1. Introduction.

The theory of agreement has been extensively covered. However, no detailed discussion on the mechanism of agreement is known. The aim here is to show that linking (Chomsky 1981, 1986) accounts for agreement in a more efficient way than using percolation. Linking is the head and argument relation that holds between lexical items and their arguments and between operators and their arguments. The relation of head and argument is also discussed in some detail, which is necessary for agreement.

The framework selected here assumes that grammar is a set of rules (a code in some sense of the word) that enables a speaker to pass information to a listener using language. There are three output signs: phonetics, signing and whistling. The latter is used in whistling languages. Phonetics is the sign that the listener hears. The speaker somehow encodes the information first into logico-conceptual (LC) component, then to syntax and morphology (form), then to pgon0logy (sign). The same code enables a listener to interpret the sign, form and LC to determine the message. Example (1) summarizes the underlying structure of the code:
Phonological form is considered part of the grammar and sign a message is mapped to LC and how LC is interpreted as a message lies beyond the scope of this paper as does phonological encoding and decoding. This is not the model adopted by Chomsky and his followers. Therefore, this model is not within the minimalist framework. However, most theories of Minimalism are adopted here.

Syntactic linking is based on the relation of a predicate or operator and its argument(s) in LC. LC here is based on the set-theoretic framework (Partee et al, 1993). Of concern here, are objects, predicates and operators.

The main objective of this paper is to show that linking is a more efficient operation than feature percolation (Chomsky 1981, 1986, 1994) for information transferal.

2. LC

Predicates and operators are forms that take one or more arguments. Arguments of predicates are sometimes called participants (Fillmore 1968). They are usually verbs and adjectives:
(2)  
   a. DIE \( (x_1) \), HAPPY \( (x_2) \) [monadic predicates]
   
   b. DEPEND ON \( (x_3, y_4) \), FOND \( (x_5, y_6) \) [binary predicates]
   
   c. GIVE \( (x_7, y_8, z_9) \), BUY \( (x_7, y_8, y_9, w_{10}) \) [n-tuple predicates]

An object is defined here as a lexeme that takes no arguments. All objects are nouns:

(3)  
  book, truck, air, finger, water, salt, planet, greenhouse, ...

Operators are linguistic forms that are required by the grammar of a language. They are the opposite of lexemes, which are not required by the grammar. The most common operators include negation, conjunction and the declarative mood. Nominal and verbal operators are discussed below. The negative operators and the declarative interrogative complementizers are unary:

(4)  
   a. NO \( (x_1) \) – no book
   
   b. NOT \( (x_2) \) – not that book
   
   c. THAT \( (x_3) \) - He said that he is ill.
   
   d. WHETHER \( (x_4) \) – He asked whether he could go.

Conjunctions take two or more arguments:

(5)  
  AND \( (x_4, y_5, z_6, w_7, ...) \)

The operators that take a noun as an argument, in effect modifying it, include numbers, determiners and quantifiers:

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1 Occasionally, an object or predicative has an alternative meaning that takes a related form that takes one argument or a different set of arguments: book of matches, box of apples, smoke \( (x) \) or smoke \( (x, y) \). Each form is considered a distinct lexeme.

2 There is a possibility that conjunctions with three arguments are actually binary, where the third argument takes the other two arguments as its argument: \( [ x \text{ and } [ y \text{ and } z ] ] \). This can be expanded indefinitely for each additional argument.
(6)  a. all the five apples  
    b. both the two students  

Verbal arguments include voice, aspect, relevance and tense. *Relevance* refers to the way the perfect is used in English:  

(7)  Has Melissa completed reading *Aspects*?  

Modifier arguments include the positive, comparative and superlative degrees.  

The remainder of this paper is concerned with nominal operators and their agreement with their nominal arguments.  

3. Links  

The concept of links and chains was proposed by Chomsky (1981) and expanded further by Safir (1985). A link holds between a head and at least one of its arguments in a syntactic structure. Two or more links may form a chain. The original concept of a link was to link a moved node and its trace:  

(8)  The house₁ was built t₁ in three days.  

The noun phrase *the house* is linked to its trace \{the house₁, t₁\}. Some basic concepts of linking are discussed in den Dikken (2006).  

