

Assignment 1 proofs

<varlist>, <vardef>, <varname>, <method>, <ifstatemt>, <assignstatemt>, <factor>, <getvarref>

The two rules of Predictive Parsing are:

1. For every production $A ::= \alpha_1 \mid \alpha_2 \mid \alpha_3 \mid \dots \mid \alpha_n$, we must have

$$\text{FIRST}(\alpha_i) \cap \text{FIRST}(\alpha_j) = \emptyset \quad \text{for each pair } i, j, i \neq j$$

2. For every nonterminal A such that $\text{FIRST}(A)$ contains λ , we must have

$$\text{FIRST}(A) \cap \text{FOLLOW}(A) = \emptyset$$

There are no methods (non-terminals) in the Java Class grammar where the $\text{FIRST}(A)$ contains λ . The $\{ \}$ metasymbol, which represents “0 or more” is never in the FIRST of any non-terminal. Thus, rule #2 is satisfied.

<varlist>

<varlist> ::= <vardef> {, <vardef>}

<vardef> ::= <type> <varname> | <classname> <varref>

$\text{FIRST}(\text{<type>}) = \{I, S\} \cap \text{FIRST}(\text{<classname>}) = \{C, D\} = \emptyset$

Same can be proven with <vardef>.

<vardef> ::= <type> <varname> | <classname> <varref>

$\text{FIRST}(\text{<type>}) = \{I, S\} \cap \text{FIRST}(\text{<classname>}) = \{C, D\} = \emptyset$

<varname>

<varname> ::= <letter> {<char>}

$\text{FIRST}(\text{<letter>}) = \{Y, Z\}$ no intersection

<method>

<method> ::= <accessor> <type> <methodname> ([<varlist>]) B {<statemt>} <returnstatemt> E

$\text{FIRST}(\text{<accessor>}) = \{P, V\}$ no intersection

<ifstatemt>

<ifstatemt> ::= F <cond> T B {<statemt>} E [L B {<statemt>} E]

$\text{FIRST}(\text{<ifstatemt>})$ is a terminal

<assignstatemt>

<assignstatemt> ::= <varname> = <mathexpr> | <varref> = <getvarref>

<varname> ::= <letter> {<char>}

$\text{FIRST}(\langle \text{letter} \rangle) = \{Y, Z\} \cap \text{FIRST}(\langle \text{varref} \rangle) = \{J, K\} = \emptyset$

$\langle \text{factor} \rangle$

$\langle \text{factor} \rangle ::= \langle \text{oprnd} \rangle \{ * \text{oprnd} \}$

$\langle \text{oprnd} \rangle ::= \langle \text{integer} \rangle \mid \langle \text{varname} \rangle \mid (\langle \text{mathexpr} \rangle) \mid \langle \text{methodcall} \rangle$

$\langle \text{integer} \rangle ::= \langle \text{digit} \rangle \{ \langle \text{digit} \rangle \}$

$\langle \text{varname} \rangle ::= \langle \text{letter} \rangle \{ \langle \text{char} \rangle \}$

$\langle \text{methodcall} \rangle ::= \langle \text{varref} \rangle . \langle \text{methodname} \rangle ([\langle \text{varlist} \rangle])$

$\text{FIRST}(\langle \text{digit} \rangle) = \{0, 1, 2, 3\}$

$\text{FIRST}(\langle \text{letter} \rangle) = \{Y, Z\}$

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$\text{FIRST}(\langle \text{varref} \rangle) = \{J, K\}$

$\text{FIRST}(\langle \text{factor} \rangle) = \{0, 1, 2, 3, Y, Z, (, J, K\}$

α_i and α_j do not intersect. There is no intersection between all the options.

$\langle \text{getvarref} \rangle$

$\langle \text{getvarref} \rangle ::= O \langle \text{classname} \rangle () \mid \langle \text{methodcall} \rangle$

$\text{FIRST}(\langle \text{getvarref} \rangle) = O$ which is a terminal. $\langle \text{getvarref} \rangle$ cannot have any other FIRST