Hierarchical structure

Nick Riches

Newcastle University

Compiled on February 12, 2020

Hierarchical structure

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Homework

Hier.Sent.Str.

Embedding

Hier. word str.

n. Ambiguity

lovement

Emb. phrases

cursion

What is recursion?

Examples of recursion Characteristics of recurs

Why do we need recursion?

dv. of tree

Advantages

Trees and UG

Pov. stim.

he UG debat

Imp of rec.

Recursion in other domains?
Presence of multiple 37

Hierarchical structure Nick Riches Homework Homework Hier Sent Str Hier, word str. Emb. phrases What is recursion? Why do we need recursion? Advantages Ideas of NC Pov stim UG and trees Imp of rec. Lang without rec.? Presence of multiple

Hierarchical structure Nick Riches

Homework

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Hier.Sent.Str.

Embedding
Hier. word str.

What are the two meanings of I'm a big dog man?

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Emb. phrases

ecursion

What is recursion? Examples of recursion

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trees

Advantages

and UG

Ideas of NC Pov. stim.

The UG do

Lang without rec.?

Recursion in other domains?
Presence of multiple 37

Hier, word str.

What are the two meanings of I'm a big dog man?

1. I'm a man who likes big dogs ('big' = LARGE)

2. I'm a man who is keen on dogs ('big' = KEEN)

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim

UG and trees

Imp of rec. Lang without rec.?

Presence of multiple 2 / 37

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim UG and trees

Imp of rec. Lang without rec.?

Presence of multiple 2/37

What are the two meanings of I'm a big dog man?

- 1. I'm a man who likes big dogs ('big' = LARGE)
- 2. I'm a man who is keen on dogs ('big' = KEEN)

Each different meaning corresponds to a different syntactic structure.

Hierarchical structure Nick Riches Hierarchical Str. Hierarchical structure Hier Sent Str Hier, word str. Emb. phrases What is recursion? Why do we need recursion? Advantages Ideas of NC Pov stim UG and trees Imp of rec.

Lang without rec.?

Recursion in other domain

Presence of multipl/ 37

Hierarchical sentence structure

structure Nick Riches

Hierarchical

Hier Sent Str

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim UG and trees

Imp of rec.

Lang without rec.? Presence of multiple 3/37

(1) The man VP [avidly watched NP [the documentary on penguins]]

Hierarchical sentence structure



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Hier Sent Str

Hier, word str.

Emb. phrases

What is recursion?

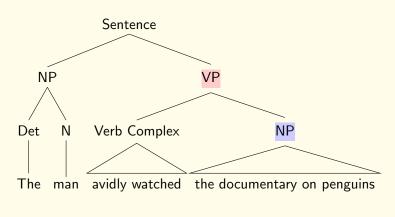
Why do we need recursion?

Ideas of NC Pov stim

UG and trees

Imp of rec. Lang without rec.?

Presence of mul



Hierarchical phrase structure

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Homework

Homework

Hier.Sent.Str.

Embedding Hier, word str.

yn. Ambigui

Movement

Emb. phrases

Recursion

What is recursion

Examples of recursion Characteristics of recursion

Why do we need recursion?

Adv. of trees

Ivantages

Trees and UG

Pov. stim.

The UG debate

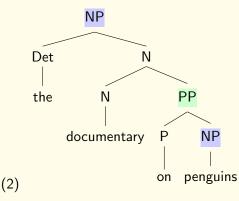
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Lang without rec.?

Recursion in other domain

Presence of multiple 37

The NP [documentary PP [on [NP Penguins]]]



Embedding

Embedding of one phrase inside another

If we move a phrase we have to move all embedded phrases.

It was [NPthe documentary [PPon penguins]] that the man watched

*It was [the documentary] that the man loved t [on penguins]

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Embedding

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim

Imp of rec.

Lang without rec.?

Hierarchical structure in words

Hierarchical structure Nick Riches

Hier Sent Str

Hier, word str.

Ideas of NC Pov stim UG and trees

Imp of rec. Lang without rec.?