It is proposed here that Linking Theory is part of a theory of information transmission and reception in a grammar of a language. Information is transmitted from a speaker or written source to one or more listeners. The listener receives information usually acoustically or less often from a printed source or from a signer. The discussion of linking is limited to the transmission of speech through sound.
A link holds between two nodes as means of passing information. In the theory of traces shown in (1) *the house* is linked to its trace $t_1$. The information here includes the theta role of the argument associated with the trace, which it receives from the main verb. Here the theta role is a theme.

In (1), the information ‘the house’ is copied from its trace in the standard theory. Alternatively, it is proposed that the head of *the house* is linked to its trace from which information is retrieved when needed. It is also proposed that linking makes possible a simple hypothesis of agreement.

The concept of information transmission goes far beyond the above paragraph. It is not just a theory of grammatical transmission but also of conceptual transmission. Linking is the means by which the information that the speaker wishes to transmit to the listener(s) is transmitted.

4. LC and Linking

First, the relation of the object CUP and the predicate CUP is considered. The former cannot take an object whereas the latter must (even if it is implied from the discourse):

(9)    a. John broke the cup.
       b. ??*John broke the cup of soup.
       c. John ate a cup of soup.
       d. *John ate a cup.

Example (9b) is rather unacceptable for me, especially when compared to example (9a). Example (9b) implies that there is something in it. Example (9c) and similar constructions are interesting in that what is eaten is the substance
contained by the noun but not the noun itself (9d). All the nouns in examples (9) and (10) are container nouns; that is their function is to contain something appropriate. This class breaks down into object container nouns and predicate container nouns. Predicate **container nouns** imply that there is a substance in the container noun. Object container nouns do not imply that there is a substance contained at the moment of the speech event. For example:

(10) Jordan bought and brought home six new glasses does not imply that they are not empty.

All container nouns take a single argument. Other container nouns include:

(11) glass of milk, mug of coffee, box of oranges, carton of illicit cigarettes, pot of beans, kettle of hot water, can of peaches, and so forth.

The most interesting thing about this set of nouns is that all or nearly all of them have a related that is an object similar to CUP. It is reasonable to suggest that there is a lexical hypothesis that can be predicate container nouns are derived from object container nouns in the lexicon. The details need not concern us here.

There is more to the story of predicate container nouns. Gruber (1967) noted the following relation:
(12) a. A can of soup.
    b. The can contains soup
    c. Soup is in the can.

Gruber was specifically talking about the relation of *contain* and *in*. The subject of *contain* is the thematic role location and the object is the theme. The reverse is true for *in*. This is shown informally in example (13):

(13) a. CONTAIN (location, theme)
    b. IN (theme, location)

The first argument is realized as the subject in the active voice (of the verb) and the second argument is the direct object of the verb or a predicate object of IN. There are various ways to represent these thematic relations in the lexical entry of each lexeme, which is not significant here. In a deeper semantic analysis, CONTAIN includes the semantic feature [in], which may be a primitive, plus other features that differentiate it from IN,

The logical structure of the object container Can and predicate container CAN are each written as follows in terms of predicate logic:

(14) a. CAN
    b. CAN(x)

‘(x)’ is a variable representing any member of the set of substances that may occur in a can.
5. Mapping

In this section mapping is discussed. Mapping is a function that performs an operation. The terms ‘transformation,’ ‘map,’ ‘mapping’ and ‘correspondence’ are commonly used terms for this function (Partee et al 1993: 31). The symbol ‘=’ is used by these authors to represent mapping. Mapping here is limited to the correspondence between a lexical item in CL and its syntactic representation.

For example, CAN is a lexical item that is mapped to a noun in a given construction. Consider the following sentence:

(15) The can is hot.

First, the properties of a lexical item must be determined. This holds for all operators and lexical items. It is necessary find a name for this set. The word *verbum*, borrowed from Latin, is proposed. *The* symbol ‘£’ is used for *verbum*. Thus, verbum is a set that contains all lexical items and operators:

(16) £ = {operator, lexeme}.

Both operators and lexemes share two members: (phonological) sign and word class. The word class for natural languages includes at least ‘noun’ and ‘verb’ and often ‘adjective’ and ‘preposition.’ The object *cup* has the following representation; other features are not represented here. Features are enclosed in square brackets, except for phoneme representation which its own marker. The features are separated by a comma and enclosed in curly brackets.:
The term *noun* is a set, which includes all the subclasses of noun including *n-obj* and *n-pred*. By the following mapping example, the lexeme CAN is mapped to the noun [CAN] and the reverse holds as well:

(18) \( \text{CUP} = [\text{CUP}] \).

