Theorem Problem

SNU 4541.664A Program Analysis

Spring 2006

Note 5

Prof. Kwangkeun Yi

계획

1. 의미구조 정의하기 연습
2. 프로그램의 의미는 아직도 고정점

회로도

$$
\begin{array}{rcll}
C & \rightarrow & \bot & \\
 & | & \top & \\
 & | & \neg\, C & \\
 & | & \times\, C\, C & \\
 & | & +\, C\, C & \\
 & | & \oplus\, C\, C & \text{arbitration} \\
 & | & \otimes\, C\, C\, C & \text{multiplexing}
\end{array}
$$

- by structural operational semantics
- by evaluation context semantics
- by transition semantics

C----

$$
\begin{array}{rcl}
C & \rightarrow & \texttt{skip} \\
 & | & x \texttt{ := } E \\
 & | & C \texttt{ ; } C \\
 & | & \texttt{if } E\ C\ C \\
 & | & \texttt{while } E \texttt{ do } C \\
E & \rightarrow & n \quad (n \in \mathbb{Z}) \\
 & | & E \texttt{ + } E \\
 & | & \texttt{- } E
\end{array}
$$

- by evaluation context semantics
- by abstract machine semantics

C---

$$
\begin{array}{rcl}
C & \rightarrow & \texttt{skip} \\
& | & x \texttt{ := } E \\
& | & C \texttt{ ; } C \\
& | & \texttt{if } E\ C\ C \\
& | & \texttt{while } E \texttt{ do } C \\
& | & \texttt{local } x \texttt{ := } E \texttt{ in } C \\
E & \rightarrow & n \quad (n \in \mathbb{Z}) \\
& | & E \texttt{ + } E \\
& | & \texttt{- } E
\end{array}
$$

C--

$$
\begin{array}{rcl}
C & \rightarrow & \texttt{skip} \\
& | & x \texttt{ := } E \mid \texttt{*}x \texttt{ := } E \\
& | & C \texttt{ ; } C \\
& | & \texttt{if } E\ C\ C \\
& | & \texttt{while } E \texttt{ do } C \\
& | & \texttt{local } x \texttt{ := } E \texttt{ in } C \\
E & \rightarrow & n \quad (n \in \mathbb{Z}) \\
& | & E \texttt{ + } E \\
& | & \texttt{- } E \\
& | & x \mid \texttt{*}x \mid \texttt{\&}x
\end{array}
$$

C---+

$$
\begin{array}{rcl}
C & \rightarrow & \texttt{skip} \\
 & | & x \texttt{ := } E \\
 & | & C \texttt{ ; } C \\
 & | & \texttt{if } E\ C\ C \\
 & | & \texttt{while } E \texttt{ do } C \\
 & | & \texttt{raise} \\
 & | & \texttt{try } C \texttt{ handle } C \\
E & \rightarrow & x \mid n \quad (n \in \mathbb{Z}) \\
 & | & E \texttt{ + } E \\
 & | & \texttt{- } E
\end{array}
$$

의미는 아직도 고정점

- 한 실행과정: $M \vdash C \Rightarrow M'$의 증명 또는
  $(M, C) \rightarrow (M_1, C_1) \rightarrow \cdots$
- $[\![C]\!]\, M = fix \lambda t.(M, C) \sqcup (t \rightarrow (M_{i+1}, C_{i+1}))$

  where $t = \cdots \rightarrow (M_i, C_i)$

  $\wedge\, (M_i, C_i) \rightarrow (M_{i+1}, C_{i+1})$
- $[\![C]\!] = fix \lambda f.\lambda M.(M, C) \sqcup (f(M) \rightarrow (M_{i+1}, C_{i+1}))$

  where $f(M) = \cdots \rightarrow (M_i, C_i)$

  $\wedge\, (M_i, C_i) \rightarrow (M_{i+1}, C_{i+1})$

$$
\begin{aligned}
[\![C]\!]\, M &= \mathit{fix}\lambda T. \\
&\quad \{(M, C)\} \sqcup \\
&\quad \{t \to (M_{i+1}, C_{i+1}) \mid \\
&\qquad t \in T,\ t = \cdots \to (M_i, C_i),\ (M_i, C_i) \to (M_{i+1}, C_{i+1})\}
\end{aligned}
$$

$$
[\![C]\!] = \mathit{fix} \cdots
$$

$$
\begin{aligned}
[\![C]\!]\, M &= \mathit{fix}\lambda S. \\
&\quad \{(M, C)\} \sqcup \\
&\quad \{(M_{i+1}, C_{i+1}) \mid \\
&\qquad (M_i, C_i) \to (M_{i+1}, C_{i+1}),\ (M_i, C_i) \in S\}
\end{aligned}
$$

$$
[\![C]\!] = \mathit{fix} \cdots
$$