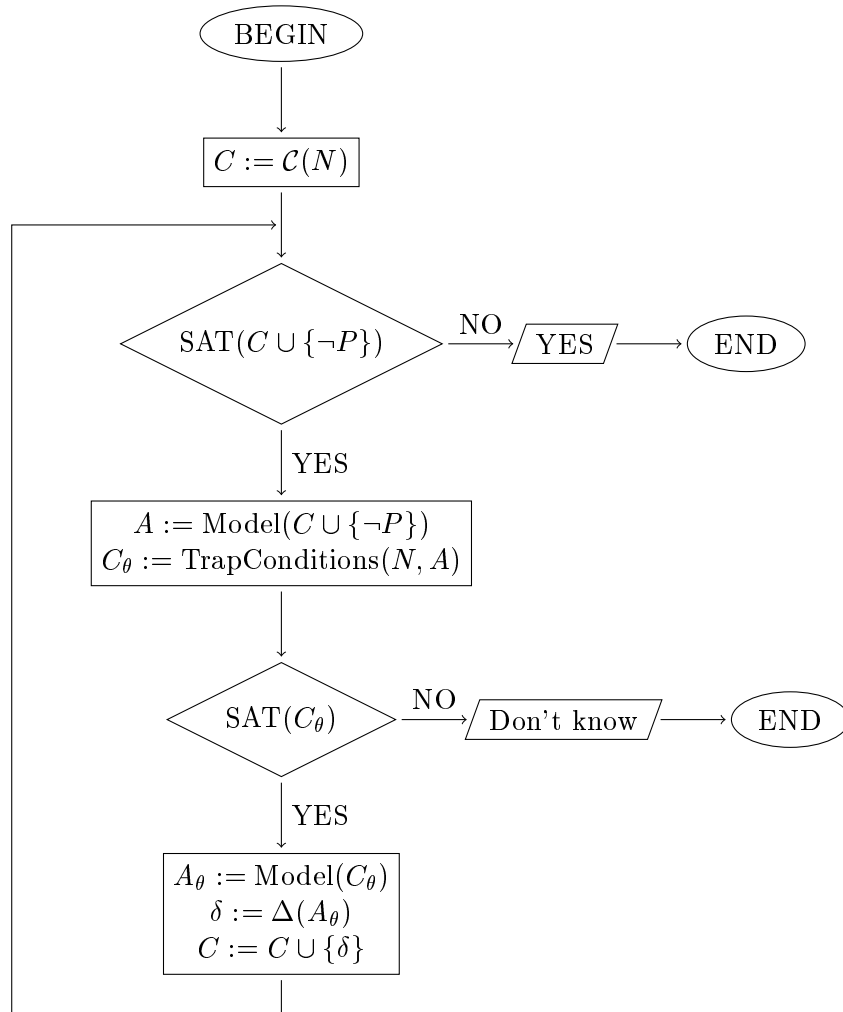


1 Peterson's Algorithm

1.1 Method



1.2 Constraints C_0

$$\begin{aligned}
p_1 &= 1 - u_1 && + u_6 \\
p_2 &= 0 + u_1 - u_2 - u_3 \\
p_3 &= 0 && + u_2 + u_3 - u_4 - u_5 \\
p_4 &= 0 && + u_4 + u_5 - u_6 \\
q_1 &= 1 && - v_1 && + v_6 \\
q_2 &= 0 && + v_1 - v_2 - v_3 \\
q_3 &= 0 && + v_2 + v_3 - v_4 - v_5 \\
q_4 &= 0 && + v_4 + v_5 - v_6 \\
(m_1 = f) &= 1 - u_1 && + u_6 \\
(m_1 = t) &= 0 + u_1 && - u_6 \\
(m_2 = f) &= 1 && - v_1 && + v_6 \\
(m_2 = t) &= 0 && + v_1 && - v_6 \\
(hold = 1) &= 1 && + u_2 && - v_3 \\
(hold = 2) &= 0 && - u_2 && + v_3 \\
p_4 &\geq 1 \\
q_4 &\geq 1 \\
\forall p \in S \cup T : &&& p \geq 0
\end{aligned}$$

$$\begin{aligned}
\delta_1 &= p_3 \vee q_2 \vee (m_2 = f) \vee (hold = 2) \\
\delta_2 &= p_2 \vee q_3 \vee (m_1 = f) \vee (hold = 1)
\end{aligned}$$

