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EXPANDING *AGREE*

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ABSTRACT

Modern research in syntax indicates that explanations incorporating fewer and simpler mechanisms are preferable to those that use more complex context sensitive means. This article accords with the goals by examining the possibility of expanding Chomsky's proposed mechanism Agree (2001, 2002) to account for the assignment of theta-roles and case as well as binding relations. Furthermore, the approach presented here begins to account for the reasons underlying this type of solution, addressing questions of Explanatory Adequacy.

Keywords: Agree, binding, case, thematic-roles, features.

1. Binding, Case and θ-roles – Are three sub-thoeries necessary?[1]

Human language, amongst other things, allows people to relate information about events. Events, however, do not happen by themselves. Thus language must also relate information about the players involved in the events being described. These 'players' are related in several different ways:

(1a) They are related to the event.
(1b) They are related to the grammar/syntax of the sentence.
(1c) They are related to the real world.

These are three 'interfaces' that seem to lie at the heart of human language. In linguistic terms they are known as:

(2a) θ-roles
(2b) Case
(2c) Binding

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[1] I would like to take this opportunity to thank the *PSiCL* anonymous reviewer, whose comments and incites have helped to improve and strengthen the argumentation and approach presented in this paper.

θ-roles, Binding and Case are three key elements for the interpretation of human speech. Each in its own way allows the speaker and the hearer to determine what role a given nominal is playing in a particular area of the grammar. θ-roles relate nouns to the event, describing the role that they play. Case tells us what grammatical function the nominal is playing in the sentence. And finally, Binding provides semantic information about whether two nominals in the sentence refer to the same individual in the real world or not. In earlier stages of generative grammar, each of these relations was accounted for by an individual sub-theory to explain their distribution. In the spirit of the Minimalist Program (MP), I would like to hypothesize that, in fact, each relationship works according to the same mechanism, namely an expanded version of Chomsky's 'Agree'.

I realize that Chomsky himself (2000, 2001, 2002) has argued that Agree applies to specific types of features and that he argues against θ-roles being assigned by Agree. But his understanding is that Case assignment is a feature-checking event, and θ-role assignment is not. According to Chomsky θ-roles are assigned via *pure (internal) merge* and never involve *move* or *internal merge*. He argues that extra features or movement into A-positions would require additional rules, which enlarge the model. Furthermore, he would relegate Binding to the semantic level, not including it in the Narrow Syntax (NS) at all. On the other hand, Chomsky has little to say about how θ-roles are actually assigned, accept to say that Hale and Keyser's (1993, 2002) model is promising.

My understanding of these relationships, however, leads me to believe that they in fact are part of the Narrow Syntax, and that they can be accounted for during the derivation without departing from the tenets of the Minimalist program.

In the first part of this article, I will briefly go over the Government and Binding (GB) assessment of Case, θ-roles and Binding, and show how they are incompatible with the Minimalist Program. I will discuss the approach to the unification of these three relations as presented in Moss (2002), and show what needs to be done to streamline the thoughts presented there.

Next I will present a model of how Agree can account for all three relations. Finally, there will be a short discussion of the problems with Agree and the issues left to be resolved.

1.1. Binding, Case and θ-roles

In GB, the three relations to be discussed here bear striking similarities to each other. First, they all involve Government. The domain in which they operated was very local (in the worst case (Binding) the domain was restricted to NP or S). Each relationship involves some kind of marking to indicate the members of the relationship. Furthermore, each of the relationships provides the speaker/hearer with a way of organizing the information being transferred. Finally, in GB, each of these relations was associated with a different level of the derivation. θ-roles represented d-structure; Case occurred at S-structure, and while Binding was not as strictly connected with a level, it was used in proofs of their existence.

It seems strange for these similarities to be coincidental. If human language does represent an optimal design, it would be unlikely that such similar phenomena would be controlled by three separate mechanisms with three individual sets of rules.

1.2. A combined theory

In Moss (2002), I proposed that each sub-theory could be reduced to a kind of Binding. I argued that each relation was limited to a domain in which each of the elements involved needed to be found and that these elements needed to be co-indexed with the other. Indexation here is not limited to the indexes of Binding. To achieve this, I treated θ-roles and unspecified Case features as indexes as well as the standard indexes found in Binding theory. In a way, this is really the first step to bringing these relations into the Minimalist Program. By treating them in this way, I made referential θ-roles and Case more like features, which has become a more common treatment, at least for Case in current theories. However, in that work, I did not take the final step and call them features, as I do here.

