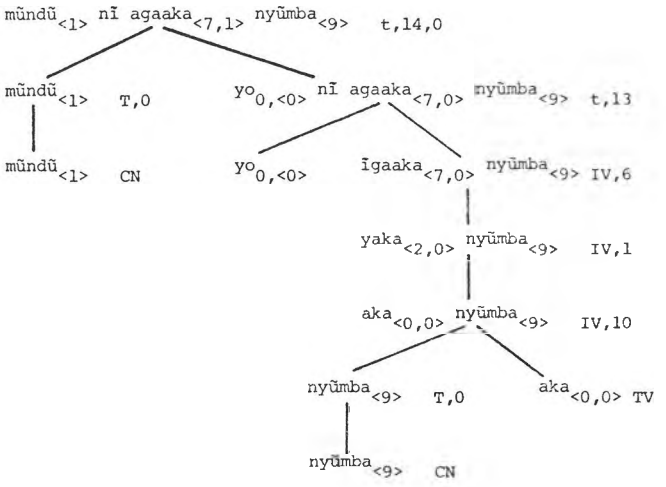
3b) YEST[NP[Vu[child$_*$(u) ^ MNF[COMP[run$_*$(u)]]]]]

Sentence (4) provides a further illustration of the syntactic replacement functions, which introduce inflected forms of a verb, and in addition, (4) illustrates how the quantification rule (S10) works in this grammar.

4) mũndũ nĩ a-ga-aka nyũmba
person he-RFComp-build house

"the man will build a house"

4a)



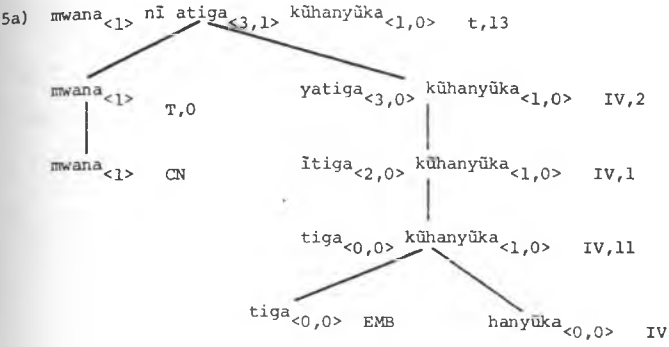
4b) $Vu[person_{*}(u) \wedge RF[IMM[COMP[Vv[house_{*}(v) \wedge build_{*}(u,v)]]]]]$

The next example demonstrates how sentences with tiga are formed by the syntactic rules.

5) mwana nī a-a-tiga kū-hanyūka
child he-IPerf-stop to-run

"the child just stopped running"

5a)

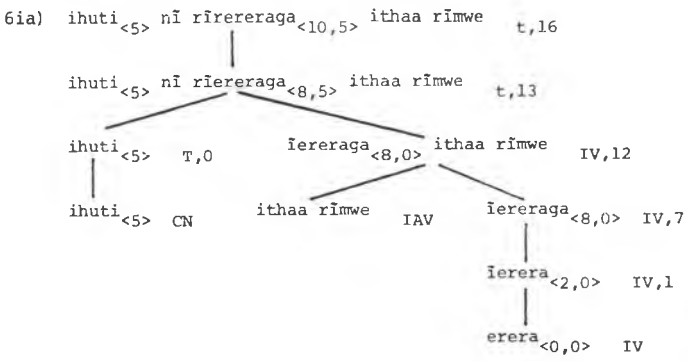


5b) $Vu[child_{*}(u) \wedge IMM[PERF[INCHO^{\vee}[PROG[run_{*}(u)]]]]]$

The last two examples show how the grammar handles a scope ambiguity involving an aspect marker and a temporal extent adverb. The ambiguity in both examples given depends upon the order of the operations which introduce adverbs, and those which introduce aspect forms. In sentence (6), for example, the progressive form may be introduced before the predicate modifier ithaa rīmwe, as in the reading (6i), or else after the predicate modifier, as in the reading (6ii).

