

Language and Mind
Prof. Rajesh Kumar
Department of Humanities and Social Sciences
Indian Institute of Technology, Madras

Module – 07
Lecture - 35
Sentence
Binding

We are looking at sentences to understand underlying patterns. These underlying patterns of language help us understand, how language functions with respect to human mind. Human mind decodes set of principles that help us understand these underlying patterns and thus, we are able to speak language. We have seen several examples of these underlying patterns so far at the levels of sounds, words and sentences.

In order to continue looking at sentences to see a few more underlying patterns, today we are looking at - Binding. We have looked at referential expressions, we have looked at elements which are dependent on interpretations and these interpretations work at a different level of representation in human mind. The level of representation in the human mind where these interpretations take place is the same level where we have seen displacement taking place; that is deeper structure.

(Refer Slide Time: 02:01)

Classification

- Anaphors: *himself, herself, itself...*
- Pronouns: *she, he, her, his, it ...*
- R-expressions: *John, the student ...*

Let us look at how binding works for giving us interpretations. So, we have seen three elements like anaphors, pronouns and referential expressions. We have looked at these things in details that anaphors are elements like: himself, herself, myself, ourselves; pronouns are elements like he, she, I, us, we; R-expressions are noun phrases like John, the student, the student of physics, etcetera.

(Refer Slide Time: 02:37)

Binding Theory

- Module of grammar/theory regulating NP interpretations is called Binding Theory.
- Binding Theory has three Principles. They govern distribution of NPs.
- They are called:
 - Principle - A
 - Principle - B
 - Principle - C

We have seen that there are three principles which take care of these three types of elements in natural language and each of these principles like Principle - A, Principle - B, and Principle - C are taking care of anaphors, pronouns and R-expressions. Principle - A takes care of anaphors, Principle - B takes care of pronouns and Principle - C takes care of referential expressions. We are going to look at how these things work.

(Refer Slide Time: 03:11)

Anaphors

- An **anaphor** does *not* get its meaning from the open world – it depends on something within the sentence.
 - John saw **himself** in the mirror.
 - Mary bought **herself** a sandwich.

We have seen what anaphors... what we mean by anaphors; like anaphors need co-indexed antecedent within the sentence; that is, anaphors do not depend on their interpretation outside the context of sentences.

(Refer Slide Time: 03:35)

Pronouns

- A **pronoun** doesn't refer to something in the open world too. However, it may get its reference from somewhere else and does not need to depend on something within the sentence.
 - John told Mary that **he** likes pizza.
 - Mary wondered if **she** agreed.
- ...but it doesn't *need* to be something in the sentence.
 - Mary concluded that **he** was crazy.

Pronouns may find its interpretation within the sentence; however, at times, they have to find their interpretations outside the sentence as well. However, R-expressions always find their interpretations in the real world; that is, outside the domain of the sentence.

(Refer Slide Time: 04:07)

The problem

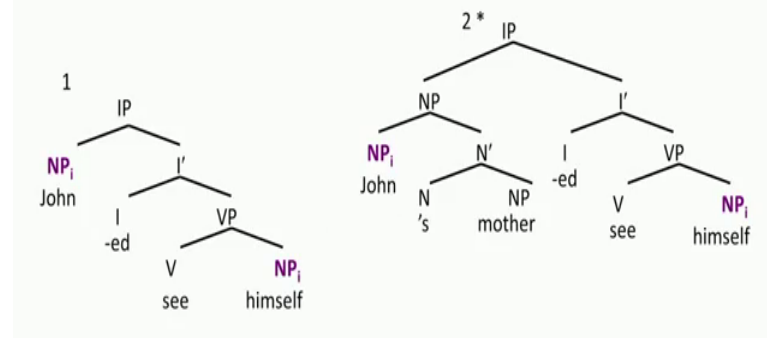
- There are very specific configurations in which anaphors, pronouns, and R-expressions can/must be used.
- Even though both *he* and *himself* could refer to *John* below, you can't just choose freely between them.
 - John saw himself.
 - *John saw him.
 - John thinks that Mary likes him.
 - *John thinks that Mary likes himself.
 - John thinks that he is a genius.
 - *John thinks that himself is a genius.
- Binding Theory answers: When do you use anaphors, pronouns, and R-expressions?

With these, we looked at the problems like, when we have sentences like ‘John saw himself’, this sentence is good, because anaphor ‘himself’ finds ‘John’ as an antecedent within the domain of the sentence and therefore, this is fine. But ‘John saw him’ is not good when the two elements ‘him’ and ‘saw’ depend ‘him’ as a pronoun, depends on ‘John’ for its interpretations; whereas, we have seen that a pronoun can find an interpretation within the sentential domain as well. However, we see ‘John thinks that Mary likes him’ is good, but ‘John thinks that Mary likes himself’ is not good. So we want to understand, why are these ungrammaticalities possible in these sentences, where we want to say that binding theory has answer to these questions. Binding theory tells us, when we use anaphors, pronouns and R-expressions.