Moss (2002) proposes that all three relationships operate under the same basic conditions, which can be generalized as follows:

(3) An element α relates to an element β if α c-commands β, and α and β are co-indexed (within NP or S).

1.3. Incompatibilities with Minimalism

Combining three sub-theories into one is inherently useful in terms of making the model more optimal. Nonetheless, MP has set various guidelines that other phenomena must accord with. These include restrictions on domain types and modification of lexical items (LIs). The guidelines that are important for this theory will be outlined briefly below.

MP has rewritten much of the thinking since the days of GB. Significantly, Government as a relation has been eliminated from the model. Furthermore, it is now understood that there are no levels of derivation, eliminating d- and s-structure and any reference that theories of θ-role or Case assignment might make to them. Perhaps most importantly, Minimalism does not allow the numeration to be modified after selection (during the derivation). This means that the indexes familiar from traditional Binding are also no longer welcome.

However, these hurdles can be overcome. As was shown in Moss (2002), c-command is in fact a better relation for syntactic description than government. As

Epstein et al. (1998), have shown quite successfully, c-command is a relation that results naturally from the process of sentence production. Thus, it is natural to use it in the description of syntactic relations over other types of more or less restrictive domains such as government, m-command, l-command etc. The absence of 'levels' in the derivation becomes natural under the phase theory of derivation (Chomsky 2001) in which sentence production is broken down into lexical, event and functional (LI, *v*P and CP) phases. Incorporating Keyser and Hale's (1993, 2002) approach to argument structure, and Williams' (1994) observations on the relational nature of θ-roles, it is possible to assign the distribution of θ-roles in specific places within the structure which makes the association of d- and s-structures less necessary. Finally, features can be used to replace indexes. Case is widely recognized to be a feature phenomenon now. Hornstein (2001, 2002) has further proposed that θ-roles be treated as features. Although I did not call them that in Moss (2002), it is not a great difficulty to translate the proposals made there into a feature-based theory. Particularly Williams (1994 and earlier) works to show that nominals also have 'unspecified' 'R' θ-roles which act very much like unspecified features in other models.

The only problem remaining is what to do with the traditional indexes used in Binding. What if we were to propose that Binding is also a kind of feature matching? We will investigate this path in a moment.

2. Agree

2.1. Background

Agree was introduced suddenly in 1999 in Minimalist Issues (MI), seemingly after Chomksy had had enough of the Affix Hoping problem:

(4) "A second [operation] is an operation we can call Agree, which establishes a relation (agreement, Case checking) between LI α and a feature F in some restricted search space (its domain)." (Chomsky 1999:101)

He goes on to say that Agree and Merge are quite different:

(5) "Unlike Merge, this option is language specific, never built into special-purpose symbolic systems and apparently without significant analogue elsewhere." (Chomsky 1999:101)

Thus Agree takes two elements α and β and makes sure that they have matching feature sets. No more playing cat and mouse with the V chasing its inflectional endings up and down the tree.

This mechanism is, of course, well suited as a replacement mechanism for Case and θ-role assignment and Binding in MP, because it was built with MP in mind. It does not use Government. It does not rely on indexing. And there is no need for derivational levels.

Agree states (generally) that within a specific domain, an element α with uninterpretable features will search out an element β with appropriate interpretable features to match. After matching the features, one set will delete, the other set will remain to be used at the PF interface.[2] Specifically, Agree has the following advantages as a mechanism governing the three phenomena in question:

(6a) It is based on c-command.
(6b) It relies on feature matching and not indexing.
(6c) It contributes to an understanding of Phase construction over d- and s-levels.

2.2. How does Agree work?

Agree is a system where by an item α matches its uninterpretable features against the interpretable features of an item β. Uninterpretable features are features that are not specified for value and are thus uninterpretable at the semantic interface. The driving force behind Agree is the deletion of such uninterpretable features before LF or [SEM], which occurs after the features match. The element seeking to delete uninterpretable features is called the probe and the element providing matching interpretable features is the goal. Both are 'activated' by the presence of interpretable features. The original features involved in Agree were ϕ-features for number and gender. This was later expanded to Case and the EPP feature on T (and perhaps on C). Chomsky sees Agree as a two-way relation: nominals have interpretable ϕ-features but uninterpretable Case features, while T and v have uninterpretable ϕ-features and interpretable Case features.