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Emb. phrases

What is recursion?

Why do we need recursion?

Advantages

Recursion in other domains? Presence of multiple 7/37

Hierarchical structure in words

Hierarchical structure Nick Riches

Hier Sent Str

Hier, word str.

Emb. phrases

What is recursion?

Why do we need recursion?

Advantages

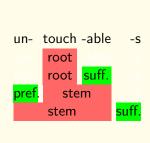
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Pov stim UG and trees

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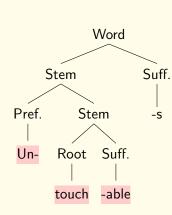
Lang without rec.?

Recursion in other domains? Presence of multiple / 37



Hierarchical structure in words





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Hierarchical

What is recursion?

Why do we need recursion?

Recursion in other domains? Presence of multiple 37

Hierarchical structure Nick Riches Hier Sent Str Syntactic ambiguity Hier, word str. Syn. Ambiguity Emb. phrases What is recursion? Why do we need recursion? Advantages Ideas of NC Pov stim UG and trees Imp of rec. Lang without rec.?

Presence of multiple 437

structure Nick Riches

Hierarchical

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Hier, word str.

Multiple syntactic presentations

(3) I'm a big dog man

Syn. Ambiguity

Movement

Emb. phrases

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Characteristics of recursion Why do we need recursion?

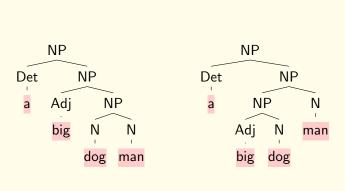
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Ideas of NC Pov. stim. UG and trees

The UG debat

Recursion in other domain Presence of multiple 37



Hierarchical structure

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Homework

Homework

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Hier.Sent.Str.

Embeddir

Hier. word str.

Syn. Ambiguit Syn. Ambiguity

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Emb. phrases

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What is recursion? Examples of recursion

Why do we need recursion?

Advantages

rees and UG

Ideas of NC Pov. stim.

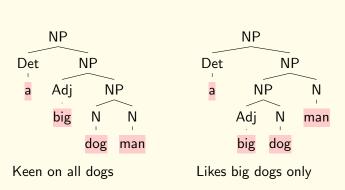
Imp of rec.

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Lang without rec.? Recursion in other domain

Recursion in other domains 10/37





Hier Sent Str

Hier, word str.

Syn. Ambiguity

Emb. phrases

What is recursion?

Why do we need recursion?

Advantages

Ideas of NC

Pov stim

Imp of rec.

Lang without rec.? Presence of mu

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Hier, word str.

Another example

(4) The man saw the woman with the binoculars

How is this ambiguous?

Syn. Ambiguity

Emb. phrases

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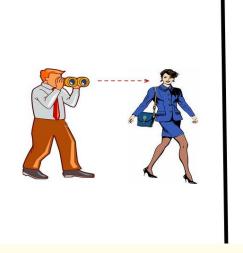
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Lang without rec.?

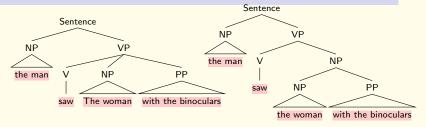
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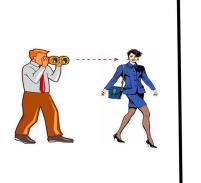
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The man saw the woman with the binoculars











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Lang without rec.? Recursion in other domai

The following sentences are syntactically ambiguous. In what way?

- 1. I saw her duck.
- 2. The chickens are too hot to eat
- 3. I said I would see you on Tuesday.
- 4. Sue adores men who love women who don't smoke.
- 5. The parents of the bride and the groom were waiting outside.

Hier. word str.

Syn. Ambiguit

Syn. Ambiguity

Emb. phrases

cursion

mples of recursion

Why do we need recursion?

of trees

s and UG

Ideas of NC Pov. stim.

Pov. stim. UG and trees

The UG debate

Lang without rec.?