1.3 A_1

$$\begin{aligned}p_1 &= 0 \\p_2 &= 0 \\p_3 &= 0 \\p_4 &= 1 \\q_1 &= 0 \\q_2 &= 0 \\q_3 &= 0 \\q_4 &= 1 \\(m_1 = f) &= 0 \\(m_1 = t) &= 1 \\(m_2 = f) &= 0 \\(m_2 = t) &= 1 \\(hold = 1) &= 1 \\(hold = 2) &= 0 \\u_1 &= 1 \\u_2 &= 0 \\u_3 &= 1 \\u_4 &= 0 \\u_5 &= 1 \\u_6 &= 0 \\v_1 &= 1 \\v_2 &= 1 \\v_3 &= 0 \\v_4 &= 1 \\v_5 &= 0 \\v_6 &= 0\end{aligned}$$

1.4 A_2

$$\begin{aligned}p_1 &= 0 \\p_2 &= 0 \\p_3 &= 0 \\p_4 &= 1 \\q_1 &= 0 \\q_2 &= 0 \\q_3 &= 0 \\q_4 &= 1 \\(m_1 = f) &= 0 \\(m_1 = t) &= 1 \\(m_2 = f) &= 0 \\(m_2 = t) &= 1 \\(hold = 1) &= 0 \\(hold = 2) &= 1 \\u_1 &= 1 \\u_2 &= 0 \\u_3 &= 1 \\u_4 &= 1 \\u_5 &= 0 \\u_6 &= 0 \\v_1 &= 1 \\v_2 &= 0 \\v_3 &= 1 \\v_4 &= 1 \\v_5 &= 0 \\v_6 &= 0\end{aligned}$$

1.5 A_{θ_1}

$$\begin{aligned}p_1 &= 0 \\p_2 &= 0 \\p_3 &= 1 \\p_4 &= 0 \\q_1 &= 0 \\q_2 &= 1 \\q_3 &= 0 \\q_4 &= 0 \\(m_1 = f) &= 0 \\(m_1 = t) &= 0 \\(m_2 = f) &= 1 \\(m_2 = t) &= 0 \\(hold = 1) &= 0 \\(hold = 2) &= 1\end{aligned}$$

1.6 A_{θ_2}

$$\begin{aligned}p_1 &= 0 \\p_2 &= 1 \\p_3 &= 0 \\p_4 &= 0 \\q_1 &= 0 \\q_2 &= 0 \\q_3 &= 1 \\q_4 &= 0 \\(m_1 = f) &= 1 \\(m_1 = t) &= 0 \\(m_2 = f) &= 0 \\(m_2 = t) &= 0 \\(hold = 1) &= 1 \\(hold = 2) &= 0\end{aligned}$$

1.7 C_θ

①

$$\begin{aligned}
p_1 &\implies o_u_1 \\
p_2 &\implies o_u_2 \wedge o_u_3 \\
p_3 &\implies o_u_4 \wedge o_u_5 \\
p_4 &\implies o_u_6 \\
q_1 &\implies o_v_1 \\
q_2 &\implies o_v_2 \wedge o_v_3 \\
q_3 &\implies o_v_4 \wedge o_v_5 \\
q_4 &\implies o_v_6 \\
(m_1 = f) &\implies o_u_1 \wedge o_v_4 \\
(m_1 = t) &\implies o_u_6 \\
(m_2 = f) &\implies o_v_1 \wedge o_u_4 \\
(m_2 = t) &\implies o_v_6 \\
(hold = 1) &\implies o_v_3 \wedge o_v_5 \wedge o_u_3 \\
(hold = 2) &\implies o_u_3 \wedge o_u_5 \wedge o_v_3 \\
o_u_1 &\implies (p_2 \vee (m_1 = t)) \\
o_u_2 &\implies (p_3 \vee (hold = 1)) \\
o_u_3 &\implies (p_3 \vee (hold = 1)) \\
o_u_4 &\implies (p_4 \vee (m_2 = f)) \\
o_u_5 &\implies (p_4 \vee (hold = 2)) \\
o_u_6 &\implies (p_1 \vee (m_1 = f)) \\
o_v_1 &\implies (q_2 \vee (m_2 = t)) \\
o_v_2 &\implies (q_3 \vee (hold = 2)) \\
o_v_3 &\implies (q_3 \vee (hold = 2)) \\
o_v_4 &\implies (q_4 \vee (m_1 = f)) \\
o_v_5 &\implies (p_4 \vee (hold = 1)) \\
o_v_6 &\implies (q_1 \vee (m_2 = f))
\end{aligned}$$

②

$$p_1 \vee q_1 \vee (m_1 = f) \vee (m_2 = f) \vee (hold = 1)$$

③₁

$$\neg p_4 \wedge \neg q_4 \wedge \neg(m_1 = t) \wedge \neg(m_2 = t) \wedge \neg(hold = 1)$$