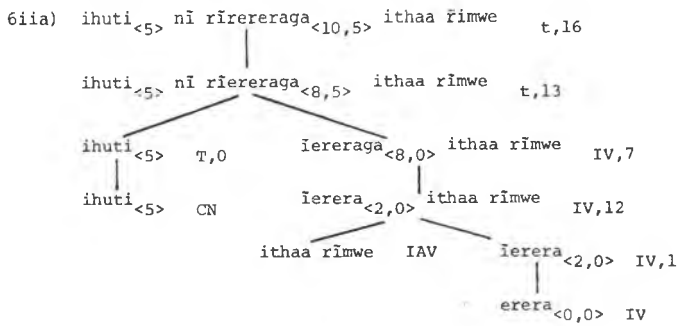
6) ihuti nĩ rĩ-r-erer-ag-a ithaa rĩmwe
leaf it-NP-float-MProg hour one

6i) "for an hour, the leaf was floating"

6ia) 

6ib) NP[Vu[leaf$_*$(u) ^ one-hour[PROG[float$_*$(u)]]]]

6ii) "the leaf was in the midst of floating" OR
"the leaf repeatedly floated for an hour"

6iia) 

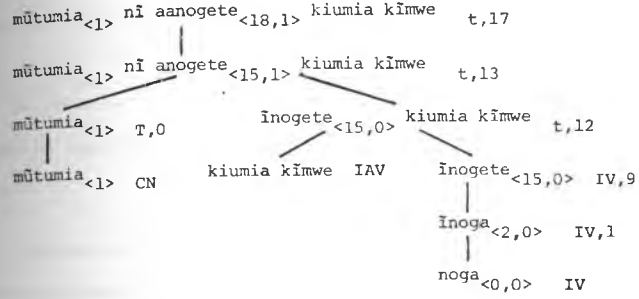
6iib) NP[Vu[leaf$_*$(u) ^ PROG[one-hour[float$_*$(u)]]]]

Sentence (7) illustrates the scope ambiguity of a temporal extent adverb with an inchoative verb in perfect aspect, which was discussed in Chapter II.

7) mūtumia nī a-a-nog-et-e kiumia kīmwe
woman he-RP-become/tired-MPerf week one

7i) "the woman was tired for a week"

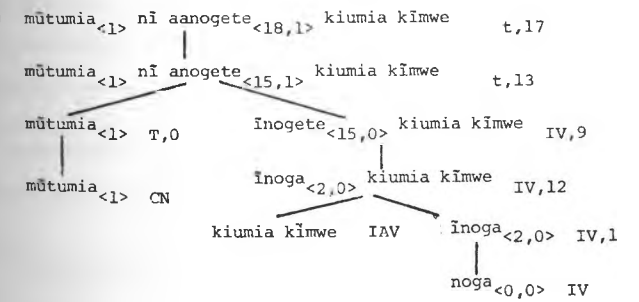
7ia)



7ib) RP[Vu[woman$_*$(u) ∧ one-week[PERF[INCHO[tired†(u)]]]]]

7ii) "the woman had been tired for a week"

7iia)



7iib) RP[Vu[woman$_*$(u) ∧ PERF[one-week[INCHO[tired†(u)]]]]]

APPENDIX A

A further test for inchoative verbs

If a Kikuyu verb is lexically inchoative, then it means that some state (or activity) "comes about and remains in existence for some period of time". Unfortunately, it is not always easy to tell whether "remaining in existence" is part of the lexical meaning of a verb, or verb phrase. For example, a case could be made that tonya nyũmba "enter the house" means (or, could be "decomposed" as) "come to be in the house". However, it does not follow necessarily that tonya is an inchoative verb, which includes the idea of remaining in a place as part of its lexical meaning. How do we decide? Fortunately, during my field-work on Kikuyu, I happened upon a construction which gives highly reliable evidence concerning this issue. This evidence involves the auxiliary construction with the verb korwo, which means literally "to be found". When used as an auxiliary verb, korwo is followed by a main verb which is marked for one of three aspect categories: progressive aspect (prefix -kī-); perfect aspect (infix -īt-); or imminent perfect aspect (prefix -a-; as in "he has just run"). korwo itself can occur in most of the inflected forms of an independent verb. For example, the auxiliary verb can occur in remote future form, in which case the following

meanings are expressed by this construction:

1) nī a-ga-korwo a-kī-hanyūka
he-RFComp-be/found he-Prog-run

"he will be running" (lit.: "he will be found to be running")

2) nī a-ga-korwo a-hanyūk-ĭt-e
he-RFComp-be/found he-run-Perf

"he will have run" (lit.: "he will be found to have run")

3) nī a-ga-korwo a-a-hanyūka
he-RFComp-be/found he-IPerf-run

"he will have just run" (lit.: "he will be found to have just run")

Of the forty-eight combinations of korwo with a main verb which are theoretically possible, only a sub-set constitute acceptable combinations, with a definite meaning. One combination in particular which is consistently rejected by native speakers is a present perfect form of korwo, followed by anything other than a progressive form of the main verb. That is, sentence (4) is judged acceptable, with the meaning indicated, but (5) and (6) are rejected as anomalous, and no translation is offered for them.