I saw her duck
I saw [NP her duck] / I saw [NP her] [√P duck]

The chickens are too hot to eat Interpretation A; the chickens are the subject of eat, Interpretation B; the chickens are the object of eat.

I said I would see you on Tuesday.
Does on Tuesday modify the verb see or the verb say?

Sue adores men who love women who don't smoke

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Hier.Phr.Str. Embedding Hier, word str.

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Syn. Ambiguity

Movement

Emb. phrases

nt is recursion?

Characteristics of recursion
Why do we need recursion?

. of trees

and UG

Ideas of NC Pov. stim. UG and trees

Imp of rec.
Lang without rec.?

Recursion in other domain 17 A7

Embedding Hier, word str.

n. Ambigui

Syn. Ambiguity

Movement

Emb. phrases

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Characteristics of recursion Why do we need recursion?

of trees

Trees and UG

Pov. stim.

The UG debate

Lang without rec.?

Recursion in other domai

Sue adores men who love women who don't smoke Sue adores non-smoking men who love women Sue adores men who love non-smoking women Ambiguity stems from who don't smoke - does this refer to men or women?

► The parents of the bride and the groom were waiting outside.

Embedding Hier, word str.

Syn. Ambiguity

Syn. Ambiguity

Emb. phrases

Recursion

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Why do we need recursion?

lv. of trees

Trees and UG

Ideas of NC Pov. stim.

The UG debate

Lang without rec.?

➤ Sue adores men who love women who don't smoke Sue adores non-smoking men who love women Sue adores men who love non-smoking women Ambiguity stems from who don't smoke - does this refer to men or women?

► The parents of the bride and the groom were waiting outside.

[NP The parents of the bride] and [NP the groom] were waiting outisde

[NP The parents of the bride and the groom] (i.e. both sets of parents) were waiting outside

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Movement of embedded phrases

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Homework

Hier.Sent.Str.

Hier. word str.

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Emb. phrases

Recursion

What is recursion? Examples of recursion

Characteristics of recursion
Why do we need recursion?

Ndv. of tree

rees and UG

Ideas of NC Pov. stim.

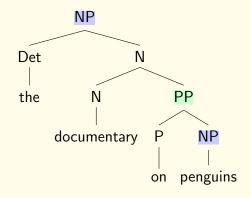
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Imp of rec.

Lang without rec.?

Recursion in other doma
18/3





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What is recursion?

Hierarchical structure Nick Riches

Hier, word str.

Emb. phrases

What is recursion?

Why do we need recursion?

Ideas of NC Pov stim

UG and trees

Imp of rec. Lang without rec.?

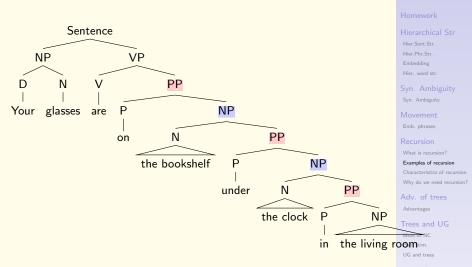
Recursion is a very important property of language.

It refers to constructions where phrases are embedded in phrases of the same type.

Examples of recursion

Hierarchical structure

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The UG debate
Imp of rec.

Recursion in other domain.

Presence of multiple 37

Examples of recursion

Hierarchical structure

Nick Riches



Homework

Hier.Sent.Str.

Embeddin

Hier. word str.

Syn. Ambiguit

Emb. phrases

What is recursion?

Examples of recursion

Characteristics of recursion

Why do we need recursion?

dv. of trees

Advantages

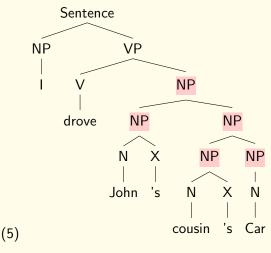
Trees and UG

Pov. stim.

The UG debate
Imp of rec.

Lang without rec.?