Thus the lexical item in CL is mapped to [CUP], where the square brackets indicate a lexical item to which the rules of morphology apply producing a word form. Similarly, the syntactic lexical stem is mapped to its lexical item in CL.

Similarly all lexical stems to its syntactic representation:

(19) \( \text{lexeme} = [\text{lexeme}] \).

Example 19 should be expanded to include the *verbum*. Since not all operators are expressed as lexemes that are to be realized as wordforms, the ones that need to be marked as an exception to rule (20), the default rule for syntactic mapping:

(20) \( \text{verbum} = [\text{verbum}] \).

The square brackets also mark phrases, clauses and the sentence has been reached. The general word order in the phrase is that the complement follows the head. There are exceptions and they have to be listed in the grammar or in the lexical entry if the rules is specific to the lexical entry but not to others in the same class.

Rule (20) does not apply to all operators. For example, conjunctions are spelled out as bracketed syntactic stems and wordform since there is no
morphology that applies to conjunctions. On the other hand, the progressive operator is spelled out as the suffix \(-ing\) adjoined to verb stems:

\[(21) \quad \begin{align*}
    \text{a. } \text{AND} &= [\text{AND}] \\
    \text{b. } \text{PROG} &= \text{‘-ing.’}
\end{align*}\]

As is well known, ‘-ing’ is a suffix, which must be adjoined to a verbal stem.

\[(22) \quad \begin{align*}
    \text{a. } \text{AND}(x, y) &= [x] \text{[AND]} [y]. \\
    \text{b. } \text{PROG}(x) &= [x \text{-ing}].
\end{align*}\]

Rule (20) does not include mapping the part-of-speech feature to the syntactic label. A label is written form representing a part-of-speech feature. Example (23) includes the set that contains various parts-of-speech features in English and most languages:

\[(23) \quad \text{Part of speech} = \{\text{noun, verb, modifier, preposition, conjunction}\}\]

For example, assume that CUP is a noun. The feature may be written as follows:

\[(24) \quad \text{CUP, noun}.\]

Example (24) may be mapped in a straightforward way:

\[(25) \quad \text{CUP, noun} = [\text{CUP, noun}]\]

By convention, the feature is written with an abbreviation of the part of speech:

\[(26) \quad [\text{N CUP}].\]
Up to this point, the position of the argument in the syntax has not been covered. For many languages including English, the argument of a predicate noun occurs to the right of the predicate noun. The following rules hold as a default for most English head-complement examples:

(27) \[ Y(X) = \left[ Y \right] \left[ X \right]. \]

Applying the labeling mapping rule, the result is shown in (31):

(28) \[ Y\{n-pred\}(X,\{n-obj\}) = \left[ [N Y] [N X] \right]. \]

Recall that ‘n-obj’ and ‘n-pred’ are members of ‘noun’.

The labeling rule should be expanded to include the first order of phrases:

(29) \[ \left[ X \right] = \left[ x_p \left[ x \right] \right], \text{ where } X \text{ is a head.} \]

By convention, the left bracket is not labeled. ‘CAN of SOUP’ now has the following representation:

(30) \[ \left[ N \left[ N CAN \right] [N SOUP] \right]. \]

Example (33) is not complete. The operator-preposition \textit{of} must be inserted. At this point syntactic theories become more varied and more controversial. The Chomskyan view that \textit{of} is a Case marker, corresponding to the genitive Case, is adopted here without argument:

(31) \[ \left[ \left[ \left[ N \left[ N CAN \right] \right] \right] \left[ N \left[ N SOUP \right] \right] \right]. \]

6. Relations

It is interesting to note that CONTAINER is related to CONTAIN and locative objects:
(32)  a. A container of soup  
b. The can contains soup.

Furthermore, Gruber (1965, 1967) discusses the relation of the preposition *in* to the verb *contain*:

(33) The soup is in the can.

Examples (20a, 20b, and (21) share the following relation at a deeper semantic level:

(34) IN (theme, location).

The basic relation is that IN is linked to both theme and location. When IN incorporates location forming a new container noun, it is the feature ‘IN’ that actually links the noun to argument.

The individual lexical item contains the information which argument will appear the subject position. In example (35a), it is possible to argue that the theme argument may occur as the subject of the noun phrase as in:

(35) The soup’s container.

