

Formal Model and Verification

Exercise 8: Symbolic preconditions of rules

1. Please compute the following preconditions.

(a) $\text{pre}(x=y+z; , x < 2y+1 \ \&\& \ y>2)$

(b) $\text{pre}(x = 3y; , x < y+3 \ \&\& \ y > 2)$

(c) $\text{pre}(x = 3; , x < 2y+3 \ \&\& \ y > 5)$

2. Please compute the following preconditions.

(a) $\text{pre}(\text{if } (x \leq 2z \ \&\& \ z > 8) \ x = x+1; \text{ else } z = 3x; , x < y+3 \ \&\& \ y > 2)$

(b) $\text{pre}(y = z+3x; x = x+1; z = 3; , x < y+3 \ \&\& \ y > 2)$

(c) $\text{pre}(\text{if } (z \leq x \ \&\& \ z > 8) \ x = x+1; \text{ else } z = 3;$

$y = 3*z+x;$

$x = x+1;$

$z = 3; ,$

$x < y+3 \ \&\& \ y > 2$

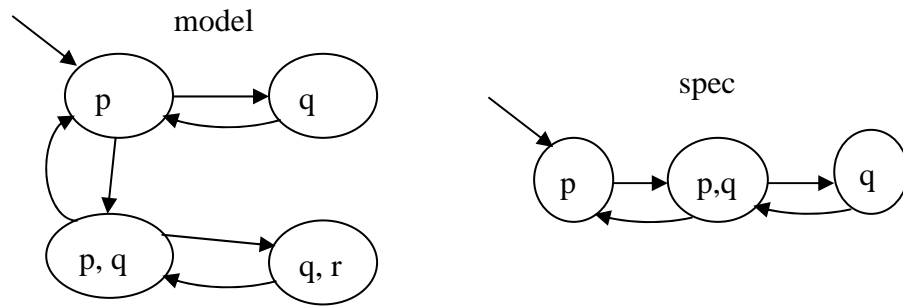
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3. Please compute the following preconditions.

(a) $\text{pre}(\text{while } (x \geq 2 \ \&\& \ y < 8) \{ x = x+1; y = y-1; \}, x < 5 \ \&\& \ y > 2)$

(b) $\text{pre}(\text{while } (x \geq y \ \&\& \ y < 8) \ y = y+2; , x > 3 \ \&\& \ y > 3)$

4. We have the following two Kripke structures.



The model uses proposition set $\{p, q, r\}$ while the spec uses $\{p, q\}$.

- (a) Please construct the state formulas for the two Kripke structures.
 - (b) Please construct the initial state formulas for the two Kripke structures.
 - (c) Please construct the formulas for the transition relations of the two Kripke structures.
 - (d) Please carry out the symbolic simulation checking algorithm for the two Kripke structures.
5. Please rewrite our symbolic simulation checking algorithm for the symbolic bisimulation checking between two Kripke structures.