4) nī a-kor-et-wo a-kī-hanyūka
he-be/found-MPerf he-Prog-run

"he has been running" (implies: "running for some time")

5) *nī a-kor-et-wo a-hanyūk-ĭt-e
he-be/found-MPerf he-run-Perf

6) *nī a-kor-et-wo a-a-hanyūka
he-be/found-MPerf he-IPerf-run

At this point in my work on Kikuyu, I will not attempt to give a principled explanation for the anomaly illustrated by (5) and (6), but will instead restrict attention to the following factual observation. Sentences with the structure of (5) (but not (6)) are acceptable if the main verb happens to be an inchoative verb. For example:

7) nĩ a-kor-et-wo a-guc-ĩt-ie mũkanda
he-be/found-MPerf he-pull-Perf rope

"he has been pulling the rope (for some time)"

8) nĩ a-kor-et-wo a-nyit-ĩt-e mwana
he-be/found-MPerf he-hold-Perf child

"she has been holding the child (for some time)"

9) nĩ a-kor-et-wo a-ŧuar-ĩt-e
he-be/found-MPerf he-become/sick-Perf

"he has been sick (for some time - and is sick now)"

Comparison of (7)-(9) with sentence (4) reveals that it is the possibility of a "resultative" meaning for the perfect form of an inchoative verb, which is parallel to the "continuous action" meaning of an activity verb in progressive form, which renders the latter examples acceptable. Other verbs which pattern in this way are kua "die", hona "heal", rĩkia "finish", hinga "close", and noga "get tired". Verbs whose perfect form fails to render this construction acceptable are aka "build", ũraga "kill", hũra "beat (someone, as with a stick)", kinya "reach", erera "float", rũa "fight", ringa "strike (someone)", and tonya "enter". In regard to the latter example, sentence (10)

below was judged to be anomalous.

10) *nĩ a-kor-et-wo a-tony-et-e nyũmba
he-be/found-MPerf he-enter-Perf house

When I asked about (10), my informants suggested (11) as the correct way to express the meaning that I apparently wanted to express.

11) nĩ a-kor-et-wo a-rĩ nyũmba
he-be/found-MPerf he-be (at the)house

"he has been in the house (for some time)"

The fact that (10) cannot express the meaning of (11) thus demonstrates that the meaning of tonya does not include the idea of remaining in a place; that is, tonya is a simple change-of-state verb, and not an inchoative state verb.

APPENDIX B

The two morphemes -ag-

Despite my claim in Chapter I that aspect infixes do not co-occur with future tense markers, the morpheme -ag- does co-occur with the near future marker -rĩ- and the remote future marker -ka-. That is, sentence (1) below is well-formed, and has the meaning indicated.

1) nĩ a-ka-hanyũk-ag-a
   he-RFComp-run-ag

"he will repeatedly/habitually run"

However, (1) is only an apparent contradiction to my previous description of the Kikuyu system of aspect inflection, for there are persuasive reasons for saying that the -ag- of (1) (which I will hereafter designate as $-ag_2-$) is not the same as the -ag- which marks progressive aspect in past tense forms (I will refer to the latter -ag- as $-ag_1-$). First of all, the $-ag_2-$ which co-occurs with a future marker does not have the full range of interpretations of a progressive marker: it means "repetition", and nothing more. Secondly, $-ag_2-$ always has wide scope over its entire sentence, whereas progressive $-ag_1-$ definitely does not in several cases. To see this, compare sentence (2) below with sentence (3): (3) is acceptable because the time adverb has

wide scope over the progressive marker; but (2) is unacceptable, because -ag$_2$- must have wide scope. Hence, the meaning of (2) is, "Repeatedly, he will run tomorrow at four o'clock"; and this meaning is anomalous because four o'clock does not recur within a single day.

2) *nĩ a-ka-hanyūk-ag-a rūciū thaa ikumi
he-RFComp-run-ag$_2$ tomorrow hour ten

3) nĩ a-ra-hanyūk-ag-a ira thaa ikumi
he-NP-run-MProg yesterday hour ten

"he was running yesterday at four o'clock"

A third point illustrating the difference between the two -ag-'s is that -ag$_2$- can co-occur with the prefix -kĩ-, in instances where -kĩ- is itself a marker of progressive aspect (-kĩ- is the morpheme used to mark progressive aspect on dependent verbs). Barlow gives the following example of -ag$_2$- in this context (Barlow: 1960, 145); sentence (4) shows the progressive use of -kĩ- in the absence of -ag$_2$-, while (5) shows the same construction with -ag$_2$-.