Examples (35a) and (36) stand out from the others in that the locative has been incorporated in some sense to the predicate forming a new predicate-container.\(^3\) Prepositions do not undergo this lexical operation.

This is concluded with the default rule of mapping a head and its primary argument. The symbol ‘£’ is an abbreviation for verbum:

\(^3\) See Pustejovsky (1995) for more on the generative lexicon.
(36) \( \mathcal{E}(X) = [[\mathcal{E}] [X]] \).

7. Agreement

7.1 The Number Operator

The number operator is the set of all natural numbers, the set of positive integers. This term is also used for the set of grammatical features including singular, plural, dual and possibly others in natural languages. In the meaning of natural numbers, number takes an argument except for reference to the integer metalinguistically:

(37) a. Gary bought one book.
    b. The number one is an integer.

In (29a) one takes a noun as an argument. It does not do so in (29b). In most if not all languages, number operators include the set of natural numbers equal to or greater than one. Zero is not an operator:

(38) *Mrs. O’Malley bought zero book(s).

The linguistic use of fractions and decimals is not covered in this paper.

The argument of numbers must be a count noun:

(39) a. Three cars collided on the freeway.
    b. *Humans must breathe three airs every day.

All number operators include the feature \([\text{Number}]\). This feature contains the binary features: \([+\text{Plural}]\) and \([-\text{Plural}]\). Some languages include \([\pm\text{Dual}]\), which is discussed briefly below. \([\pm\text{Plural}]\) plays a large role in agreement of most natural languages.
The number operator ONE is required for a singular count noun:

(40)   a. One bomb can ruin your day.
       b. *Bomb can ruin your day.

The forms “a” and “an” are each considered here an allomorph of ONE. Another form of the phonologically null allomorph when it follows a definite determiner or a quantifier:

(41)   a. The (this, that) paper is uninteresting.
       b. Each paper is uninteresting.
       c. Bill believes that any paper is uninteresting.

The singular agreement shown in the verb indicates a singular (ONE) paper.

A number is not certain if the noun is plural:

(42)   Books are often too expensive to buy.

The exact number of books is not relevant in generic constructions such as (38). Nevertheless, number is implied as is shown in the following example:

(43)   Books are often too expensive to buy, but I manage to buy one or two a month.

The empty argument of *two is linked back to books. Book must be an argument of a number as can be evidenced in:

(44)   *Books are often too expensive to buy, but I manage to buy book.

A much stronger argument is in CL. Consider books in example (38). It means ‘more than one book.’ Number is implied here. Assuming that if number
is an operator, how is it represented and what is the feature of the operator? The feature \([±\text{Finite}]\) is proposed. The feature \([+\text{Finite}]\) means that there are set number of books. All numbers carry this feature. The feature \([-\text{Finite}]\) indicates that the number is not specified. It is either unknown by the speaker or he is unsure of the number. Perhaps he just does not want to specify the number. The feature \([-\text{Finite}]\) must occur with \([+\text{Pl}]\). This is because \([-\text{Pl}]\) implies ONE and nothing else. One is \([+\text{Finite}]\).

Mass nouns, of course, are not modified by number. This is determinable, basically, from LC. There could be varying factors here, but are there any cultures that count air, for example? If so, we need to know more about such a system before jumping to conclusions.

7.2 The Determiner Operator

Determiners are operators that also take a noun as its argument.

The determiner operator is required for all English nouns. The operator may be phonetic or it may be phonetically null:

(45) a. the boy, boys

b. the grass, grass

as in:
a. The boy is tall.

b. Boys are tall.

c. The grass is green.

d. Grass is green.

The determiner operator may be understood as a set with two members: [+Def] (definite) and [-Def]. In (3b) and (3d) there is a determiner operator and it is phonetically null. The null determiner operator is always interpreted as [-Def]. A phonetically null string as in ‘X ø Y’ differs from a sequence of two strings ‘X Y.’ For example, if no adjective is modifying a noun string (‘X Y’), no adjective is implied:

(47) The boy came home.

Here there is no adjective modifying boy. An adjective cannot be interpreted here. That is, example (52) cannot be interpreted ‘the large boy came home’ from the syntax alone. Adjectives are lexical; they are not operators, although they do take at least one argument.

The determiner takes a noun as its argument. The following two examples support this claim:

(48) a. The two books are not cheap.

b. The grass appears greener this year.

