18-1-T01

(Dijkstra's "A Discipline of Programming": The Ninth Lecture, The Formal Treatment of Some Small Examples — I)

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1) [1] (

```
(m = x \text{ or } m = y) \text{ and } m \quad x \text{ and } m \quad y
                                                                                            m = x
                                                       x y
                                                                   m:=x
                                                                    (m = x \text{ or } m = y) \quad m := x
(correctness)
                                                             m:=y
                                                                                  (flow-chart)
                  (plane geometry)
                   가
                   , 가
                                             가
                                                                                   8-1
                                                                             R(m)
                                                                      )
                               X, y, . . .
                  x0, y0, . . .
                                         , x = x0
and y = y0 and . . .
and y = y0 and . . .
                (temporary constant)'
       (assignment statement)
                                                                                   8-2
                                                                가
                                                                                            !
                                                        R(x) = ((x = x \text{ or } x = y) \text{ and } x \quad x \text{ and } x \quad y)
                                                              = (x y)
                                     R(m)
                       가
                                                        R(y) = ((y = x \text{ or } y = y) \text{ and } y \quad x \text{ and } y \quad y)
```

```
= (y x)
                  :
                                        (P and non BB) R
 if x \quad y \quad m := x \mid y \quad x \quad m := y \text{ fi}
(x \quad y \text{ or } y \quad x) = T
      (abortion)
                          (
                                                               가
                         (existence
proof) : x y

R(m) m
                                ). (x
y and y x) F
     (deterministic)
                                . 0 k < j n and (A i: 0 i < j: f(k) f(i))
    x = y,
                                                        (finite domain)
            'max'가
    , R(max(x, y)) = T
                                                   (P \text{ and } j = n) R
  m : \blacksquare max(x, y)
        . ( .)
     가
                                                 (k = 0 \text{ and } j = 1) P
        n(n > 0)
                             f(i)가 0
                                                  가 ).
                              R
                                          k, j := 0, 1 \{PP\} };

do j \quad n \quad P \qquad j = n
                                          k, j : = 0, 1 {P가
  0 	 k < n 	 and 	 (A 	 i: 0 	 i 	 n: f(k) 	 f(i))
                                          {R }
                         n
```

```
4 프로그래밍언어논문지 제17권 제2호 (2003. 7)
```

```
0 	 j < j + 1 	 n  and
(monotonically decreasing) t t
                                                         (A i: 0 i < j + 1: f(j) f(i))
= (n - j)
                                                         0 j < j + 1 n and
        P \quad (t \quad 0) \qquad . \quad t
                                                         (A \ i : 0 \ i < j : f(j) \ f(i))
                                        가
                            j 1
                                                              (P \text{ and } j \quad n \text{ and } f(k) \quad f(j))
                                                                wp("k, j : = j, j + 1", P)
  wp("j : = j + 1", P) =
    0 \quad k \quad j+1 \quad n \text{ and }
    (A i: 0 i < j + 1: f(k) f(i))
    0 \quad k \quad j + 1 \quad n \text{ and }
    (\mathbf{A} \ i: \ 0 \qquad i < j: \ f(k) \qquad f(i)) \ \mathbf{and} \ f(k) \qquad f(j)
                                                      k, j := 0, 1;
                       P and j n
                                                       do j  n if f(k) f(j) j := j + 1
        ((j \quad n \text{ and } j \quad n) \quad (j + 1)
                                                                  | f(k)   f(j)   k, j := j, j + 1 fi od
                             가 j 1
n)
가
                             ).
                                                           가
                                                                           )
                                                                                            가
     (P \text{ and } j \quad n \text{ and } f(k) \quad f(j))
      wp("j : = j + 1", P)
                             가
                                                           f>⊦ k
  k, j := 0, 1;
 do j n if f(k) f(j) j := j + 1 fi od
                                                                                                 !
                           가
                                가
                   )
                            k = 0 R
                                             f(k)
                                              k :
   f(j)가
= j
    가
                                                                k
                                                                              f(k)
 wp("k, j := j, j + 1", P) =
```

```
h('help'
                                                                    )
                                        가
                      . (
                                                              h = f(j)
(messiness)
                                                         가
                                             (global)
             가
                                               : j = n
                                 가
                                                 f(j)가
                        .)
                                                         ʻod
   가
                                            1)
              f(k)
  k
                           가
                                               k, j, max := 0, 1, f(0);
                                              do j n
                                                       h:=f(j);
  max
                                                         if max \ h \ j := j + 1
                                                          | max h
               max = f(k)
                                                             k, j, max: = j, j + 1, h \text{ fi od}
 가
           가
                  k
                            -max
                                                                              가
 k, j, max := 0, 1, f(0);
                                                                              가
 do j n if max
                          j := j + 1
                    f(j)
            | max f(j)
               k, j, max: = j, j + 1, f(j) fi od
                                                                             가
    f(j)
                                               (trading)'
                              가
```

 $X = x_i$ 

Xn

가 . *n i* ,

가 *n* 가

do i n i, X := i + 1, f(X) od

가

```
;
                                               X = x_n
                                  가
가 'j < n'
         가
                                    do i < n  i, X := i + 1, f(X) od
         가 'j n'
                                         X = x_n
   가 . 가 'j n'
                                        가 가
   j = n
                                          . ( .)
 , 가 'j < n'
  가 'j n' j n
                              [1] Dijkstra, E. W., A Discipline of
    )
                                 Programming, Prentice Hall,
    (robustness)
                                 Englewood Cliffs, NJ, 1976.
    . j:=j+1
j 가 j>n
    , 가 'j < n'
             가 'j n'
                                           1981 ~ 1985
   . x_0, x_1, x_2, \ldots 가 x_0
         X_i = f(X_{i-1})
  i > 0
      . f
                        가
```



1985 ~ 1987 1987 ~ 1992 1992

n

!)

1997 ~ 1998