Logical (Propositional) Structure of Sentences

The Logical Structure of the World from a Linguistic Perspective

1. Introduction

From a linguistic perspective the world (both real and irreal worlds) can be viewed as a set of propositions. Propositions are statements (or sentences) that can be true or false:

(1) John likes syntax.

(1) is a proposition since it can be either a true statement or a false statement (go to).

Propositions are first divided into predicates and arguments:

(2) proposition ø predicate + argument.

The term predicate is defined in two different ways in linguistics (see Crystal (1997)). In the older definition and the one used in predication theory, a predicate is what is left over after extracting the subject from the sentence. In (1) John is the subject and likes syntax is the predicate.

The second definition is used in predicate calculus. In short, it refers to the basic meaning of a concept which corresponds to a lexical word. In (1) the central predicate is likes. The proposition is based on this predicate. It takes two arguments: John and syntax. Both John and syntax are predicates in their own right, but neither takes an argument. Throughout this course we will use the second definition only.

An argument may be seen as a participant in some sense of an eventuality. Technically, arguments are predicates in their own right. An argument is a special property of some other predicate. Let us illustrate with more examples. Consider the following sentence:

(3) John slept.

Slept is an event which takes one argument. The argument (or participant) is John, the person who slept. John is a predicate that takes no arguments. Slept is the basic predicate on which the proposition (3) is based.

Some predicates take two arguments:

(4) Mary read a book.

Here, read is the predicate, and it takes two arguments: book and Mary. Some take three arguments (or possibly more):

(5) The dog put a bone in his masterÕs shoe.

Put is the basic predicate; its three arguments are the dog, a bone, and his masterÕs shoe.

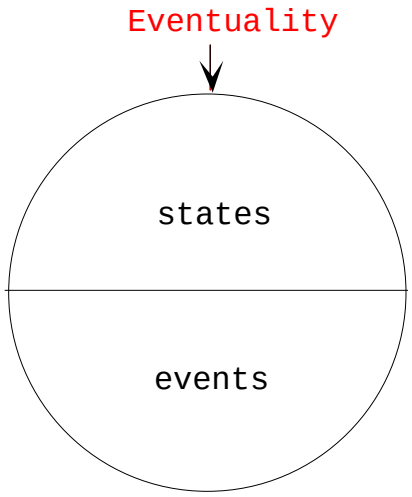
2. Eventualities and Objects.

The basic predicate is an eventuality. Most arguments of predicates are objects. We accept these as given and undefinable. They are diametrically opposed to each other, but with one exception to be discussed later. Predicates are divided into two sets:

(6) predicates --> eventualities and objects.

An eventuality is a set that contains all events and states. Events denote a change of state, states denote no change of state. An event is a set that contains actions, accomplishments, and achievements. (Go to).

(7)



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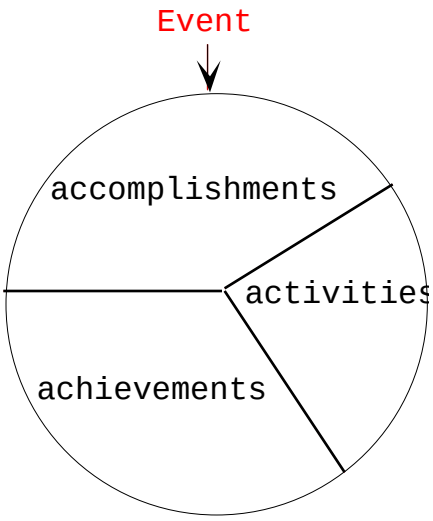


All events are expressed as verbs in English. Some states are expressed as verbs and others as adjectives in English. Spatial and temporal states are expressed as verbs in English as well as certain abstract states.

Unlike states and events, objects are not members of the set of eventualities. They are the arguments of an eventuality. All tangible things are objects as are abstract and imaginary things. A proposition cannot consist of an abject alone:

(9) *That book.

An object must be part of an eventuality:

(10) a. That book is dull.

b. Frank bought that book.

c. That book intrigued my neighbor.

Occasionally, a proposition may be an argument of another eventuality:

(11) a. Sally thinks that that book is dull.

b. Frank tried to buy that book.

One of the arguments of think is the proposition that that book is dull, and of tried is the proposition to buy that book.