If there is no number operator for mass counts, then the determiner is the only operator besides that modifies the mass noun. The lexical entry for the number and determiner operators can be listed in the following way:
Definite determiners are phonologically overt and marked as [+Def]. Indefinite determiners are covert and marked as [-Def]. The indefinite determiner forms a binary opposition with the definite one:

a. The two books are on the table.

b. Two books are on the table.

The use of the definite determiner means that the two books are already known to the speaker, either through discourse or through general knowledge (pragmatics). The lack of a determiner in (46b) does not mean that it is unknown whether the books are pragmatically unknown (maybe the listener knows special information about them or perhaps he does not) or it is not known whether there is a reference to them in the discourse. It simply indicates that there is no discourse or pragmatic information in the context of the sentence.

7.3 Quantifiers

Quantifiers include such forms as all, every, each, both, any, some, many, much, more, few, a few, little, a little, several. The quantifiers have different properties. For example, every is inherently [-Pl] and [+Ct]:


All is singular if it agrees with a mass noun or it is plural if it agrees with a count noun:
(52)  all books, *all book, all rice, *all rices.

The example the phrase *all rices fails if rices refers to rice in general. If it refers to kinds of rice or species of rice, it succeeds because in the second meaning it is a count noun.

Quantifiers take one argument — a noun. If the noun is a mass noun, the quantifier must contain the feature [-Pl]:

(53)  a. all the six books
    b.  all (the) rice
    c.  *all the (one) book
    d.  some books
    e.  some rice, much rice.

The quantifier all does not have to be marked for plurality since there are no overt signs that it must in English. However, all must be marked as [-Dual] just as both must be marked for as [+Dual]:

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4 ‘(One)’ in (43c) means that ONE has two allomorphs: ‘ø’ and one, which is emphatic and (two) in (44b) means that Two has two allomorphs: ‘ø’ and two.

5 German and Russian, for example, must be marked for plurality as they display agreement.
(54)  
   a. *all those two men
   b. both these (two) men
   c. *both these three men
   d. *both this (one) man

8. Linking and Agreement

In LC it is shown that linking is the relation that a predicate or operator has with its arguments. Linking with multiple arguments is put aside for further research. In example (31) the relation is shown with an arrow pointing to the complement.

Nouns, for example, be modified by more than one operator. The following diagram for (60b) illustrates multiple linking:

(55)  The Linking Diagram for (39b)
In terms of set theory \{BOTH, MAN\}, \{THIS MAN\} AND \{TWO MAN\} form an intersection where MAN is in three sets simultaneously. TWO is marked for [+Plural] and [+Dual]. The features [+Dual] and [-Dual] are each a member of the set [+Plural]. In order to account for the agreement of BOTH and TWO as shown in (40), which are marked as [+Dual], the noun stem must be marked as [+Dual] unless it is marked [-Pl], in order for agreement to succeed:

Certain features exhibit agreement. Nouns are inherent [+Ct] or [-Ct]. Number is not inherent in most nouns. Through agreement, nouns show morphological number. The vast majority of nouns contain the feature [-Ct], which means that [+Ct] must be marked ‘+’ or ‘-‘. This is shown below. Some nouns are inherently plural and they have no singular form:

(56) police, cattle, scissors, pants, breeches ...

Mass nouns are inherently singular. Though many show a plural form, the meaning of the mass noun usually changes to ‘type of’ ‘species of’ and so forth. These forms have a singular with altered meaning. Forms like this are separate lexical entries, though they are somehow linked in the lexicon (Pustejovsky 1995).

The Lexical Entry for all is divided into three components: function, form and sign. Function includes the meaning of the lexical item and features that have meaning or features that are linked to meaning. The form contains information whether the lexical consists of one morpheme or more and certain properties about the form. Sign here is phonological, though signing of the deaf and the properties of whistles in whistling languages belong in this component as well. Various ways exist to represent a lexical entry. Two variations are shown below:
Three variations for the lexical entry of BOOK

<table>
<thead>
<tr>
<th>Variation 1</th>
<th>Variation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOOK, [-PI], [+Ct]</td>
<td>BOOK, [-PI], [+Ct]</td>
</tr>
<tr>
<td>stem, noun</td>
<td>stem, noun</td>
</tr>
<tr>
<td>/mæn/</td>
<td>/mæn/</td>
</tr>
</tbody>
</table>

Variation 2 is preferable for space reasons, but variation 1 is also used. The three components may seem like an arbitrary way of representing lexical items. However, there could be a reason for this. First, the function component cannot change. The sign component exhibits the most change due to allophonic distribution and morphophonemic distribution. Form shows little change. One change is the features [+Comparative] and [-Comparative]. Each may a suffix added to an adjective or adverb or each may be degree word that precedes the modifier. This basic componential analysis of the lexicon is found in Haspelmath (22x), though in a different form.