Recursion in other domain
Presence of multiple / 37



Examples of recursion

Hierarchical structure

Nick Riches

Hier Sent Str

Hier, word str.

Emb. phrases

What is recursion?

Examples of recursion

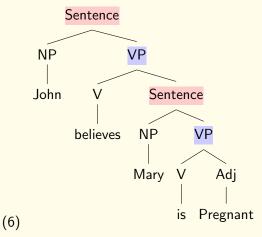
Why do we need recursion?

Advantages

Pov stim

Lang without rec.?

Ideas of NC UG and trees Imp of rec. Recursion in other domains? Presence of multiply 37



Characteristics of recursion

Hierarchical structure Nick Riches

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Embedding
Hier, word str.

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Emb. phrases

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Characteristics of recursion Why do we need recursion?

trees

Trees and UG

UG and trees

The UG debate

Pov stim

Imp of rec.

Lang without rec.?

Recursion in other domain

Presence of multiple 37

And again and again...

• It is on the bookshelf under the clock in the living room at number 10 Grosvesnor street in the East End of London

UG and trees

Imp of rec.

Lang without rec.?

And again and again. . .

- It is on the bookshelf under the clock in the living room at number 10 Grosvesnor street in the East End of London
- I drove John's cousin's auntie's builder's hairdresser's car

Hier, word str.

Emb. phrases

Characteristics of recursion

Why do we need recursion?

Ideas of NC

Pov stim

Imp of rec. Lang without rec.?

And again and again. . .

- It is on the bookshelf under the clock in the living room at number 10 Grosvesnor street in the East End of London
- I drove John's cousin's auntie's builder's hairdresser's car
- John believes that Sally believes that Cassandra believes that Rufus believes that Mary is pregnant.

Characteristics of recursion



Hierarchical structure

Nick Riches

Homework

Hier.Sent.Str. Hier.Phr.Str. Embedding Hier. word str.

Syn. Ambiguity
Syn. Ambiguity

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What is recursion?

Examples of recursion

Characteristics of recursion

hy do we need recursion

Advantages

Trees and UG
Ideas of NC
Pov. stim.

The UG debate
Imp of rec.
Lang without rec.?

Recursion in other domains?

Why do we need recursion?

structure Nick Riches

Hierarchical

• Your glasses are on the bookshelf under the clock in the living room \Rightarrow

Hier Sent Str Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC Pov stim

Imp of rec.

UG and trees

Lang without rec.?

Presence of multiply 37

Why do we need recursion?

structure Nick Riches

Hierarchical

 \bullet Your glasses are on the bookshelf under the clock in the living room \Rightarrow

There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.

Homework

Hierarchical S

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Embedding Hier. word str.

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Emb. phrases

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Examples of recursion
Characteristics of recursion
Why do we need recursion?

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Trees and UG

Pov. stim.

UG and trees

The UG debar

Imp of rec.

Lang without rec.?

Recursion in other domains
Presence of multiple 37

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC Pov stim

UG and trees

Presence of mu

Imp of rec. Lang without rec.?

 Your glasses are on the bookshelf under the clock in the living room \Rightarrow

There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.

I drove John's cousin's car ⇒

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC Pov stim

UG and trees

Imp of rec. Lang without rec.?

 Your glasses are on the bookshelf under the clock in the living room \Rightarrow

There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.

 I drove John's cousin's car ⇒ I drove a car. John has a cousin. The car belongs to the cousin.

living room \Rightarrow

cousin.

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim UG and trees

Imp of rec. Lang without rec.?

Your glasses are on the bookshelf under the clock in the

There is a clock in the living room. The bookshelf is under

this. Your glasses are on that bookshelf.

I drove John's cousin's car ⇒

I drove a car. John has a cousin. The car belongs to the

John believes Mary is pregnant⇒

Embedding Hier, word str.

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Emb. phrases

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Why do we need recursion?

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Trees and UC

Ideas of NC Pov. stim.

UG and trees
The UG de

Imp of rec.
Lang without rec.?

