

Exercises to the lecture
Concurrency Theory
Sheet 3

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Delivery until 13.05.2014 at 12h

Exercise 3.1

Consider the following proof sketch:

$$\begin{array}{ccc}
 & \{x = 0\} & \\
 \{x = 0\} & \parallel & \{x = 0\} \\
 \quad x = x + 1 & & \quad x = x + 2 \\
 \{x = 1 \vee x = 3\} & \parallel & \{x = 2 \vee x = 3\} \\
 & \{x = 3\} &
 \end{array}$$

- a) Show that this is not a valid proof sketch with respect to HOARE + (OG – INF).
 b) Find a valid proof for $\{x = 0\} x = x + 1 \parallel x = x + 2 \{x = 3\}$ in HOARE+(OG–INF).

Exercise 3.2

- a) Show that there is no proof sketch for $\{x = 0\} x = x + 1 \parallel x = x + 1 \{x = 2\}$ in HOARE + (OG – INF).
 b) Provide an equivalent program C so that $\{x = 0\} C \{x = 2\}$ can be proven.

Exercise 3.3Consider the following program P :

$$\begin{array}{ccc}
 y = y + 1 & \parallel & \mathbf{assume}(y > 0) \\
 \mathbf{assume}(x > 0) & \parallel & x = y
 \end{array}$$

Give suitable rely-guarantee predicates R and G so that $P : (\{x > 0 \wedge y > 0\}, R, G, \{\text{true}\})$.**Exercise 3.4**

Prove the soundness of the sequential composition rule (SEQ) for rely-guarantee.

Delivery until 13.05.2014 at 12h into the box next to 34-401.4