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## Grammar Systems Applied to Parsing Jakub Martiško



### What was the Goal?

Parsing is part of the compilation.  
 Checks whether symbols are used in correct order.  
 Based on models of CFGs.  
 CFGs are limited.  
 Stronger models (CSGs) are too complex to work with.  
 Some hybrid would be nice - more powerful but simple to describe.  
 Possible solution - Grammar Systems.

### What Are Grammar Systems?

Set of more grammars (mainly CFGs).  
 Somehow cooperate to create non CF languages.  
 Two variants - PC or CD grammar systems.  
 CDGS - single shared sentential form.  
 Grammars work over the sent. form in turns.  
 Grammar is activated, rewrites part of form and deactivates.  
 Mode of derivation - deals with grammar deactivation.  
 Modes: \* - when it wants  
 t - when it can  
 k - after k steps (at least/at most/exactly)

### Proposed Grammar System

Modification of CDGS.  
 One special grammar - controlling grammar.  
 Its terminals are starting nonterminals of controlled grammars.  
 It generates some string and controlled grammars are activated based on this string.  
 New mode of derivation - C(l).  
 l is an index of some other controlled grammar.  
 Grammar working in this mode must make same (at least/at most/exactly) number of steps as l.  
 This referencing is possible only in the same rule of the controlling grammar.

$$1: S_M \rightarrow S_1^t S_2^{=C1}$$

$$2: S_1 \rightarrow aAb$$

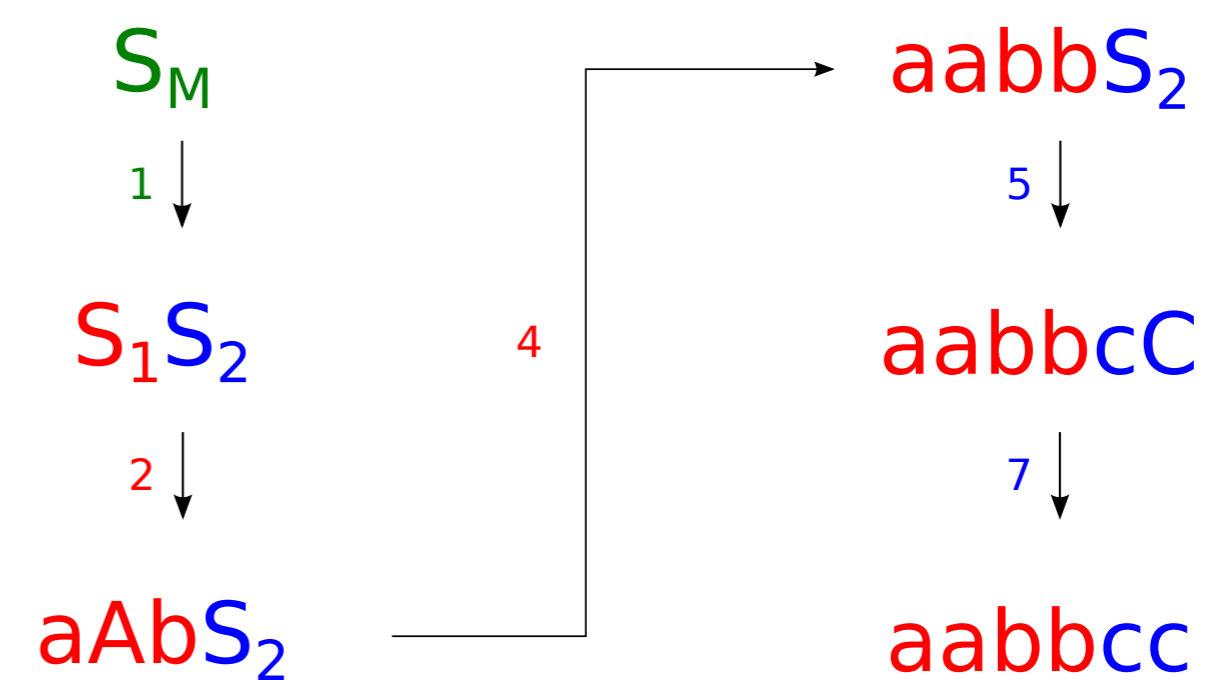
$$3: A \rightarrow aAb$$

$$4: A \rightarrow ab$$

$$5: S_2 \rightarrow cC$$

$$6: C \rightarrow cC$$

$$7: C \rightarrow c$$



### Proposed Parsing

Based on the proposed GS.  
 Combines top down and bottom up parsing.  
 Controlling grammar - top down (LL).  
 Controlled grammars - bottom up (LR).  
 When Controlling grammar should pop terminal, bottom up parser is started instead.  
 This allows usage of some C(l) mode limitations.  
 Able to parse some non-CF languages.

