

LL(k) FIRST AND FOLLOW SETS

- The **k-prefix** of a string of terminals w is a string consisting of the first k terminals in w . If $|w| \leq k$, then the k -prefix of w is w .
- The **First_k set** of a non-terminal S is the set of all k -prefixes of all strings of terminals derivable from S .
- The **First_k set** of a string γ of terminals and non-terminals is the set of all k -prefixes of all strings of terminals derivable from γ .
- The **Follow_k set** of a non-terminal S is the set of all k -prefixes of all strings of terminals that can follow S in a partial derivation.
- Note that First and Follow are First₁ and Follow₁.

LL(k) PARSE TABLES

A parse table for an LL(k) grammar G is created as follows:

- Calculate First_k and Follow_k for all non-terminals
- The rows of the table are labeled with G 's non-terminals
- Create a column in the table for each string of terminals of length k (strings can be shorter than k if they end with \$)
- Each entry of the table is either empty, or contains the rhs of a production:
Look at each production $A \rightarrow \gamma$
 - If $\gamma = \epsilon$, $\forall \alpha \in \text{Follow}_k(A)$ $\text{Table}(A, \alpha) = \gamma = \epsilon$
 - Otherwise, $\forall \alpha \in \text{First}_k(\gamma)$ $\text{Table}(A, \alpha) = \gamma$

EXAMPLE

$S \rightarrow \text{ASSIGN}$

$S \rightarrow \text{FNCALL}$

$S \rightarrow \text{WHILESTAT}$

$\text{FNCALL} \rightarrow \text{identifier "(" PARAMS ")"}$

$\text{ASSIGN} \rightarrow \text{identifier "=" RHS}$

$\text{WHILESTAT} \rightarrow \text{while E do S od}$

$\text{RHS} \rightarrow \text{identifier}$

$\text{RHS} \rightarrow \text{FNCALL}$