2.3. Advantages and disadvantages

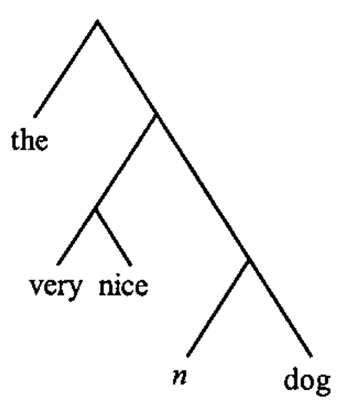
The advantages presented by using Agree over Binding as the mechanism to describe the distribution of Case, θ-roles and Binding relations as in Moss (2002) are the following: Agree is a product of MP; it is based on c-command, it does not require indexing. However, Agree is not entirely transparent. Chomsky has outlined

[2] The reviewer points out that in fact both sets of features could be sent to PF (the agreement on v/T as well as the number feature on the Subject NP). This brings up, of course, an interesting question concerning the mechanism of *Agree* in general. Discussion of optional non-deletion of features in checking relations is also discussed in Ura (2000).

the way it works, but there is no explanation for its basis. The use of terms such as *Activate, Probe* and *Goal* makes Agree quite active but still remains descriptive rather than explanatory. More technically, Agree works between a head α and a phrase P(H) that has the features of the head H. But there is no real explanation of how the features *percolate* from the head to the phrase. Apparently the features move up the phrase due to the fact that they, in fact, become the label of the phrase during the derivation. Finally there is the 'deletion' operation, which theory has avoided in the past, but now seems to be acceptable.

One solution to the *percolation* problem may be found in Collins (2002). There, Collins argues for the elimination of labels in syntactic structures. He argues that a theory of phrase structure in which V is merged with X produces {V, {V,X}} in which the outer V is the label (as proposed by Chomsky 1995a, 1995b) is less economical than a phrase structure component in which the merger of V and X produces simply {V, X}. In this system, c-command only occurs between a lexical/functional item and other elements further down the tree, or between a head and its complement. If a phrase is merged into the structure, it can only enter into an agree relation with something that further c-commands it, but not with any of the elements below. So, in the phrase *the very nice dog*, *very* and *nice* c-command each other, but neither c-commands *dog* as in (7):[3]

(7)



On this story, the elements must agree with each other as they merge, leaving the features that still need to be checked on the head or the maximal projection.

Agree also makes use of an operation called *delete*, which adds to the complexity of the mechanism and leads to further questions such as when do they delete and when is the structure spelled out? Deletion has been avoided in the past, because it

[3] Collins suggests that, in fact, nouns first merge with a light *n* projection (the equivalent of light *v* in verbal projections) for agreement purposes, as shown in the diagram.

adds to the technology without justification. The removal of features before LF is required so as not to send uninterpretable features to the LF which would cause the structure to crash, or to send interpretable features which would only add unnecessary bulk to the LF output. But how deletion actually works is not clear. Epstein and Seely (2002) further discuss the problems related to deleting features before spell-out (SO), and conclude that, optimally, deletion and SO should occur *within* the rule being applied (merge, move etc.). If this is the case, then deletion would be a property of transformations which would lighten the load on the model as a whole.

Thus, Agree has its advantages and disadvantages. On the up side, it provides motivation for movement and implies the deletion of features before LF. On the down side, however, it needs some further work on the details in order to fully incorporate it into the model.

3. Expanding Agree

3.1. Expanding Agree to include other syntactic relations

Agreement is about feature checking. Thus, if it is going to be used to explain the syntactic relations being discussed here, each of them must be re-defined in terms of features. Fortunately, this is not as outlandish as one might think.

First of all, Hornstein (2002) argues that treating θ-roles as features would allow us to do away with chains, which is a welcome conclusion for LF structure. He argues, contra Chomsky, that θ-roles are necessary at LF and that this can be achieved if they are features on the arguments relating them to the event in a Davidsonian sense such as (Hornstein 2002: (5)):

(8) Bill arrested John.

There is an event *e*: (arresting(*e*) & Agent(Bill, *e*) & theme(John, *e*).

The problem with θ-features and Agree is that since they will be unvalued on the nouns in the numeration, they will be erased (shortly) after Agree applies[4], which means that they will not be present for interpretation at LF. As mentioned above, however (and see (Epstein and Seely 2002a) for more details on why features may not be deleted based on whether or not they are valued as opposed to ±interpretable), I propose that θ-features cannot be deleted at or after Agree because they are necessary to proper LF interpretation. How this is to be achieved requires further research.[5]

[4] See Eptsein and Seely (2002a) for a criticism of the state of affairs as they stand in Chomsky (2001 and later).

