Parsing

Homework 10 (Earley), due 21 June 2022, 10.30 am

Laura Kallmeyer

SS 2022, Heinrich-Heine-Universität Düsseldorf

Question 1 (Earley Parsing)

 $\begin{array}{l} \textit{Consider the CFG} \ \langle N,T,P,S \rangle \textit{ with } N = \{S,A,B,X\}, \ T = \{a,b\}, \ P = \{S \rightarrow AA, \ S \rightarrow aXa, \ X \rightarrow bXb, \ X \rightarrow \varepsilon, \ A \rightarrow a\} \end{array}$

- 1. What are the parse trees for w = aa?
- 2. Give the chart resulting from an Earley-recognition of aa with prediction lookahead and completion lookahead:

$$Predict with \ lookahead: \ \frac{[A \to \alpha \bullet B\beta, i, j]}{[B \to \bullet\gamma, j, j]} \ B \to \gamma \in P, w_{i+1} \in First(\gamma) \ or \ \epsilon \in First(\gamma)$$

Complete with lookahead:
$$\frac{[A \to \alpha \bullet B\beta, i, j], [B \to \gamma \bullet, j, k]}{[A \to \alpha B \bullet \beta, i, k]} \quad w_{k+1} \in First(\beta) \text{ or } \epsilon \in First(\beta)$$

Question 2 (Earley Parsing)

 $\textit{Consider the CFG}\; \langle N,T,P,S\rangle \textit{ with } N = \{S\}, \; T = \{a,b\}, \; P = \{S \rightarrow aS \,|\, Sb \,|\, S \,|\, \varepsilon\}$

- 1. Give the chart resulting from an Earley-recognition of ab using the algorithm from slides 6–8 (no lookahead).
- 2. How many parse trees does the input "ab" have with this grammar?