③₂

$$\neg p_4 \wedge \neg q_4 \wedge \neg(m_1 = t) \wedge \neg(m_2 = t) \wedge \neg(hold = 2)$$

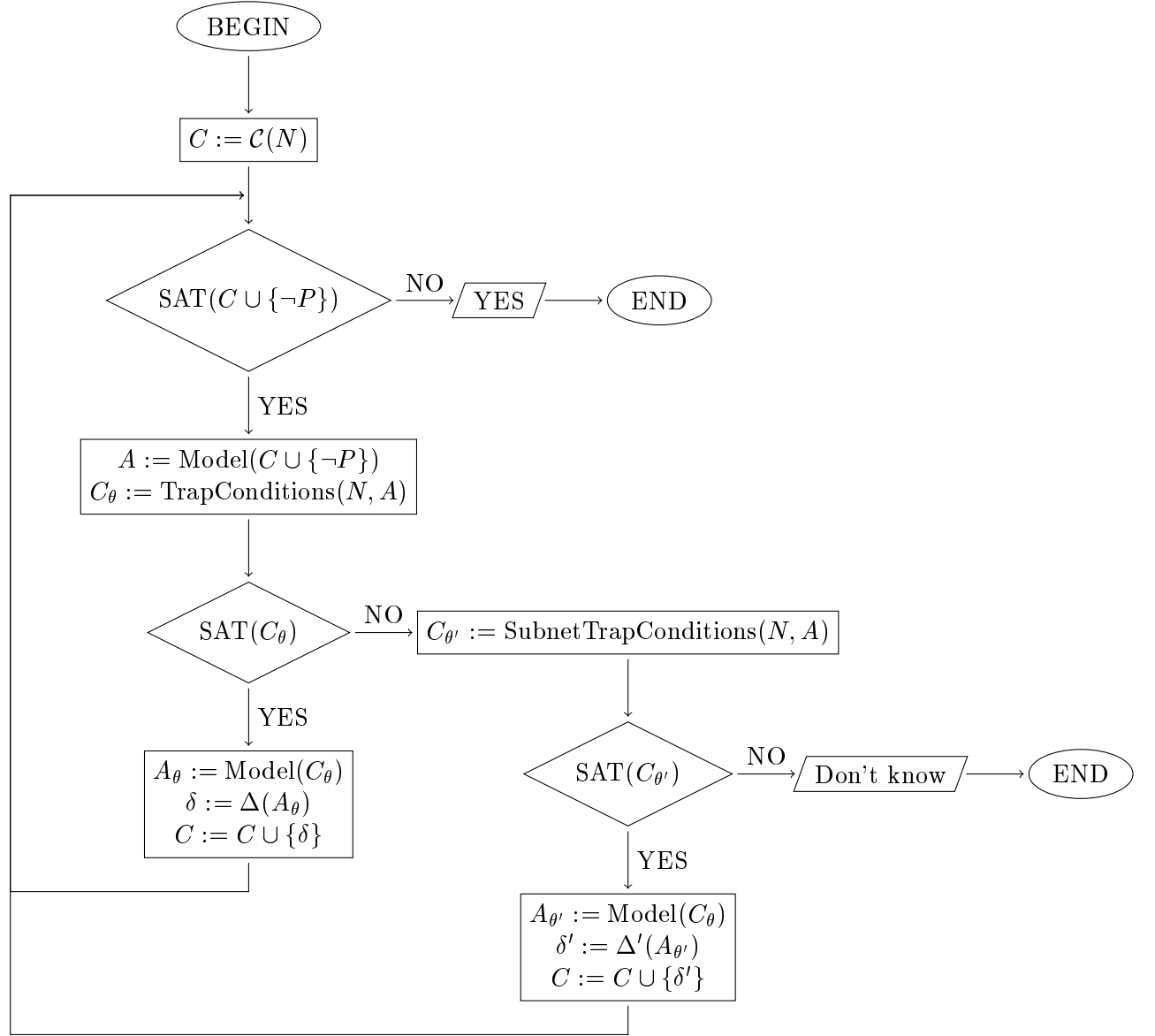
1.8 Benchmark

Give by Daniel Kroening:

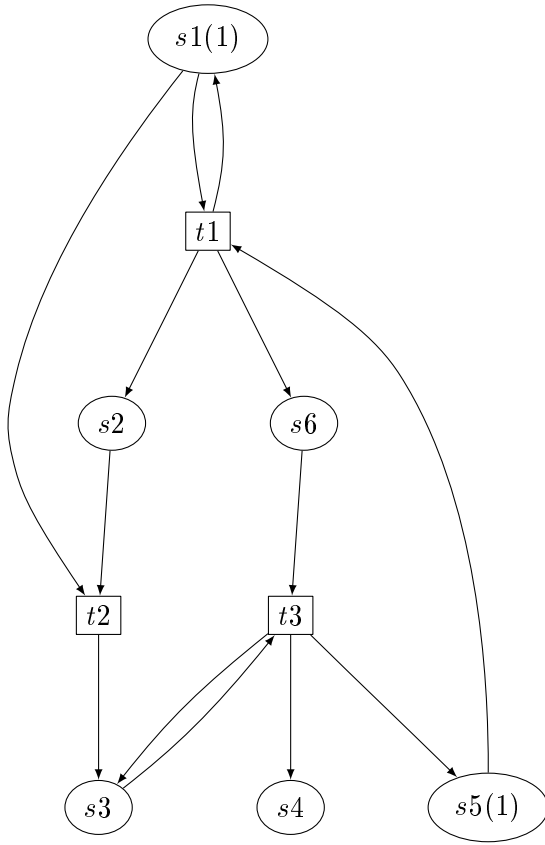
		Our tool			
		positive	don't know	timeout 10 min	
Mist	positive	8	3	0	11
	negative	0	28	0	28
	timeout 1 min	15	23	0	38
		23	54	0	77

2 Cyclic net

2.1 Method



2.2 Petri net



2.3 Constraints C_0

$$s_1 = 1 - t_2$$

$$s_2 = 0 + t_1 - t_2$$

$$s_3 = 0 + t_2$$

$$s_4 = 0 + t_3$$

$$s_5 = 1 - t_1 + t_3$$

$$s_6 = 0 + t_1 - t_3$$

$$s_1 \geq 1$$

$$s_2 \geq 1 \quad s_4 \geq 1$$

$$s_5 \geq 1$$

$$\forall p \in S \cup T : p \geq 0$$

$$\delta'_1 = (t_1 > 0) \wedge (t_2 = 0) \wedge (t_3 > 0) \implies (s_3 > 0)$$

2.4 A_1

$$s_1 = 1$$

$$s_2 = 1$$

$$s_3 = 0$$

$$s_4 = 1$$

$$s_5 = 1$$

$$s_6 = 0$$

$$t_1 = 1$$

$$t_2 = 0$$

$$t_3 = 1$$

2.5 $A_{\theta'1}$

$$s_1 = 0$$

$$s_2 = 0$$

$$s_3 = 1$$

$$s_4 = 0$$

$$s_5 = 0$$

$$s_6 = 0$$

2.6 C_θ

$$s_1 \implies o_t_1 \wedge o_t_2$$

$$s_2 \implies o_t_2$$

$$s_3 \implies o_t_3$$

$$s_4 \implies true$$

$$s_5 \implies o_t_1$$

$$s_6 \implies o_t_2$$

$$o_t_1 \implies (s_1 \vee s_2 \vee s_6)$$

$$o_t_2 \implies s_3$$

$$o_t_3 \implies (s_3 \vee s_4 \vee s_5)$$

$$s_1 \vee s_5$$

$$\neg s_1 \wedge \neg s_2 \wedge \neg s_4 \wedge \neg s_5$$

2.7 $C_{\theta'}$

$$\begin{aligned}
s_1 &\implies o_t_1 \wedge o_t_2 \\
s_2 &\implies o_t_2 \\
s_3 &\implies o_t_3 \\
s_4 &\implies true \\
s_5 &\implies o_t_1 \\
s_6 &\implies o_t_2 \\
o_t_1 = (t_1 > 0) &\implies (s_1 \vee s_2 \vee s_6) \\
o_t_2 = (t_2 > 0) &\implies s_3 \\
o_t_3 = (t_3 > 0) &\implies (s_3 \vee s_4 \vee s_5)
\end{aligned}$$

$$(t_1 = 1) \wedge (t_2 = 0) \wedge (t_3 = 1)$$

$$s_1 \vee s_2 \vee s_3 \vee s_4 \vee s_5 \vee s_6$$

$$\neg s_1 \wedge \neg s_2 \wedge \neg s_4 \wedge \neg s_5$$

2.8 Benchmark

Give by Daniel Kroening:

		Our tool			
		positive	don't know	timeout 10 min	
Mist	positive	8	3	0	11
	negative	0	28	0	28
	timeout 1 min	15	19	4	38
		23	50	4	77