[5] In general addition and deletion of elements such as features, indexes etc. during the derivation is frowned on due to the Inclusiveness Condition (Chomsky 1995: 228). As a result, the system finally adopted should hopefully not have to resort to any feature deletion.

Case is currently seen as a feature-based operation, which makes this unproblematic for the model.

Binding may be the most controversial component of the model. However, it is not beyond the pale. The main problem with the indexes used in GB Binding is that they are added to LIs during derivation. MP would rather that LIs remained the same. Some research, however, seems to show that the indexes used for Binding are actually part of the LIs themselves. For instance, Williams (1994) proposes that nominals have an R θ-role that serves both feature-like and Binding-like purposes in that it relates a nominal to an element in the real world. Further, Fiengo and May (1994) argue that co-reference is an occurrence of syntactic 'reconstruction' based on reference to the same 'real' item. Meaning that reference is *part* of the noun as an LI itself, and that it is the syntax that recognizes this reference and not the LI that is modified. Finally, and most importantly for this paper, Hornstein (2001) uses the copy theory of movement to explain co-reference as multiple copies of the same element in the course of the derivation. This is coupled with the assumption that 'self' can be identified as a separate lexical element.

I propose, along the lines outlined above, that nominals have reference when they are selected to the numeration. This reference can be specific or general depending on the intentions of the speaker. Further, this reference must occur at LF (or SEM/Σ) for interpretation. The reference feature I (identity) seems to have the characteristics ±*specific*.

Hornstein points out that the copy theory of movement also provides an explanation of co-reference in which items refer to each other when they are copies of each other (see above as well). If we say that 'self' and 'each other' have an uninterpretable I feature that need to agree for deletion before LF then this will also fit into the paradigm.

4. Putting the system to work

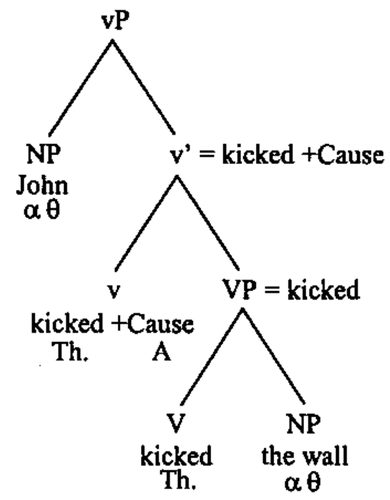
In this section I will present sample derivations of the syntactic relations discussed above. This presentation will not show all of the potential structures in which the relations in question appear, but will at least outline how the system works.

4.1. θ-roles and Agree

First let us inspect how θ-features are checked using the expanded *Agree* mechanism. In a sentence like *John kicked the wall*, θ-features need to be checked on two arguments as illustrated in (9) overleaf.

Using technology from Keyser and Hale (1993, 2001) and Larsonian verb shells, we create a V projection from the verb *kicked* with a light-*v* projection containing

(9)



the causative affix. I propose that the verb *kicked* is able to match one θ-feature, namely the Theme. At the time of selection from the numeration, the verb has a valued θ-feature and the potential complement does not. Thus the verb is active and seeks a goal. At this stage it does not have far to search, since the structure contains two elements. The causative affix is chosen from the numeration and merged into the structure. I modify the standard belief that the verb contains both the Agent and the Theme θ-features. I propose that the causative affix possesses the valued Agent θ-feature, which makes it an active probe seeking a goal, which it finds by merging with the argument *John*. At this point all I can suggest is that Agreement is reached through the label *kicked+Cause,* which c-commands the specifier position containing *John*. This derivation has the additional benefit that all θ-features are checked within the light-*v* projection, setting this type of checking apart from other types as will be illustrated below.[6]