4) tũ-nog-ir-e tũ-gĩ-thiĩ
we-get/tired-MComp we-Prog-go

"we got tired as we went (were going)"

5) n-gũ-rĩa n-gĩ-thi-ag-a
I-EPComp-eat I-Prog-go-ag$_2$

"I shall eat as I go along"

According to Barlow, the form of the dependent verb (that is, the second one) in sentence (5) "has a similar use to the above [(4)],

but the continuance of the action is more particularly expressed". It seems clear that this use of -ag$_2$- is analogous to that shown in (1), and that it does not involve inflection of a verb for the category of progressive aspect.

Finally, it is worth noting that the use of -ag$_2$- as a sentence adverb meaning "continuously" or "repeatedly" is found only in grammatical contexts where it could not be confused with the progressive marker -ag$_1$-, and that in these instances, there is a good alternative account of the syntax of -ag$_2$-. That is, there appears to be a whole class of sentence modifiers in Kikuyu which occur as infixes on a verb. Another member of this class is -kĩ- (again, a morpheme homophonous with a progressive marker, but contrasting in meaning). Barlow describes this use of -kĩ- as follows:

> "Kĩ is a particle which affects neither mood nor tense, but which may be infixed into any verb of whatever mood or tense. Its function appears to be that of a connective, with the force of "so", "then", etc. Its position in the verb is always directly before the stem in verbs which have no objective infix and directly before the objective infix when that is present." (Barlow: 1960, 118)

Some examples of the use of -kĩ- as a sentence connective are sentences (6) and (7) below (from Barlow: 1960, 264):

6) nĩ tw-a-gĩ-kiny-ir-e
   we-RP-kĩ-arrive-MComp

   "in due course, we arrived"

7) gĩ-kĩ-rĩ ha rĩu?
   it-kĩ-be where now

   "then where is it now?"

For all of the above reasons, I think it is justifiable to conclude that -ag$_2$- is part of a special class of items in Kikuyu, whose syntax and semantics is distinct from that of the class of aspect inflectional markers to which the progressive marker -ag$_1$- belongs.

LIST OF REFERENCES

Anderson, J. 1973. An essay concerning aspect. The Hague: Mouton.

Appleby, L. L. 1947. A first Luyia grammar. Nairobi: East Africa Literature Bureau.

Austin, J. L. 1962. How to do things with words. New York: Oxford University Press.

Barlow, A. R. 1960. Studies in Kikuyu grammar and idiom. Edinburgh: Blackwood.

Bennett, D. C. 1975. Spatial and temporal uses of English prepositions. London: Longman.

Bennett, M. and B. Partee. 1972. Toward the logic of tense and aspect in English. Ms.

Comrie, B. 1976. Aspect. Cambridge: Cambridge University Press.

Dowty, D. R. 1972. Studies in the logic of verb aspect and time reference in English. University of Texas at Austin Ph.D. Dissertation.

Dowty, D. R. 1974. The stative in the progressive and other essence/accident contrasts. Linguistic Inquiry 6.579-88.

Dowty, D. R. 1976. Montague grammar and the lexical decomposition of causative verbs. In B. H. Partee (ed.), Montague Grammar (New York: Academic Press), 201-246.

Dowty, D. R. 1977. Toward a semantic analysis of verb aspect and the English 'imperfective' progressive. Linguistics and Philosophy 1.45-77.

Fortune, G. 1949. The conjugation of inchoative verbs in Shona. African Studies 8.132-40.

Greenberg, J. H. 1966. Language universals. The Hague: Mouton.

Grice, H. P. 1974. Logic and conversation. In D. Davidson and G. Harman (eds.), The logic of grammar (Encino, California: Dickenson), 64-75.

Holt, J. 1943. Etudes d'aspect. Acta Jutlandica 15.2.

Jessen, M. 1974. A semantic study of spatial and temporal expressions in English. University of Edinburgh Ph.D. Dissertation.

Montague, R. 1968. Pragmatics. In R. Klibansky (ed.), Contemporary philosophy (Florence: La Nuova Italia Editrice), 102-22. Reprinted in Montague (1974), 95-118.

Montague, R. 1970. Pragmatics and intensional logic. Synthese 22.68-94. Reprinted in Montague (1974), 119-47.

