COMP 3610 Tutorial 6

21 September, 2023

Exercise 1

For each of the following proposed equivalences, determine whether they hold based on our definition of semantic equivalence on slide 275 of the combined slide deck. Either give a counterexample or an argument for why the equivalence holds.

1. $5 \overset{?}{\simeq} 2 + 3$
2. $l_1 := 4; l_1 := 2 \overset{?}{\simeq} l_1 := 2$
3. $l_1 := 4; l_2 := 2; !l_1 \overset{?}{\simeq} l_2 := 2; l_1 := 4; !l_1$
4. $l_1 := 4; l_1 := 2; !l_1 \overset{?}{\simeq} l_1 := 2; l_1 := 4; !l_1$
5. $l_1 := 3; (\textbf{while true do skip}); 4 \overset{?}{\simeq} l_1 := -2; (\textbf{while true do skip}); 16$
6. $\textbf{if } !l_1 = 4 \textbf{ then while true do skip}; 3 \textbf{ else } 3 \overset{?}{\simeq} \textbf{if } !l_1 = 3 \textbf{ then while true do skip}; 4 \textbf{ else } 4$
7. $\textbf{if } !l_1 = 4 \textbf{ then while true do skip}; 4 \textbf{ else } 4 \overset{?}{\simeq} \textbf{if } !l_1 = 3 \textbf{ then while true do skip}; 4 \textbf{ else } 4$

Exercise 2

Prove cases "$E; \_$" and "$\_; E$" of the Congruence theorem for semantic equivalence (Lecture 20/09).

Exercise 3

Show that the following equivalences hold in the context of denotational semantics:

1. $l := a_1; l := a_2 \overset{?}{\simeq} l := a_2$
2. $l_1 := 4; l_2 := 2; !l_1 \overset{?}{\simeq} l_2 := 2; l_1 := 4; !l_1$