4.2. Case and Agree

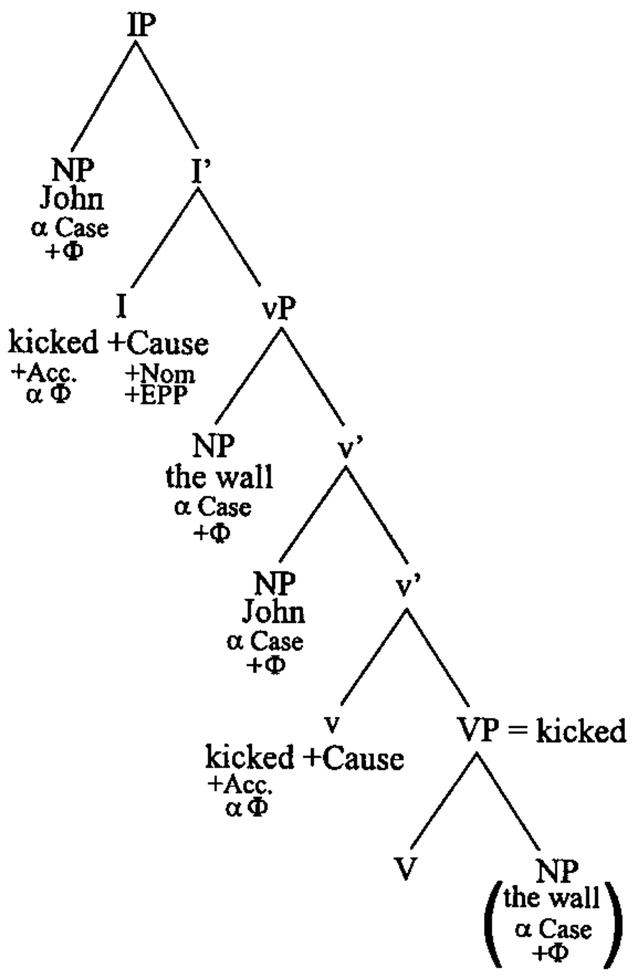
Case is the standard application of Agree and as such need not be commented on in detail. In (10) below, I will present how Case is assigned using the same sentence as in (9) above.

In the Agr-less theory of Case checking, as presented in Chomsky (1995b) and elsewhere, accusative Case is checked in the outer specifier position in *v*P. Again

[6] This, of course, brings up the question of what to do with the Agent in passive constructions. The *by* phrase has always been a problem for generative grammar. At present, I do not have a good answer as to what to do with the *by* phrase. On this approach, the light-v projection will also be necessary in the passive construction, providing the causative affix and assigning the agent θ-role optionally. I would like to thank the reviewer for pointing out the omission of this information in earlier versions.

this either happens through percolation of the features up the structure in labels as hypothesized for θ-features. Or we could adopt Epstein and Seely's (2002) explanation outlined above, that Agree is actually transformation internal, i.e. the result of a rule that can compare the input and output of a stage of the derivation. It seems that Epstein and Seely's approach is more explanatory as it gives reason behind the ability for Agree to actually *check* features. Finally, the unvalued feature on John is checked via Agree with the valued feature on I after (or during) movement to the specifier position.[7]

(10)



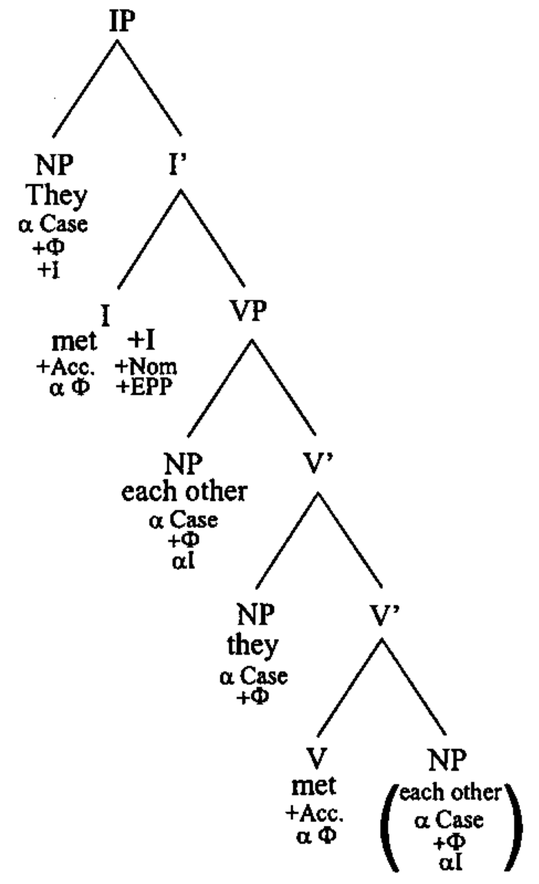
[7] In response to a comment made by the reviewer, I realize that the standard analysis shows Case being valued on the subject noun by features on T, and that the +EPP feature independently forces the subject to move. I would prefer to remain neutral on this point, without commenting on the values of this analysis for the moment.