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Why do we need recursion?

ullet Your glasses are on the bookshelf under the clock in the living room \Rightarrow

There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.

- \bullet I drove John's cousin's car \Rightarrow I drove a car. John has a cousin. The car belongs to the cousin.
- John believes Mary is pregnant⇒
 John has a belief. The following is his belief... Mary is pregnant.

structure Nick Riches Hier Sent Str Hier, word str. Emb. phrases The advantages of trees What is recursion? Why do we need recursion? Adv. of trees Advantages

Hierarchical

Ideas of NC Pov. stim. UG and trees

Imp of rec.
Lang without rec.?

Bibliography

Ideas of NC Pov stim

UG and trees

Imp of rec. Lang without rec.?

Advantages

representing sentences;

1. They can represent hierarchical structure

We can see that trees are extremely useful means of

2. They can represent syntactic amiguity

3. They can represent movement processes and how these apply to embedded phrases

4. They can represent recursion

Hierarchical structure
Nick Riches

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Syntactic ambiguity

Movemen

Recursion

The advantages of trees

Trees and Chomsky's Universal Grammar

The Universal Grammar debate

Hairman Communication of Income in the contract

Bibliography

Ideas of NC

Why do we need recursion?

Pov. stim. UG and trees

Advantages
Trees and UG

Hier Sent Str

Hier, word str.

Emb. phrases

What is recursion?

The UG deb

Lang without rec.?

The ideas of Noam Chomsky



Generative syntax

The main assumption of the this approach is that there is a poverty of the stimulus

Language input is not sufficiently rich to account for children's lingustic knowledge

i.e. the *stimulus* is too *poor*

Hierarchical structure

Nick Riches

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim UG and trees

Imp of rec.

Lang without rec.?

The Poverty of the Stimulus

Hierarchical structure

Nick Riches

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim

UG and trees

Imp of rec. Lang without rec.?

Presence of multiple / 37

At aged $2\frac{3}{4}$ children are capable of forming very complex structures such as questions and negatives

But rudimentary mathematical abilities

The Poverty of the Stimulus

Hierarchical structure

Nick Riches

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim

UG and trees

Imp of rec.

Lang without rec.?

At aged $2\frac{3}{4}$ children are capable of forming very complex structures such as questions and negatives

But rudimentary mathematical abilities

⇒ we are born with an innate knowledge of language, sometimes called Universal Grammar.

Hier. word str.

Syn. Ambiguity
Syn. Ambiguity

Movement

Emb. phrases

cursion

is recursion?

Characteristics of recursion
Why do we need recursion?

trees

s and UG

Ideas of NC

UG and trees
The UG del

Imp of rec.
Lang without rec.?

Offiversal Graffillial and tree.

According to Chomsky, Universal Grammar is a system which is optimised for building trees

So, the trees we have drawn above provide an insight in our innate knowledge of language

Hierarchical structure

Nick Riches

Homework

Hierarchical structure

Syntactic ambiguity

Hierarchical Structure

Syntactic ambiguity

Recursion

The advantages of trees

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The Universal Grammar debate

Universal Grammar theories of language impairmen

Bibliograph

UG and trees
The UG debate

Imp of rec.
Lang without rec.?

Emb. phrases

Trees and Ideas of NC Poy stim

What is recursion?

Why do we need recursion?

in other doma

The importance of recursion

Grammar

Hierarchical structure Nick Riches

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim UG and trees

Imp of rec.

Lang without rec.?

In a recent article (Hauser, M. D., Fitch, W. T., & Chomsky, N. (2002). The faculty of language: what is it, who has it, and how did it evolve? Science, 298. Click Here.) Chomsky "lets go" of a number of different components of Universal

But they insist that recursion is a key principle.

A language without recursion?



Daniel Everett

Pirahã language does not actually contain recursion

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Homeworl

Hierarchical St

Hier.Sent.Str. Hier.Phr.Str.

Hier. word str.

Syn. Ambiguity

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Emb. phrases

What is recursion?

Examples of recursion
Characteristics of recursion
Why do we need recursion?