The lexical entries for both, the and two are shown in Table (58):

<table>
<thead>
<tr>
<th>BOTH, [+PI], [+Dual]</th>
<th>THE [+Def, -Demonst]</th>
<th>TWO [+PI, +Dual]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem, Q</td>
<td>Stem, D</td>
<td>Stem, Num</td>
</tr>
<tr>
<td>/boʊ/</td>
<td>/ðə/</td>
<td>/tu/</td>
</tr>
</tbody>
</table>

The items BOTH and TWO seem to be the only two operators to be marked [+Dual]. The remaining numbers are marked [-Dual]. It is most likely that Indo-European noun stems were overtly marked for dualness. Written
records show duality in some Indo-European languages. Eventually, the feature became overtly unmarked in most Indo-European languages except the Slavic languages Slovenian and Sorbian, where the feature [Dual] remains overtly marked. The feature [Dual] is covert is most Indo-European languages.

9. Process

The process of agreement is covered in this section. Just where in the grammar this occurs is another topic.\(^6\) Too many issues abound.

The determiner THIS is marked with the features \{[+Def], [+Prox], [-Pl}\}. The feature [-Pl] is incomplete. All such features must be marked for plus or for minus. Any unspecified feature at surface structure is ungrammatical:

\[(59) \quad \text{The Unmarked Feature Constraint} \]

\[* \text{all forms that contain unspecified features at the surface level (or at S-Structure).} \]

Such unmarked features must receive a sign. I will show below that links provide the means of how unmarked features receive a sign. Copying a sign to an unspecified feature is a process.

The number ONE is inherently marked as \{[+Count], [-Pl]\}.\(^7\) These features must agree with the same features in the complement of the number in the syntax. The noun SANDWICH is marked for its inherent features [+Count] and [-Pl] among other feature not relevant to this problem. Since both the

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\(^6\) One possibility is that structures such as \{Num, N\}, \{D, N\}, and Q, N\} are memorized and occur in a lexicon-like (sub)component. In this case, N would have to contain [±Pl], for example. In the production of speech, the word form would have to have the appropriate feature value. The idea of a structure component occurs in DeArmond, unpublished).

\(^7\) The only singular number in English is one. The remaining quantifiers are [+Plural]: Half of them are, 2/3rds of them are, none of them are, and so forth.
number and its argument are marked for count, the features must agree or the sequence will fail.

In percolation, the marked feature is copied up one node at a time until it reaches the first node that dominates the form containing the marked feature and the form that must agree with the marked feature. Linking eliminates all the steps necessitated by percolation. Two similar features of two linked items must agree. If both items contain the same feature, the construction passes. If they do not agree in polarity, the construction fails. This a far simpler solution than percolation.

Given two linked nodes where one is marked for a feature and the other is unspecified for the feature, something must happen if the two nodes are to agree. One approach is that the feature is somehow copied, a process somewhat akin to “move alpha”. However, another approach appears to be better Suppose that either ‘plus’ or ‘minus’ is inserted into the unspecified position of a feature:

(60) \[ \text{[Feature]} \rightarrow \text{ [+Feature]} \text{ or [+Feature].} \]

If the head and the complement fail to agree, the construction fails. If they agree, the construction passes.

In the case of number and its complement, the construction may be written simply as:

(61) \[ \text{[Number]} \rightarrow \text{ [Noun]} \]

Example (61) is a short form of the construction which may be represented as the tree structure for TWO SANDWICH
Starting with the feature [+Count], they must agree. Example (62) represents the structure for TWO SANDWICH including the feature [Ct]:

(62) [TWO, [+Ct]] — [SANDWICH, [+Ct]].

In this case, the feature [Ct] is positive in both the number and noun. Next, example (62) is revised to include the feature [Pl]:

(63) [TWO, [+Ct], [+Pl] — [SANDWICH, [+Ct], [+Pl]]].