As a note, I suggest that checking of θ- and Case-features in prepositional phrases is achieved via a light *p* projection over P. In this way, the θ-feature is checked when merging the argument with the preposition to form the underlying head complement structure. Case-features agree after the head P moves into a *p* position and the prepositional argument moves into an the P specifier position.

4.3. Binding and Agree

Hornstein presents convincing argumentation for *-self* and copying (Hornstein 2001). Evidence presented above indicates the necessity of a new feature I (identity) on nominals which is marked specific (+) or unspecific (–). If we take an example with *each other* we can present the following derivation:

(11)



In this derivation, Case and θ-features are checked on *each other* as described in the previous sub-sections. *Each other*, however still has an unvalued I feature that must agree with a nominal in the sentence before SO. It is difficult to say, however, what

causes the features to Agree. For a lack of a better solution, since the Binding relation is closely tied to semantics, perhaps this type of agreement is triggered by the actual transfer to SO itself.

It has been suggested by the reviewer that perhaps reflexive or binding agreement occurs early in the derivation, and that the binder then moves to a c-command position in the course of the derivation. If we accept my proposal that anaphora are unspecified for I in the Numeration, and if we further accept Hornstein's (2001) proposal that anaphora are semantically empty elements that allow a noun to be associated with more than one θ-role, then the pieces start falling into place. The anaphor and its antecedent must be selected from the numeration one after the other for Merge. This is necessary for the anaphor to gain the correct features from the antecedent via Agree. The antecedent then moves up the structure for case assignment and will, by default, arrive in a position that c-commands the anaphor to *satisfy* what has traditionally been known as Condition A (Chomsky 1981). The advantage to such an approach is that it starts to explain binding theory, instead of simply observing the conditions of well-formedness.

Such an approach, in fact, ties in extremely well with the approach proposed in Zwart (2002), concerning the derivation of Binding conditions. Zwart argues that relations of co-reference are established because a Referential expression or a pronoun are merged directly with the reflexive pronoun or other anaphora in sister relation as shown below (Zwart 2002: 269):

(12) [α β]

He further argues that in a sentence like *John killed himself* the first elements to merge are *John* and *himself* producing <*John himself*>. As the derivation continues, *John* is unable to (using Zwart's terminology) "acquire features relating to argument structure [...] (thematic roles) and grammatical function (subject/object, Case)" (Zwart 2002: 279). As a result *John* is forced to move out of the original structure to a new position producing *John killed* <<*John*> *himself*>.

Zwart's approach, however, differs from mine in that he proposes that anaphors *receive* a [+coreferencial] feature from their antecedents. This type of *feature assignement* does indeed run the risk of violating the Inclusiveness Condition, by changing the anaphor's feature structure in the course of the derivation. By using Agree, we can explain why the two elements are drawn into the derivations together (for feature agreement) and we don't run into the potential problems with the Inclusiveness Condition, because the feature I (although unvalued) is *on* the anaphor when it enters the derivation.

In conclusion to this section, I must thank the reviewer for his/her suggestions, which have led to what I think are much stronger arguments supporting Binding as the result of Agreement. I was unfamiliar with the work presented in Zwart (2002) until the revision of this article was in progress, but the similarities in our arguments lead me to believe that this is the right line of thought.

5. Unresolved questions

5.1. What is the driving force behind Agree?

In this paper we have looked at Agree as a potential mechanism behind Case and θ-role assignment as well as Binding relations. One might argue, however, that Agree itself is still missing a driving force. Each of the different types of features proposed seems to have different needs. For instance, with inflection, the Verb is looking for features to agree with its subject (and in some Cases its object). In θ-role assignment, it is the other way around, the nouns have unvalued θ-features that need to agree with valued θ-features on the verb and the causative affix.

Case assignment seems to be similar to θ-role assignment, although this time the feature is purely syntactic. A possible solution is that, Case is not assigned by lexical items, but that it is a syntactic agreement with a functional projection as listed below:

(13a) Nominative is assigned by I
(13b) Accusative is assigned by *v*
(13c) Oblique Case is assigned by *p*

6. Conclusion

In this paper, I have presented a model in which Case and θ-role and Binding relations are all accounted for using Agree. In order to make this possible, each of the relations has been represented using specific feature types instead of traditional indexes, θ-grids etc. This model reduces the number of individual syntactic mechanisms needed to *make language work* and, in part, provides evidence for *why* and *how* these syntactic relations are created.

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