(Refer Slide Time: 05:27)

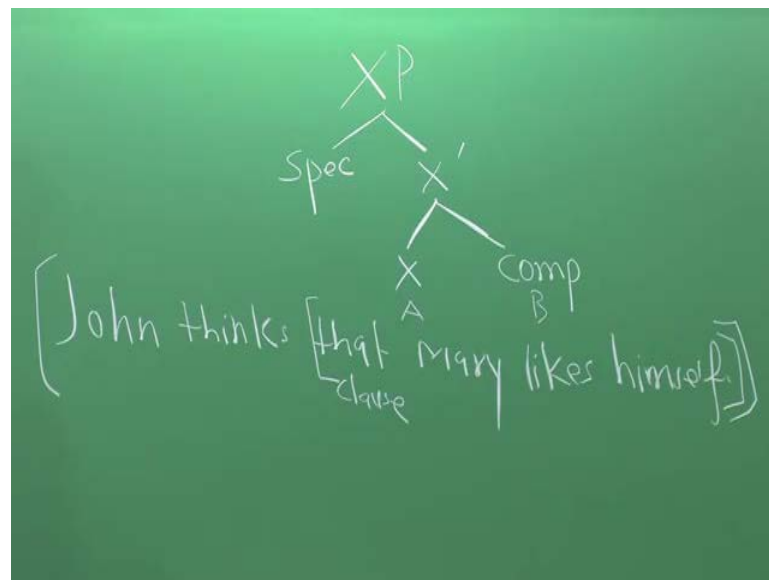
Binding

- What is the difference between 1 and 2. Why is 1 good and the 2 ungrammatical.



We have seen the notion of c-command for the purpose of interpretation of elements in the phrasal structure.

(Refer Slide Time: 05:47)



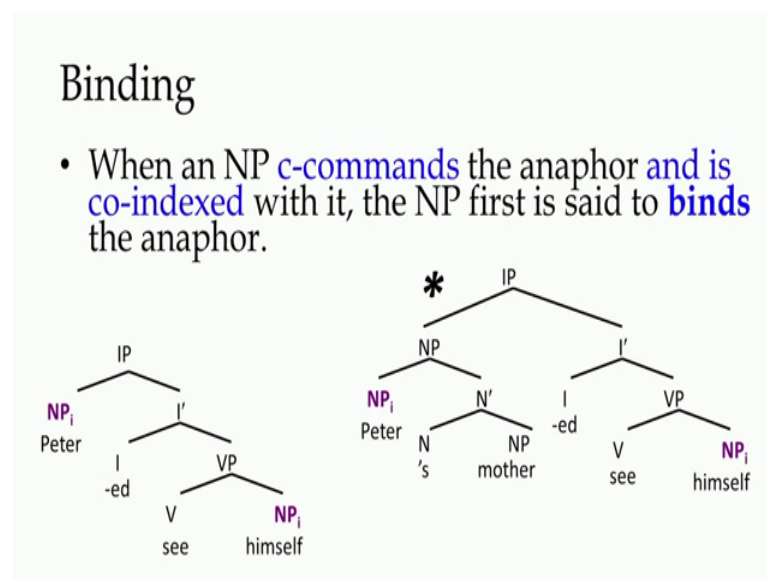
To talk about the notion of c-command once again, what we are actually saying is, if we have an X P and we have X, then in such a configuration, we are trying to say that X c-commands this one. At the same time, we are saying this spec c-commands this one too. We do not want to take you into details of debate around the notion of c-command,

because we are not looking at the theory per se. We are trying to understand the phenomenon of interpretation of certain elements to look at underlying patterns.

However, this should be clear for you to understand, what we actually mean by c-command. The simple notion involved in c-command is, if this is B, then B... and we are saying, if this is A and this is B, then, what we are saying is, A c-commands B, when this same branching node dominates both. In this simpler definition of c-command, we can say this c-commands this one, because the same branching node dominating spec, that is X P, dominates this one as well.

So, under this notion of c-command, we are saying the structure on a screen, structure number 1 is grammatical, because 'John' the antecedent of the anaphor 'himself' c-commands the anaphor; therefore, it is a grammatical sentence. However, 'John' in the second example, in the second structure does not c-command anaphor 'himself'; therefore, this sentence is ungrammatical.

(Refer Slide Time: 08:16)



So, what we say for binding condition is, when an N P c-commands the anaphor and it is co-indexed with it, then N P is said to bind the anaphor. In such a situation, we see that, N P 'John' in structure 1 on this screen is co-indexed with N P 'himself', which is an anaphor and it c-commands as well. Therefore, this structure is grammatical; however, even though N P 'John' is co-indexed with the N P 'himself' in structure 2 because, N P

'John' does not c-command the NP anaphor 'himself'; therefore structure 2 is ungrammatical.