3. Modifiers

Both eventualities and objects may be modified. There two kinds of modifiersÑlexical modifiers and operators (see below). Lexical modifiers are adjectives if they modify a noun, adverbs if they modify a verb. Making the distinction between an operator and a lexical item in linguistics is no easy task.

Lexical modifiers of nouns include adjectives and nouns that occur in the first part of a compound construction:

(12) a. a long phrase

b. a noun phrase

c. a long noun phrase.

Long is formally an adjective and noun is formally a noun. Both modify phrase. Nouns may be modified by PPs and clauses as well:

(13) a. the phrase in this sentence

b. the phrase which is too long.

Lexical modifiers of verbs include adverbs and PPs:

(14) a. Andy rapidly gulped down his dinner.

b. Andy gulped down his dinner in an impolite manner.

4. Lexical Items

4.1 Objects

A lexical item is a member of a special set. A set is a group of items called members or elements. Take the word trees, for example. In its generic sense, it refers to the set of all members, each of which is called a tree:

(15) a. Trees grow almost everywhere on land.

b. Each tree shares something in common with every other tree, identifying each as a tree, and each tree is unique.

Example (15a) is generic in that it is a statement alleged to be true for all trees. The word tree refers to the set or any member of the set. Each entity called a tree in english is conceptually a TREE (see section 7. below)... each member TREE is called a tree as indicated by the phrases each tree and every other tree. A lexical item is morphemic stem which is

assigned to all members if the and to the set itself (usually in the plural in English). Each member has a unique reference, but each shares a common lexical item. The subscripts identify each tree uniquely:

(16) $\{TREE_1, TREE_2, \ldots, TREE_n\} = \{TREE\}$

Each tree inside the braces refers to a unique tree. Note that {TREE} includes all trees, present, past, and future, and, real and imaginary.

We say that the morpheme tree is a lexical item that can make reference to any one of a set of objects of the set {TREE}. The plural form trees is either generic referring to the entire set (15), or it may refer to any combination of individual trees greater than one:

(17) We have three trees in our yard.

Three is a quantificational modifier, an operator (see section 8.), limiting the members to just three without specifying the reference.

Phrasal lexical items are similar except that they are phrases containing two or more morphemic stems. The subscript identifies each tree as a unique referent. ÒnÓ identifies the last tree in an indefinite set of conceptual entities which we could arbitrarily write as:

(18) $\{BIRCH\ TREE_1, BIRCH\ TREE_2, \ldots, BIRCH\ TREE_n\} = \{BIRCH\ TREE\}$.

It is understood that {BIRCH TREE} belongs to the set {TREE}.

4.2 Eventualities

The verb walk is a lexical item. As a set it refers to all events that we consider walking. Each individual event is a member of the set:

(19) $\{walk_1, walk_2, walk_3, \ldots, walk_n\} = walk$.

Compare the following sentences:

(20) a. Mary walked to school yesterday.

b. Mary walked to school twice.

c. Human beings walk.

Walk in (20a) refers to a single specific event. In (20b) there are two distinct events. Each event we may refer to with the verb walk.(20c) is generic. Walk does not refer to a specific event, but to a class of events that characterize human beings.

5. Names

A name is a morphemic stem or a group of stems that refer to a specific referent uniquely:

(21) a. John
b. Mary
c. John Adams Smith
d. Mary Louise Alcott
e. Vancouver
f. Mt. Rushmore
g. Canada
h. Eritrea
i. The Swanee River
j. The Atlantic.

In a sentence such as:

(22) John is here.

John refers to a unique person, not to one of a group of males with the same name. Sometimes a name can be used to in the latter sense:

(23) How many Johns do you know?

Here,. Johns means the number people with the name John. Naming is mostly arbitrary, with certain cultural limitations imposed by different cultures. One restriction used in English is that of gender for humans and some pets, though there some names that can be used for both genders, e.g. Kim.

Occasionally the same morpheme used for a name may be used as a lexical item:

(24) a. The john is over there.
b. Several johns were arrested lasted night.

Note that any bathroom can be called the john, but not any male can appropriately be called John, if he already has a name. This is what differentiates a lexical item from a name.

As far as I know no eventuality has a name.