The feature [Pl] in both forms do not agree. A polarity sign must be inserted:

(64) Insert a Polarity Sign

Insert the binary values ‘+’ or ‘−’ / [−Feature].

If ‘plus’ is inserted, the feature [Pl] agrees in both forms. Of course, if ‘minus’ is inserted, the features do not agree and the construction fails. The same process applies to the feature [Dual].

Another constraint on the sign of features is that an inherent sign cannot be changed. For example, *trousers* is inherently plural. It cannot be the complement of *one*:
(65) *one trousers.

Obviously, *trousers cannot be changed to singular:

(66) *one trouser.

The Sign Changing Constraint is proposed to account for the above.\(^8\)

(67) The Mapping Constraint

\[ * [\alpha \text{Feat}] = [-\alpha \text{Feat}] \] (mapping constraint).

The sign can be changed in lexical derivation:

(68) a. egg, [+Count], Lolita cracked an egg open.
   b. egg, [-Count], Howard has egg on his tie.

Of course, the meaning of *egg also changes.

4.4 Determiner Agreement

Determiners and quantifiers must agree as well. As is well known, only the demonstratives show agreement with quantifiers for plural:

(69) a. this book, these books
   b. that goose, those geese

The links for *this book (62a) and inherent features and signs are shown in Figure (63). The feature \(_{\text{Pl}}\) in D is linked to \(_{\text{Pl}}\) in the noun. Example (62) there must be a number, which must be INDEF in this case. It is inherently [+Pl].:

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\(^8\) This is an extension of the principle that was proposed around 30 to 35 years ago: a transformation cannot change the meaning of any constituent.
When features are added to figure (63), the representation becomes harder to read.

(71) The underlying (or initial) structure for example (62a):

The feature [\_Pl], which occurs in D and N, must acquire a sign. N must agree with Num: [\_Pl] \rightarrow [+Pl]. D is linked to N, in which case [\_Pl] must also be marked ‘+’. Similarly, the feature [\_Dual] in N must become marked ‘-’. Agreement is now complete in (64).

10. Other Examples of Linking

There are more cases of linking than agreement in NP. They are not covered in detail here. All these examples remain for further research.
10.1 Antecedent Trace and Variable Linking

I began this paper citing example (1) on the link between the antecedent and the trace. The major difference here is that does not appear to be a predicate-argument link. In the later versions of Chomsky-based syntax, the link is created by movement or feature copying. What if there is no movement or copying of features? One possibility is that the antecedents are connected to operators that are linked to at least one argument.

Consider a WH-construction:

(72) Who$_1$ did Bill see t$_1$?

It is possible that the WH-word is an operator that takes one argument, the trace of who. If that is the case here, then who is linked to the trace. In this case, all of the features of who must match those of the trace. It is possible that WH is an operator with the argument N. If so, then linking applies here as above.

This problem is put aside for further research.

10.2 Subject-Verb Agreement

Subject-Verb Agreement occurs in many languages. In many languages the subject and the verb must agree for person and number such as English:

(73) a. The cat is happy.
    b. The cats are happy.
    c. I am happy.

Linking is required for subject-verb agreement. Empty features in the verb must agree with the same in the subject noun. Here the subject noun must c-command the verb, because the verb must agree with the head of the subject
for person and number. This does not appear to be a large problem. It deals with the operators in the verbal construction. This topic is complex and too long to cover here. However, it does suggest that the subject should be an operator as well.

10.3 Raising

Raising is a construction that links a subject (prominence) to a trace in an immediately lower clause:

(74) Louise₁ appears t₁ to be competent.

If the subject, Louise, is an operator, then the subject is directly linked to its trace. In this case raising could be an operator whose argument is the trace of the NP subject in the clausal argument.

10.4 There Insertion

The most interesting thing in *There Insertion* is backwards agreement:
(75) a. There was a book on the table.
b. There were some books on the table.
c. *There was some books on the table.
d. *There were a book on the table.
e. There was a book and a newspaper on the table.
f. There was a book and some newspapers on the table.
g. There’s a book on the table.
h. There’s some books on the table.
i. ?There’re some books on the table.

The expletive pronoun *there* has no feature of number. Thus, there is no sublinking for number between the pronoun and the noun that follows it. The problems in the agreement of the verb *be* and the noun that follows it. The agreement here does not follow the standard rules for forward linking.