So, there are two conditions for binding and we are looking at these two conditions in terms of structure, in terms of phrasal structure of these sentences, and how elements are represented at this level of representation in human mind. To see these two conditions with the help of a structure, for the purpose of interpretation of the element 'himself', we will say, there are two conditions, one is c-command and the other is co-indexing.

So, we can only say that A binds B, if and only if A c-commands B and A is co-indexing B. It is the same thing that we have said before. That, for this N P, for this position, this position c-commands this position; and if the N P here is also co-indexed with this N P, then this defines binding condition. And that helps us explain grammaticality and ungrammaticality of structures where we do not see... where in a grammatical structure, we see interpretation of anaphors taking place and the interpretation of anaphor does not properly take place in the ungrammatical structure.

The Principle - A that particularly deals with anaphor says an anaphor must be bound. That is, if there is an anaphor in a sentence like 'himself', that anaphor must be bound; meaning, that anaphor must have a co-indexed antecedent in a sentence and that antecedent must also c-command the anaphor. If this takes place, if this happens, then the structure results into grammaticality; however, if this does not, then the structure results into ungrammaticality. And thus, we can see the differences between structure 1 and a structure 2 on the screen.

(Refer Slide Time: 12:02)

- Principle-A explains why the following sentences are ungrammatical:
 - *Himself_i saw John_i in the mirror.
 - *Herself_i likes Mary_i's father.
 - *Himself_i likes Mary's father_i.
- Nothing c-commands and is co-indexed with *himself* and *herself*. The anaphors are not bound.

Now you see why these sentences are ungrammatical and whether or not Principle - A can explain these ungrammatical sentences. 'Himself saw John in the mirror' - this sentence is ungrammatical because 'himself' as an anaphor has a co-indexing N P in the sentence, but the N P does not seem to be c-commanding the anaphor 'himself'. Similarly, the anaphor 'herself' may have a co-indexed element in the sentence, second sentence – 'Herself likes Mary's father', but the sentence is ungrammatical because the antecedent does not c-command the anaphor.

Number 3 – 'Himself likes Mary's father' is also ungrammatical, because of this, the c-commanding. So nothing c-commands and is co-indexed with 'himself' and 'herself'; the anaphors are not bound. So, all we are saying in order to explain the ungrammaticality of three sentences on the screen is, in these cases, anaphors are not bound, because they are not meeting the requirement of being c-commanded by their antecedents. Therefore, these sentences are ungrammatical.

(Refer Slide Time: 13:51)

Binding Domains

- *John_i said that himself_i likes pizza.
- *John_i said that Mary called himself_i.
- The NP *John* c-commands and is co-indexed with (=binds) *himself*, satisfying Principle A.

How do we know about the binding domain? So, now, we have said that anaphor must be bound in order for anaphor to appear in a sentence and for the sentence to result in ungrammaticality. How do we know the anaphor is bound and for that we have seen two conditions; but now we need to see, can these two conditions apply too far away from one another? Look at these two sentences on your screen now. ‘John said that himself likes pizza’ - this sentence is ungrammatical and ‘John said that Mary called himself’ - this sentence is ungrammatical too.

Now even though the two conditions that we have seen so far that anaphors must have, a c must have a co-indexed antecedent; this condition is fulfilled in both the sentences that anaphors have their co-indexed antecedent ‘John’ in both the sentences. And the antecedent must c command the anaphor. In both the sentences, antecedents c command anaphors. Then, there must be something more than the constraint on binding in terms of those two conditions why these two sentences are ungrammatical.

What would explain ungrammaticality of these sentences is, the N P ‘John’ c-commands and is co-indexed with ‘himself; satisfying Principle - A. Therefore, we can say that in both these sentences anaphors are bound and the co-indexed N Ps binds ‘himself’.

(Refer Slide Time: 15:55)

The NP *John* binds *himself* in every case.

What is the difference between 1 and 2 on one side and 3 and 4 on the other?

1. John_i saw himself_i in the mirror.

2. John_i gave a book to himself_i.

3. *John_i said that himself_i is a genius.

4. *John_i said that Mary dislikes himself_i.

– In the ungrammatical cases, *himself* is in an embedded clause.

Again, what explains this thing? So what is the difference between sentence 1 and 2 on one side and sentence 3 and 4 on the other? So, ‘John saw himself in the mirror’ is grammatical; ‘John gave a book to himself’ is also grammatical; but ‘John said that himself is a genius’ and ‘John said that Mary dislikes himself’ are ungrammatical. So, one of the differences is apparent that in the ungrammatical cases, ‘himself’ is part of the embedded clause.