6. Sense and Reference

At this point we should introduce sense and reference. As we indicated above each object both real and imaginary is a potential reference for some word or phrase as is each eventuality both real and imaginary. Names identify the referent, but names gives us little information about the referent. Sense, on the other hand, is the information about the referent.

To illustrate this, suppose there exists a person named John Horatio Alabaster.[1] From his name we may infer that he is a male. We will refer to him as John in what follows. Consider the following sentences:

(25) a. My uncleÕs name is John.

b. My fatherÕs brotherÕs name is John.

Let us assume that both sentences are true. The information given in (25a) is that the name of the brother of one of my parents is John. The information given in (25b) is that the name of the brother of my father is John. The information given in both sentences differs, even though the referents could be the same person. This information is called sense.

Note that the referents in each sentence could be the same referent, but not necessarily. My motherÕs brotherÕs name could be John, too, but presumably not John Horatio Alabaster, unless there was a little incest involved here.

Of course, more information can be given:

(26) My fatherÕs oldest brotherÕs name is John.

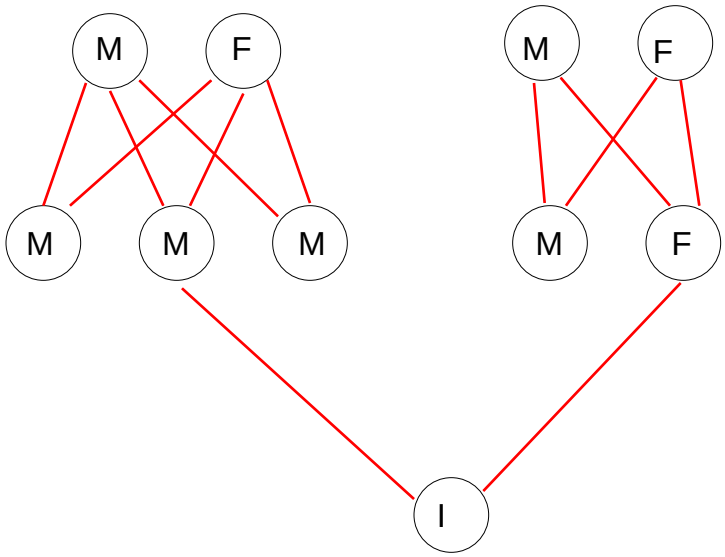
(26) tells us that my father has more than one brother and we know which brother is named John, but we might not know which is the oldest one.

As you can see, the person named John in the above three sentences may be the same person (referent), but the information conveyed in each sentence (sense) differs.

Let us illustrate this with following set of figures. The first figure sets up the basic information. Suppose my fatherÕs parentÕs had three sons and my motherÕs has a son and a daughter:

[1] Should there actually exist a person with this name, I apologize to him averring that the choice of the is purely arbitrary and the similarity in names is a pure coincidence.

(27)

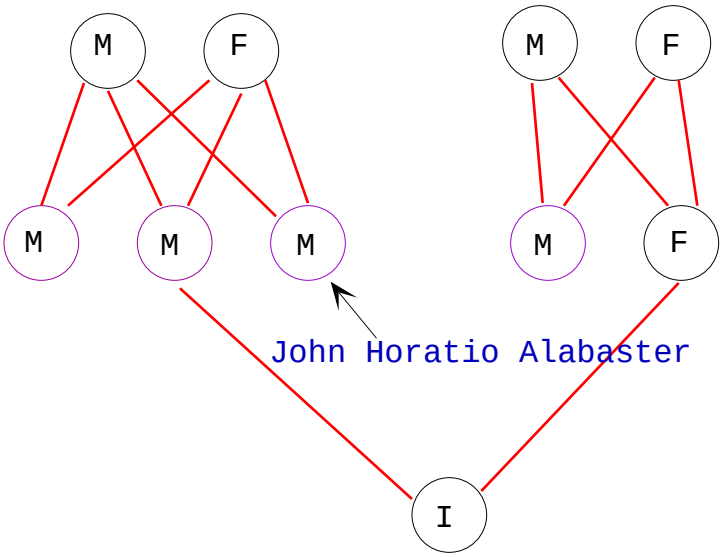


Each circle represents a human referent. Those marked F are female and those marked M are male. M and F represent sense. ÔIÕ represents the speaker of the above sentences. The gender of the speaker is irrelevant in this problem. The lines represent parent-child links. There are three referents for the term Òmy uncleÓ in (27): all the male referents in the middle row not directly linked to ÔI.Õ But in (25a) only one of them is named John Horatio Alabaster.[2]

