COMP 3610/6361

12/10/2023

if b then c_1 else c_2

$$(b \to c_1 \to nil) + (\neg b \to c_2 \to nil)$$

(while b do c) ; d

$$W() \stackrel{def}{=} b \to c \to W() + \neg b \to nil$$

$$\frac{b \to true}{(b \Rightarrow p) \xrightarrow{\tau} p}$$

$$\underbrace{(x>3) \Rightarrow (\alpha!x) \to nil}_{p}$$

$$p \xrightarrow{\alpha!x} nil$$ (assuming $x>3$ evaluates to true)

using the above rule

$$p \xrightarrow{\tau} (\alpha!x \to nil) \xrightarrow{\alpha!x} nil$$

$$\underbrace{(x>3) \to (x<2) \to \alpha!x \to nil + (x>2) \to \alpha!x \to nil}_{\xrightarrow{\alpha!x}\ nil\ \text{(under CCS)}}$$

the alternative rule introduces deadlock

$$P(x, y) \stackrel{\text{def}}{=} x > y \to \alpha!x \to \text{nil}$$
$$+\, x \leq y \to \alpha!y \to \text{nil}$$

$$\to \ldots \to P(3, 7+2)$$

$$\dfrac{\dfrac{(\alpha!3 \to nil + P) \,\|\, \tau \to nil \xrightarrow{\alpha!n} ? \qquad \alpha?x \xrightarrow{\alpha?n} nil}{((\alpha!3 \to nil + P) \,\|\, \tau \to nil) \,\|\, \alpha?x \to nil \xrightarrow{\tau} \ldots}}{(((\alpha!3 \to nil + P) \,\|\, \tau \to nil) \,\|\, \alpha?x \to nil) \setminus \{\alpha\} \xrightarrow{\tau} \ldots}$$

$$p_0 + p_1 \triangleq \sum_{i \in \{0,1\}} p_i$$

$$nil \triangleq \sum_{i \in \emptyset} p_i$$