

# SNU 4541.664A Program Analysis

## Spring 2005

### Note 5

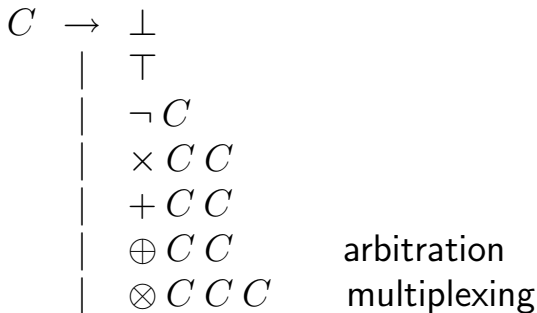
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# 계획

1 의미구조 정의하기 연습

2 프로그램의 의미는 아직도 고정점

## 회로도



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

## C-----

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

- by evaluation context semantics
- by abstract machine semantics

## C---

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

## C--

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

## C----+

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

# 의미는 아직도 고정점

- 한 실행과정:  $M \vdash C \Rightarrow M'$ 의 증명 또는  $(M, C) \rightarrow (M_1, C_1) \rightarrow \dots$
- $\llbracket C \rrbracket M = \text{fix } \lambda t. (M, C) \sqcup (t \rightarrow (M_{i+1}, C_{i+1}))$   
 where  $t = \dots \rightarrow (M_i, C_i)$   
 $\wedge (M_i, C_i) \rightarrow (M_{i+1}, C_{i+1})$
- $\llbracket C \rrbracket = \text{fix } \lambda f. \lambda M. (M, C) \sqcup (f(M) \rightarrow (M_{i+1}, C_{i+1}))$   
 where  $f(M) = \dots \rightarrow (M_i, C_i)$   
 $\wedge (M_i, C_i) \rightarrow (M_{i+1}, C_{i+1})$



$$\begin{aligned}
 \llbracket C \rrbracket M &= \text{fix } \lambda T. \\
 &\quad \{(M, C)\} \sqcup \\
 &\quad \{t \rightarrow (M_{i+1}, C_{i+1}) \mid \\
 &\quad \quad t \in T, t = \dots \rightarrow (M_i, C_i), (M_i, C_i) \rightarrow (M_{i+1}, C_{i+1})\}
 \end{aligned}$$

$$\llbracket C \rrbracket = \text{fix } \dots$$

$$\begin{aligned}
 \llbracket C \rrbracket M &= \text{fix } \lambda S. \\
 &\quad \{(M, C)\} \sqcup \\
 &\quad \{(M_{i+1}, C_{i+1}) \mid \\
 &\quad \quad (M_i, C_i) \rightarrow (M_{i+1}, C_{i+1}), (M_i, C_i) \in S\}
 \end{aligned}$$

$$\llbracket C \rrbracket = \text{fix } \dots$$