In (25b) the number of possible referents is reduced by one to one of the referents in the middle row on the left side excluding the referent directly linked to I (IÕs father). In (26) there is enough information to identify which referent is John H. Alabaster. In (27) letÕs assume that the chronological age of each sibling is ordered starting with the youngest on the right. The third male on the left is the one. The uncles of ÔIÕ are in the coloured circles:

[2] Of course we are assuming that no one gives two of their children identical names. And we are eliminating the extremely remote possibility that there are two men JHA each of whom has a sibling that married each other,

(28)



Returning to lexical items, note that a given referent can be assigned a large range of lexical items depending on what information the speaker chooses to convey. For example we could the following all refer to John Horatio Alabaster:

(29) a. brother (of the two referents on the left)

b. brother-in-law (of the two referents on the right)

c. uncle (of I)

d. son (of the two referents in the first row on the left)

e. nephew (of the two referents in the first row on the right).

7. Conceptual Forms

Briefly, a conceptual form is the semantic form of an object or eventuality as perceived through human cognition. This is a broad topic and we cannot do it justice here. Take the word tree, for example. When we see or visualize certain plants with trunks, branches, and leaves or flattened needles, we visualize an object which we call a tree in English. The conceptual form we will write in CAPS: TREE. How we write it is purely arbitrary. The form TREE is obviously biased on English orthography. We do so for the convenience of the reader. We could write it as SBYKP, but it would be difficulty to maintain the connection. This does not imply that everyone sees certain plants as trees. If they conceive of it as a BUSH, they use the word bush. Of course there are objects which might not have a conceptual for. In those cases we cannot refer to it uniquely with an English word. When we use a form such as TREE, we are assuming that it holds true for those people who can conceive of a tree, not for those who cannot.

We assume that there is no conceptual unit TREES such that it corresponds with the noun trees. Plurality is a distinct concept It is projected into English as the quantification operator (see Logical form of the Noun Phrase). In the same vein GOOSE is the conceptual form for goose and geese.

There are problems with this arbitrary system. Some words may refer to conceptually different forms; for example: egg:

(30) a. Bill had an egg for breakfast.

b. Bill has egg on his tie.

Despite the relation between these words, each is a different concept. Compare (30b) with

(31) Bill has an egg on his tie.

When such cases arise, we will arbitrarily differentiate the conceptual forms. Any attempt to systematize conceptual forms will take us too far off of our topic here.

8. Operators

In math and logic an operator is an eventuality that performs an operation. In some sense this holds true in linguistics, too. But we want to be a bit more precise here. There are two basic kinds of operators: the logical operators and, or, and but, and such arithmetical operators as plus and minus:

(32) a. Our cat almost caught a mouse and a robin.

b. You can go to the movies or the ball game.

c. Vanessa bought a banana but she did not eat it.

d. 2 plus 3 equals 5.

e. 26 minus 33 equals -7.

The second class of operators are the modifying operators. Nouns are modified by quantificational operators and discourse operators:

(33) the six books.

Operators have a referent and a single sense: this differentiates operators from lexical items. Operators make up the grammatical categories of a language.Operators vary from language to language, even from dialect to dialect.

Modifying operators modify both objects and eventualities. The most common operator modifying objects (nouns) are the quantification operators (numerals and words

such as *much* and *several*). Consider the quantifiers *one*. It has a single referent: Ô1.Õ It has a single sense: Òoneness.Ó

Discourse operators link objects or eventualities of the current sentence to the same in other sentences in the discourse. The most common discourse operator is the definite operator (*the*) as in (33).

The most common operator modifying eventualities is tense. Tense refers to the temporal relation between the speech event and the narrated event. That, does the time of the eventuality correspond with the speech event (present tense), precede the speech event (past tense), or follow the narrated event (the future tense). Other operators modifying eventualities include aspect, relevance, voice, mood, and negation.

9. Bibliography

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