

\mathbf{C}^\pm : a simple language for calculus, inspired by C

Manuel Di Agostino

November 1, 2024

1 Lexical elements

$\langle token \rangle ::= \langle keyword \rangle$
| $\langle identifier \rangle$
| $\langle constant \rangle$
| $\langle string-literal \rangle$
| $\langle punctuator \rangle$

1.1 Keywords

$\langle keyword \rangle ::= \text{'bool' | 'char' | 'const' | 'do' | 'double' | 'else' | 'float' | 'for'}$
| $\text{'if' | 'int' | 'long' | 'return' | 'unsigned' | 'while'}$

1.2 Identifiers

$\langle identifier \rangle ::=$
| $\langle identifier-nondigit \rangle$
| $\langle identifier \rangle \langle identifier-nondigit \rangle$
| $\langle identifier \rangle \langle digit \rangle$

$\langle identifier-nondigit \rangle ::= \langle nondigit \rangle$

$\langle nondigit \rangle ::= \text{'_'} | \text{'a'} | \dots | \text{'z'} | \text{'A'} | \dots | \text{'Z'}$

$\langle digit \rangle ::= \text{'0'} | \dots | \text{'9'}$

1.3 Constants

$\langle constant \rangle ::=$
| $\langle integer-constant \rangle$
| $\langle floating-constant \rangle$
| $\langle character-constant \rangle$

1.3.1 Integer constants

$\langle integer-constant \rangle ::= \langle decimal-constant \rangle \langle integer-suffix \rangle?$

$\langle decimal-constant \rangle ::= \langle digit \rangle \mid \langle decimal-constant \rangle \langle digit \rangle$

$\langle digit \rangle ::= '0' \mid \dots \mid '9'$

$\langle integer-suffix \rangle ::=$
 $\langle unsigned-suffix \rangle \langle long-suffix \rangle?$
 $\mid \langle long-suffix \rangle \langle unsigned-suffix \rangle?$

$\langle unsigned-suffix \rangle ::= 'u' \mid 'U'$

$\langle long-suffix \rangle ::= 'l' \mid 'L'$

1.3.2 floating-constant

$\langle floating-constant \rangle ::= \langle decimal-floating-constant \rangle$

$\langle decimal-floating-constant \rangle ::=$
 $\langle fractional-constant \rangle \langle exponent-part \rangle? \langle floating-suffix \rangle?$
 $\mid \langle digit-sequence \rangle \langle exponent-part \rangle \langle floating-suffix \rangle?$

$\langle fractional-constant \rangle ::=$
 $\langle digit-sequence \rangle? '.' \langle digit-sequence \rangle$
 $\mid \langle digit-sequence \rangle '.'$

$\langle exponent-part \rangle ::=$
 $'e' \langle sign \rangle? \langle digit-sequence \rangle$
 $\mid 'E' \langle sign \rangle? \langle digit-sequence \rangle$

$\langle sign \rangle ::= '+' \mid '-'$

$\langle digit-sequence \rangle ::= \langle digit \rangle \mid \langle digit-sequence \rangle \langle digit \rangle$

$\langle floating-suffix \rangle ::= 'f' \mid 'l' \mid 'F' \mid 'L'$

1.4 String literals

$\langle string-literal \rangle ::=$
 $'"' \langle s-char-sequence \rangle? "'$
 $\mid 'L' '"' \langle s-char-sequence \rangle? "'$

$\langle s-char-sequence \rangle ::=$
 $\langle s-char \rangle$
 $\mid \langle s-char-sequence \rangle \langle s-char \rangle$

$\langle s-char \rangle ::=$ any character except $'"'$, $'\backslash'$, $'\n'$
 $\mid \langle escape-sequence \rangle$

1.5 Punctuator

$\langle punctuator \rangle ::=$ '[' | ']' | '(' | ')' | '{' | '}' | ',' | ';' | '++' | '-' | '*' | '+' | '-' |
'!' | '/' | '%' | '<' | '>' | '<=' | '>=' | '==' | '!=' | '&&' | '||' | '=' | '*=' | '/=' |
'+=' | '-=' | '^=' | '#' | '##'