

BNF Practice

CS 4100

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BNF

- Recall
 - Terminals are symbols and letters in the alphabet or language
 - Non-Terminals are variables not in the alphabet or language
 - CFG Rules are of the form
 - $\langle \text{Non-Terminal} \rangle ::= \text{string with terminals and non-terminals}$
 - Replace the non-terminal on LHS with RHS as a step in a derivation
 - Continue until you have a sentence in the language
 - Recognize
 - Given a sentence find a derivation to show it is in the language
 - Generate
 - Given a grammar generate sentence in the language

$\langle \text{identifier} \rangle ::= \langle \text{letter} \rangle \mid \langle \text{identifier} \rangle \langle \text{letter} \rangle \mid \langle \text{identifier} \rangle \langle \text{digit} \rangle$

- This is the syntax for identifiers in Algol
- Give some (5+) examples of legal identifiers
- Give some (3+) examples of illegal identifiers
- Explain in English what legal identifiers are in Algol

Variables in Algol

- $\langle \text{variable identifier} \rangle ::= \langle \text{identifier} \rangle$
- $\langle \text{simple variable} \rangle ::= \langle \text{variable identifier} \rangle$
- $\langle \text{subscript expression} \rangle ::= \langle \text{arithmetic expression} \rangle$
- $\langle \text{subscript list} \rangle ::= \langle \text{subscript expression} \rangle \mid$
 $\langle \text{subscript list} \rangle , \langle \text{subscript expression} \rangle$
- $\langle \text{array identifier} \rangle ::= \langle \text{identifier} \rangle$
- $\langle \text{subscripted variable} \rangle ::= \langle \text{array identifier} \rangle [\langle \text{subscript list} \rangle]$
- $\langle \text{variable} \rangle ::= \langle \text{simple variable} \rangle \mid \langle \text{subscripted variable} \rangle$

Variables in Algol

- Find Derivations for:
 - epsilon
 - detA
 - A17
 - $Q[7,2]$
 - $x[\sin(n \times \pi/2), Q[3, n, 4]]$

Arithmetic Expressions

- $\langle \text{adding operator} \rangle ::= + | -$
- $\langle \text{multiplying operator} \rangle ::= \times | / | \div$
- $\langle \text{primary} \rangle ::= \langle \text{unsigned number} \rangle | \langle \text{variable} \rangle | \langle \text{function designator} \rangle | (\langle \text{arithmetic expression} \rangle)$
- $\langle \text{factor} \rangle ::= \langle \text{primary} \rangle | \langle \text{factor} \rangle \uparrow \langle \text{primary} \rangle$
- $\langle \text{term} \rangle ::= \langle \text{factor} \rangle | \langle \text{term} \rangle \langle \text{multiplying operator} \rangle \langle \text{factor} \rangle$
- $\langle \text{simple arithmetic expression} \rangle ::= \langle \text{term} \rangle | \langle \text{adding operator} \rangle \langle \text{term} \rangle | \langle \text{simple arithmetic expression} \rangle \langle \text{adding operator} \rangle \langle \text{term} \rangle$
- $\langle \text{if clause} \rangle ::= \text{if } \langle \text{Boolean expression} \rangle \text{ then}$
- $\langle \text{arithmetic expression} \rangle ::= \langle \text{simple arithmetic expression} \rangle | \langle \text{if clause} \rangle \langle \text{simple arithmetic expression} \rangle \text{ else } \langle \text{arithmetic expression} \rangle$

Letters and Digits

- $\langle \text{letter} \rangle$
 ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z|A|B|C|
 D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z
- $\langle \text{digit} \rangle ::= 0|1|2|3|4|5|6|7|8|9$