C±: a simple language for calculus, inspired by C

Manuel Di Agostino

October 1, 2024

1 Lexical elements

⟨*token*⟩ ::= ⟨*keyword*⟩
| ⟨*identifier*⟩
| ⟨*constant*⟩
| ⟨*string-literal*⟩
| ⟨*punctuator*⟩

1.1 Keywords

⟨*keyword*⟩ ::= ‘`bool`’ | ‘`char`’ | ‘`const`’ | ‘`do`’ | ‘`double`’ | ‘`else`’ | ‘`float`’ | ‘`for`’
| ‘`if`’ | ‘`int`’ | ‘`long`’ | ‘`unsigned`’ | ‘`while`’

1.2 identifiers

⟨*identifier*⟩ ::=
⟨*identifier-nondigit*⟩
| ⟨*identifier*⟩ ⟨*identifier-nondigit*⟩
| ⟨*identifier*⟩ ⟨*digit*⟩

⟨*identifier-nondigit*⟩ ::= ⟨*nondigit*⟩

⟨*nondigit*⟩ ::= ‘`_`’ | ‘`a`’ | ... | ‘`z`’ | ‘`A`’ | ... | ‘`Z`’

⟨*digit*⟩ ::= ‘`0`’ | ... | ‘`9`’

1.3 Constants

⟨*constant*⟩ ::=
⟨*integer-constant*⟩
| ⟨*floating-constant*⟩
| ⟨*character-constant*⟩

1.3.1 Integer constants

⟨*integer-constant*⟩ ::= ⟨*decimal-constant*⟩ ⟨*integer-suffix*⟩?

⟨*decimal-constant*⟩ ::= ⟨*digit*⟩ | ⟨*decimal-constant*⟩ ⟨*digit*⟩

⟨*digit*⟩ ::= '0' | ... | '9'

⟨*integer-suffix*⟩ ::=
    ⟨*unsigned-suffix*⟩ ⟨*long-suffix*⟩?
  | ⟨*long-suffix*⟩ ⟨*unsigned-suffix*⟩?

⟨*unsigned-suffix*⟩ ::= 'u' | 'U'

⟨*long-suffix*⟩ ::= 'l' | 'L'

1.3.2 floating-constant

⟨*floating-constant*⟩ ::= ⟨*decimal-floating-constant*⟩

⟨*decimal-floating-constant*⟩ ::=
    ⟨*fractional-constant*⟩ ⟨*exponent-part*⟩? ⟨*floating-suffix*⟩?
  | ⟨*digit-sequence*⟩ ⟨*exponent-part*⟩ ⟨*floating-suffix*⟩?

⟨*fractional-constant*⟩ ::=
    ⟨*digit-sequence*⟩? '.' ⟨*digit-sequence*⟩
  | ⟨*digit-sequence*⟩ '.'

⟨*exponent-part*⟩ ::=
    'e' ⟨*sign*⟩? ⟨*digit-sequence*⟩
  | 'E' ⟨*sign*⟩? ⟨*digit-sequence*⟩

⟨*sign*⟩ ::= '+' | '-'

⟨*digit-sequence*⟩ ::= ⟨*digit*⟩ | ⟨*digit-sequence*⟩ ⟨*digit*⟩

⟨*floating-suffix*⟩ ::= 'f' | 'l' | 'F' | 'L'

1.4 String literals

⟨*string-literal*⟩ ::=
    '"' ⟨*s-char-sequence*⟩? '"'
  | 'L'"' ⟨*s-char-sequence*⟩? '"'

⟨*s-char-sequence*⟩ ::=
    ⟨*s-char*⟩
  | ⟨*s-char-sequence*⟩ ⟨*s-char*⟩

⟨*s-char*⟩ ::= any character except '"', '\', '\n'
  | ⟨*escape-sequence*⟩

1.5 Punctuator

⟨*punctuator*⟩ ::= ‘`[`’ | ‘`]`’ | ‘`(`’ | ‘`)`’ | ‘`{`’ | ‘`}`’ | ‘`,`’ | ‘`;`’ ‘`++`’ | ‘`-`’ | ‘`*`’ | ‘`+`’ | ‘`-`’ | ‘`!`’
| ‘`/`’ | ‘`%`’ | ‘`<`’ | ‘`>`’ | ‘`<=`’ | ‘`>=`’ | ‘`==`’ | ‘`!=`’ | ‘`^`’ | ‘`&&`’ | ‘`||`’ | ‘`=`’ | ‘`*=`’ | ‘`=`’ |
‘`+=`’ | ‘`-=`’ | ‘`^=`’ | ‘`#`’ | ‘`##`’