If the predicate object (subject of the small clause) is singular, the agreement is singular. If the predicate object is plural, the agreement is plural. If the predicate object contains two conjoined NPs, they should be plural. But this is not the case if the first one is singular. The agreement with predicate verb is usually singular, though the plural is acceptable but not strongly so. A similar problem occurs if the predicate is a clitic adjoined to the expletive pronoun. The task is to determine how the first NP but not the second NP is linked as opposed to normal subject verb agreement the conjoined NPs are always plural.

Backwards agreement occurs in these examples. Two major problems arises when the auxiliary verb agrees with the first singular noun phrase as in
(80e) and (80f). And the use of singular contracted auxiliary when the agreement should be plural is another example that is the second problem

5.6 Concord

Wechsler and Zlati (2003) first differentiate between pragmatic and grammatical agreement. Pragmatic agreement is semantic and it is not determined by grammatical rules. Wechsler and Zlati (W&Z, p. 9) provide the following example:

(76) A cowboy approached the bar. She ordered a drink.

The pronoun *she* cannot be coindexed with *cowboy* since the latter is semantically male, whereas the pronoun can have only a female referent. I will return to this below.

Wechsler & Zlati (2003) next differentiate between concord agreement and index agreement. The former is grammatical, the latter semantic. Linking occurs with concord agreement.

Index agreement is semantic in nature. Wechsler & Zlati (2003: 12) cite the following examples to illustrate this. It is well known that anaphors must agree with their antecedents. Index agreement is not evident in English. It is evident in inflected languages. For example, consider the Russian examples:

(77) Ona xoroshij professor.

she good (m. sg. nom) professor (m. sg. third pers.

‘She is a good professor.’

The noun *professor* is masculine, and concord requires that the adjectives that modify it must be masculine. The pronoun *ona* is feminine singular nominative.
The selection of this pronoun is an example of index agreement. Certain nouns referring to profession are masculine in concord, but may be feminine or masculine in index. If it is known that the professor is female, the feminine form must be used. Whether one uses the masculine or the feminine form depends on the pragmatic knowledge, whether the person is male or female. In unknown cases, the default is the masculine.

The adjective is a lexical predicate. Its argument is the noun it modifies. It is linked to the noun and it must agree with it for number and case. This is common in languages of the world. The problem here is index agreement. The Russian word professor must be marked [-Fem] for grammatical agreement and it must be marked for index agreement. For this class of words in Russian (and in several languages) a natural gender set of features must be included, which may be related to grammatical gender but not necessarily. A set of features [±FGen] (feminine or masculine gender) is proposed. The remaining problem is to work out the linking for constructions of this type.

Wechsler & Zlati cite as an example of pragmatic agreement the generic pronouns one and you that differ in register only:
In the first two examples, the reflexive anaphor must agree with the subject pronoun. This is grammatically determined (concord) as the last two examples show. Such words as ship have two gender indices: feminine (marked) and neuter (default). Register may be mixed in selected the index, but mixing is not possible in cases of concord. This mixing seems reasonably acceptable. It might not be acceptable in very formal grammar, but the lower register (you) is not acceptable in formal grammar.

The links occur in concord agreement, which is bound in syntax. A theory of index linking seems impossible. This is due in part to the problem of discourse analysis where the speaker and the addressee interchange between sentences in a discourse:

(79)  

| a. Did you₁ buy yourself₁ another book on syntax? |
| b. No, but I₁ did buy myself₁ a book on set theory. |

11. Conclusion

In conclusion, linking theory is theory of the relationship of a verbum (a lexical predicate or an operator) and its argument(s). Linking accounts for agreement, which is a process and is subject to a linking constraint and a universal constraint:
(80) Insert the binary values ‘+’ or ‘−’ / ___ [-_Feat].

(81) * [αFeat] — [-αFeat]. (linking constraint)

(82) * [αFeat] = [-αFeat] (mapping constraint).

There are several problems to be resolved. Once such problem is how the PP arguments of a predicate are linked — there are no agreement features. For some languages, e.g. Georgian, Russian and Polish, to name a few, there is agreement with the head of dative NPs (Falk 2006). In these languages, is the dative NP a dative subject? Switch-reference (Falk 2006) is another example. Falk discusses many constructions that must be worked out.

Looking into the future, linking theory once it has been completely worked out, will someday correspond in some way to neurons associated with grammar and language in the brain (Feldman. 2006, Pulvermuller 2002 and Loritz 1999).

12. Bibliography


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