Adv. of tree Advantages

Trees and UG

Pov. stim.

The UG debate
Imp of rec.

Lang without rec.?

Recursion in other domain
31 / 37

Recursion in other domains?



Marilyn Monroe's character thinks [that Tony Curtis's character (Joe) is a woman called Josephine]

We therefore mentally represent the situation described by the recursive sentence *Marilyn believes that Josephine is a* woman Hierarchical structure

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Homework

Hierarchical Str

Hier.Sent.Str. Hier.Phr.Str.

Hier. word str.

Syn. Ambiguity

Syn. Ambiguity

Emb. phrases

Recursion

Examples of recursion
Characteristics of recursion
Why do we need recursion?

Ndv. of trees Advantages

Trees and UG

Pov. stim. UG and trees

The UG debate
Imp of rec.
Lang without rec.?

Recursion in other domains?

Recursion in other domains?

Hierarchical structure Nick Riches

nework

Hier.Sent.Str.

Embedding Hier. word str.

Ambiguity

Movement Emb. phrases

What is recursion?

Examples of recursion

Characteristics of recursion

Why do we need recursion?

of trees

Advantages

Trees and UG

Ideas of NC

UG and trees
The UG d

Imp of rec.
Lang without rec.?

Recursion in other domains?
Presence of multiple

A37

Concepts involving recursion

Hierarchical

Ideas of NC

Pov stim

UG and trees

Imp of rec. Lang without rec.?

Recursion in other domains?

Concepts involving recursion

Pregnancy (a person inside a person)

Russian dolls (a doll inside a doll inside a doll inside a doll, etc.)

Postal addresses (1 Smith Street, Covington, Berkshire,

England, Europe, the Northern Hemisphere, the World, the Solar System, the Milky Way, the Universe, the Multiverse).

Presence of multiple recursion in spoken language

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Hierarchical

structure

Hier, word str.

Theoreticaly, we can say John believes that Sally believes

Emb. phrases

Why do we need recursion?

Ideas of NC Pov stim

UG and trees Imp of rec.

Lang without rec.? Presence of multiple / 37

that Cassandra believes that Rufus believes that Mary is pregnant

I drove John's cousin's auntie's builder's hairdresser's car

But do we actually do this?

structure Nick Riches

Universal Grammar theories of language impairment

Hier Sent Str

Hierarchical

Hier, word str.

Emb. phrases

What is recursion?

Why do we need recursion?

Advantages

Ideas of NC

Pov stim

UG and trees

Imp of rec.

Lang without rec.?

Presence of mu

Rice & Wexler's "ATOM" model: Universal Grammar mechanisms governing realisation of tense and case-marking are 'broken' (Rice, Wexler & Redmond, 1999)

Van der Lely's Computational Grammatical Complexity

(7) Him go there

Account (van der Lely & Pinker, 2014)

(8) The dog was chased by the cat

Hierarchical

Hier, word str.

Emb. phrases

Why do we need recursion?

Ideas of NC

Pov stim

UG and trees

Imp of rec.

Lang without rec.?

Gaye) Whenever/wherever we're meant to be together, I'll be there and you'll be near (sung by Shakira)

Wherever I lay my hat, that's my home (sung by Marvin

Hierarchical

Emb. phrases

Why do we need recursion?

Ideas of NC Pov stim

Imp of rec.

Lang without rec.?

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Pov stim

UG and trees

Imp of rec. Lang without rec.?

Rice, M. L., K. Wexler, and S. M Redmond. Grammaticality

Judgments of an Extended Optional Infinitive Grammar: Evidence from English-Speaking Children with Specific Language Impairment. Journal of Speech, Language, and Hearing Research 42, no. 4 (1999): 943-61.

Lely, Heather K.J. van der, and Steven Pinker. The Biological Basis of Language: Insight from Developmental Grammatical Impairments. Trends in Cognitive Sciences 18, no. 11 (November 2014): 586-95. https://doi.org/10.1016/j.tics.2014.07.001.