Now, here is what we want to understand - as part of understanding these patterns, the notion of embedded clause. So, what we are saying is, a sentence like ‘John thinks that Mary likes himself’ - this is a sentence, but within this sentence ‘that Mary likes himself’ is a clause which is embedded. Now, the problem in 3 and 4, and also in the sentences that we have seen before; in these two sentences on your screen that ‘John said that himself likes pizza’ and ‘John said that Mary called himself’; in both these sentences and on this screen in number 3 and number 4, the anaphor ‘himself’ is part of the embedded clause. Therefore, there appears to be some problem in binding and thus ungrammatical.

(Refer Slide Time: 18:15)

More precise constraint:

Anaphor need to be bound and they need to be bound **locally**.

Principle A:

An anaphor must be bound in its binding domain.

Binding Domain:

The binding domain of an anaphor is the smallest clause containing it.

So, we need to put little bit more constraint on this and say that anaphor needs to be bound. But they need to be bound within a local domain; that is, it cannot happen that the antecedent is in main clause and the anaphor is in the embedded clause. Because the two: antecedent and anaphors do not share same clause, therefore ungrammatical. So, how do we define this constraint in a more precise way? And now we can say about Principle – A that anaphor must be bound in its binding domain; and the binding domain of an anaphor is the smallest clause containing antecedent and the anaphor itself.

So, the two conditions that we have discussed about the antecedent being c-commanding the anaphor and both of them being co-indexed - they exist, but one more thing we need to add which is they must be in this binding domain. Both of them must be in the binding domain; that is both of them must be part of the same clause. This is an important condition.

(Refer Slide Time: 19:45)

Pronouns

1 *John_i saw him_i in the mirror.

2 John_i said that he_i is a genius.

3 John_i said that Mary dislikes him_i.

4 John_i saw him_j in the mirror.

- In the distribution of pronouns, they appear to differ from anaphors?
- Pronouns are *opposite* of anaphors.

Now, we want to look at some of the... some of the things about pronouns and say, 'John saw him in the mirror' is wrong, is ungrammatical, because 'John' and 'him' are co-indexed. 'John said that he is a genius'; even though they are co-indexed, because they are part of the two different clauses, the sentence is grammatical. John said that Mary likes... 'John said that Mary dislikes him' is perfectly alright, is a grammatical sentence even after being co-indexed with 'John'; even after the pronoun 'him' being co-indexed with John, because these two, that is 'John' and 'him' are part of two different clauses. And 'John saw him in the mirror' - in this case you see, the sentence is OK even though they are part of the same clause; that is, 'John' and 'him' are part of the same clause, but they are not co-indexed. Here 'him' refers to someone else out there in the world. Therefore, these sentences are grammatical.

So, what do we see as part of the story here? We are saying, for the distribution of pronouns, there appears to be a different set of rules applying and that rule is very simple which is completely opposite of pronouns, and it says that the pronouns must be free in its binding domain.

(Refer Slide Time: 21:29)

Principle B

A pronoun must be free in its binding domain.

Free means not bound

1 *John_i saw him_i.

2 John_i's mother saw him_i.

That is, if the pronoun is being... is finding a co-indexed antecedent within the same local domain, then the sentence is going to be ungrammatical. And if the pronoun is not within the same domain, if they are not co-indexed, then that is alright. Therefore, we can say this condition and constraint of Principle - B in a simple sentence; that pronouns must be free in the same domain.

(Refer Slide Time: 22:08)

Principle C

R-expressions need to be free everywhere.

Let's look at the following sentences.

- *He_i likes John_i.
- *She_i said that Mary_i fears clowns.
- His_i mother likes John_i.

Pronouns are free in the binding domains.

The key is - R-expressions need to be free everywhere. They can't be assigned their reference from somewhere in the sentence.

For elements like R-expressions, we need to say something else and what happens is, look at the three sentences that is... that you have on your screen: 'He likes John'; this

sentence is ungrammatical, because 'he' and 'John' are co-indexed. 'She said that Mary fears clowns'; 'she' and 'Mary'- because the two things are co-indexed, this sentence is grammatical. 'His mother likes John' is okay, because they are not co-indexed. Now, what we can say about R-expressions is R-expressions must be free everywhere.

(Refer Slide Time: 22:53)

Binding Theory

- **Principle A** -- An anaphor must be bound in its binding domain.
- **Principle B** -- A pronoun must be free in its binding domain.
- **Principle C** -- An r-expression must be free.

- The **binding domain** for an anaphor is the smallest of (i) An IP that dominates it.
- **Bound**: co-indexed with a c-commanding antecedent

Therefore, when we wanted to summarize the three principles which take care of three different types of elements in natural language, for their interpretations, we can say: an anaphor must be bound in the local domain; a pronoun must be free in the local domain; and R-expression must be free everywhere; and the local domain... by local domain or binding domain, we mean that the smallest domain - that is the IP itself.

Thank you.