

Nuts and Bolts

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Miscellaneous

Joopathon applications distributed in byte code form are difficult to reverse engineer: keywords/identifiers are one/two byte values respectively, code tree has no embedded parentheses. Byte code files have a .JPBC extension. Almost all of the remainder of this web page consists of obsolete material.

Public Fields

Public fields are Joopathon fields (method variables) which are declared in a var block, whereas private (inner) fields are declared in an ivar block. Public fields which include getters and/or setters cannot be modified directly using an assignment statement, except within the class in which they are declared. For a field called myfield, the corresponding getter method is called get-myfield, and the corresponding setter method is called set-myfield. For a boolean field called myfield, the corresponding getter method is called is-myfield. For a boolean field called is-myfield, the corresponding getter method is called get-myfield.

Joopathon Parsing

Parser uses following sets of initial chars. (in parentheses or on separate line) to help determine class of tokens encountered.

- Alpha:
 - keyword (a-z)
 - built-in function (a-z)
 - system function* (_)
- Identifiers:
 - local variable (A-Z, _)
 - field (A-Z, _)
 - method (A-Z, _)
 - class (A-Z, _)
- Numeric:
 - 0-9, -
- Punctuation:
 - (,), {, }, #, ", \$, ;
- Operators:
 - +, -, *, /, %, &, |, ^, ~, =, !, <, >, :, ;, ?
- Invalid:
 - Literal Chars. (\, .)
 - Symbols ([,], ', ` , @, comma)

* System function names begin and end with 2 consecutive underscores. User-defined identifiers begin with optional single underscore followed by a letter, and may contain letters of both cases. The other 3 types of identifiers (keywords, built-in functions, system functions) contain lower case letters only.

Oddball characters:

- (\) backslash found only in string literals
- (.) period found only in numeric literals
- (-) hyphen found at beginning of numeric literals and 3 operators: negate, subtract, -=
- (}) close brace in string literal must be escaped

Lexical Scanner (Summary)

Each bottom-level category followed by (n), where n = count, category omitted if zero.

- ALPHA
 - KEYWORD
 - BLTINFUNC
 - SYSFUNC
 - IDENTIFIER
- NUMERIC
 - BINARY
 - OCTAL
 - HEXADECIMAL
 - DECIMAL
 - LONG
 - FLOAT
- PUNCT
 - OPENPAR
 - CLOSEPAR
 - SEMICOLON
 - CMTLINE
 - CMTBLK
 - STRLIT
 - OPERATOR
- INVALID
 - ERRSYM
 - ERRESC
 - ERRDOT
- Error messages:
 - Line no., description

Lexical Scanner (Detail)

```
LN # TYP VAL CNV
==== === === ===
      XXX xxx xxx
0001 [ line buf one ]
      KWD str op
      FUN str
      SYS str
      ID str
0002 [ line buf two ]
      BIN str dec
      OCT str dec
      HEX str dec
      DEC dec dec
      LNG dec dec
      FLT str val
0003 [ line buf three ]
      PAR (
      PAR )
      PAR ;
      CMT {
      CMT }
      CMT #
      STR str
      OP str name
      ERR str desc
      [ omit blank lines ]
```

Each 4-digit line no. followed by contents of line in square brackets, followed by tokens, one per line.
Global boolean: summary/detail

Code Execution

All Joopathon source code is in Polish notation, in which operators precede their operands. The following algorithm is used, in which operators are stored in one stack and operands in a separate stack. Executable code consists of tree nodes.

```
rightp = root
while true do
  if rightp = 0 then
    op = pop operator
    if op = root then
      return true
    if op = while/for/loopbody then
      pop rightp from operator stack
      continue
    if op = if then
      pop rightp from operator stack
      pop (
      continue
    if op = block then
      pop (
      pop if from operator stack
      pop (
      pop rightp from operator stack
      continue
    count = 0
    while true do
      pop operand
      if open parenthesis then break
      push operand on operator stack
      increment count
    if op = call then
      rightp = handlecall(count)
      continue
    if op = constructor then
      rightp = handlecons(count)
      continue
    if op = callback then
      rightp = handlecallback(count)
      continue
    pop operand from operator stack
    push operand
    repeat count - 1 times
      pop operand from operator stack
      push operand
      rightpop = pop
      leftpop = pop
      push op(leftpop, rightpop)
      // (: obj attridx) => obj...
    if count = 1 then
      if unary op then
        push op(pop)
      else
        rightpop = pop
        leftpop = pop
```

```

        push op(leftpop, rightpop)
    pop rightp from operator stack
    continue
currnode = getnode(rightp)
if open parenthesis then
    push on operand stack
    push rightp on operator stack
    rightp = currnode.downp
else if operand then
    push on operand stack
    rightp = currnode.rightp
else if operator then
    push on operator stack
    rightp = currnode.rightp
else if funcbody then
    handlebody
    rightp = currnode.rightp
else if endfunc then
    pop downto begin from operator stack
    pop rightp from operator stack
else if while/for then
    rightp = currnode.rightp
    push rightp, while/for on operator stack
else if do then
    flag = pop
    if not flag then
        pop while, rightp from operator stack
        pop rightp from operator stack
        pop (
    else if continue then
        pop downto while from operator stack
        pop rightp from operator stack
    else if break then
        pop downto while from operator stack
        pop rightp, rightp from operator stack
        pop (
    else if breakfor then
        pop downto for from operator stack
        pop rightp, rightp from operator stack
        pop (
        pop (
    else if contfor then
        pop downto loopbody from operator stack
        pop rightp from operator stack
else if then then
    flag = pop
    if flag then
        rightp = currnode.rightp
    else
        pop if from operator stack
        pop (
        pop rightp from operator stack
else
    return false

```

```

pop downto x from operator stack: // handle pop-downto
  pop multiple from operator stack
  if: pop (
  while: pop (

do block while flag: // handle do-while loop
  while true do block if not flag then break

handlecons(count):
  pop classref from operator stack
  gen objref: root 0/1 = instance/class vars
  push objref on operator stack
  return handlecall(count)

handlecall(count):
  pop objref from operator stack
  push objref
  pop codept from operator stack
  return handlecodept(codept, count)

handlecodept(codept, count):
  repeat count - 2 times
    pop val from operator stack
    push val
  push count - 1
  return codept

handlecallback(count):
  pop callback from operator stack
  unpack objref, codept
  push objref
  return handlecodept(codept, count)

handlebody:
  count = pop
  root = new node
  for i = count - 2 downto 0 do
    parm = pop
    add parm to 1st half of tree[i]
  objref = parm
  rightp = currnode.rightp
  loccount = currnode value
  repeat loccount times
    add null node to 2nd half of tree
  rightp = currnode.rightp

```