Montague, R. 1973. The proper treatment of quantification in ordinary English. In J. Hintikka, J. Moravcsik, and P. Suppes (eds.), Approaches to natural language (Dordrecht: Reidel), 221-42. Reprinted in Montague (1974), 247-70.

Montague, R. 1974. Formal philosophy. New Haven: Yale University Press.

Myers, A. 1971. Assertion and presupposition in Kikuyu. In C.-W. Kim and H. Stahlke (eds.), Papers in African Linguistics (Edmonton: Linguistic Research), 135-40.

Nordenfelt, L. 1976. Events, actions, and ordinary language. Ms.

Partee, B. H. 1975. Montague grammar and transformational grammar. Linguistic Inquiry 6.203-300.

Reichenbach, H. 1947. Elements of symbolic logic. New York: Macmillan.

Searle, J. R. 1969. Speech acts. Cambridge: Cambridge University Press.

Scheffer, J. 1975. The progressive in English. Amsterdam: North-Holland.

Taylor, B. 1977. Tense and continuity. Forthcoming in Linguistics and Philosophy.

Thompson, S. A. 1974. On the issue of productivity in the lexicon. In S. A. Thompson and C. Lord (eds.), Approaches to the lexicon (UCLA Papers in syntax, No. 6), 1-25.

Vendler, Z. 1967. Linguistics in philosophy. Ithaca: Cornell University Press.

Waugh, L. R. 1976. The semantics and paradigmatics of word order. Language 52.82-107.

Whorf, B. L. 1950. An American Indian model of the universe. International Journal of American Linguistics 16.67-72. Reprinted in Whorf (1956), 57-64.

Whorf, B. L. 1956. Language, thought and reality. Cambridge: MIT Press.

Zwicky, A. and J. Sadock. 1975. Ambiguity tests and how to fail them. In Syntax and Semantics 4 (New York: Academic Press), 1-36.

A SEMANTIC ANALYSIS OF KIKUYU TENSE AND ASPECT

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The major goal of this dissertation is to propose a model-theoretic treatment of tense and aspect, and to test the theory by applying it to Kikuyu, a Bantu language of Kenya with a particularly large and complex inflectional system for distinctions of this sort. The analysis of tense and aspect is based upon Reichenbach's theory of natural language time reference. Reichenbach claimed that time reference in a natural language involves three distinct time points: the "point of speech", the "point of reference", and the "point of the event". This basic analysis is translated into model-theoretic terms by proposing a semantic system in which the truth of a sentence is evaluated relative to an index consisting of a world, and three times: a moment of time, corresponding to the time of speaking; an interval of time, corresponding to the "reference-time"; and a set of intervals of time, which constitute "episode-time". The categories of tense and aspect - as these are expressed by particular classes of morphemes in Kikuyu - are characterized

Hence, these forms describe episodes which are still in an early stage of development.

The last part of the thesis provides a grammar of Kikuyu, based upon the grammar of English presented in Richard Montague's "The proper treatment of quantification in ordinary English". The purpose of this grammar is to show how sentences of Kikuyu can be related in a systematic way to formulae of intensional logic, thus demonstrating the relation between the semantic analysis of tense, aspect and status categories, and the syntax and morphology of Kikuyu.

within this system as follows. First, it is shown that the aspect categories of Kikuyu ("completive", "progressive" and "perfect" aspect) can be analyzed with a set of sentence operators which specify the relation of episode-time to reference-time. Secondly, the categories of tense are shown to specify the relation of reference-time to the time of speaking; in addition, it is demonstrated that the analysis accounts for the semantics of deictic time adverbs which co-occur with different tense forms. Finally, it is shown that the third logically possible set of relations in Reichenbach's system - namely, relations of episode-time to speaking-time - also play a role in the analysis of Kikuyu. The semantic categories which involve such relations are called existential status categories, because they describe the stage of development of an episode, viewed in relation to the time of speaking. In Kikuyu, there are two such categories, which are designated "manifest action" and "imminent action". These categories are not expressed by any particular morphemes, but rather by a fundamental division in the formal organization of the verbal paradigm. Members of the "manifest action" sub-paradigm of the verb share the feature that episode-time begins at least several hours earlier than the time of speaking. Hence, forms within this sub-paradigm describe episodes which are "manifest", in the sense that they have reached a relatively advanced stage of development. Forms in the "imminent action" sub-paradigm, on the other hand, describe episodes which either begin just before the time of speaking, or later than this time.