

CSCI803 Project

Yao Xiao
SID 2019180015

May 23, 2021

1 Part 1

1.1 1)

$$P' = \{p_1, p_2, p_3, c_1, c_2, p_4, p_5, p_6\}$$

$${}^\circ P' = \{t_1, t_2, t_3, t_4, t_5, t_6\}$$

$$P'^\circ = \{t_1, t_2, t_3, t_4, t_5, t_6\}$$

A trap is a set of places P such that the set of output transitions of P is included in the set of input transitions of P .

We have $P'^\circ \subseteq {}^\circ P'$.

A siphon is a set of places P such that the set of input transitions of P is included in the set of output transitions of P .

We have ${}^\circ P' \subseteq P'^\circ$.

Based on these, traps and siphons exist in the given Petri net.

1.2 2)

We suppose the marking of p_2 have passed to p_1 , and the marking of p_4 have passed to p_5 . And we use the fundamental equation to prove the features.

$$M_0 = (1, 0, 0, 0, 1, 0, 1, 1)$$

$$s_0 = (0, 1, 0, 0, 0, 0)$$

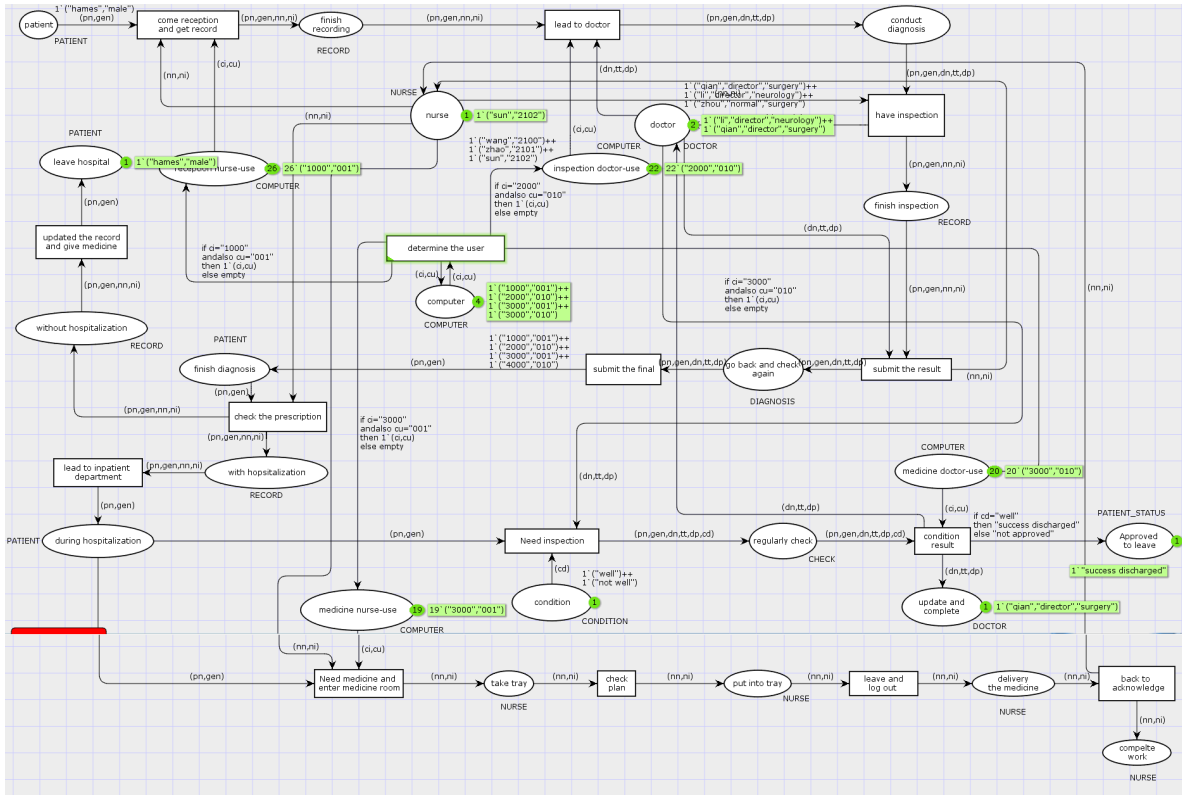
$$W = \begin{bmatrix} 1 & -1 & 0 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 & -1 \\ 0 & -1 & 1 & 0 & 0 & 0 \end{bmatrix}$$

$$M_0 + W \cdot s_0 = M$$

$$M = (0, 0, 1, 0, 1, 0, 1, 0)$$

We can see after fundamental equation, p_3, p_5, c_1 have the marking, and because c_2 don't have the marking, so p_6 won't have the marking. Based on the analysis, p_3 and p_6 cannot contain one token at the same time for all reachable markings M , e mutual exclusion feature of the Petri net model is proved.

2 Part 2



6. Set of colour set functions:

$$C(p) = \begin{cases} PATIENT & \text{if } p \in \{PATIENT_NAME, GENDER\} \\ NURSE & \text{if } p \in \{NURSE_NAME, NURSE_ID\} \\ COMPUTER & \text{if } p \in \{COMPUTER_ID, COMPUTER_USER\} \\ DOCTOR & \text{if } p \in \{DOCTOR_NAME, TITLE, DEPARTMENT\} \\ DIAGNOSIS & \text{if } p \in \{PATIENT_NAME, GENDER, DOCTOR_NAME, TITLE, DEPARTMENT\} \\ CONDITION & \text{if } p = CONDITION \\ PATIENT_STATUS & \text{if } p = PATIENT_STATUS \end{cases}$$

7. Set of arc expression functions:

$$E(a) = \begin{cases} 1'(pg, gen) & \text{if } a \in \{(\text{patient, come reception and get record}), \dots\} \\ 1'(nn, ni) & \text{if } a \in \{(\text{nurse, come reception and get record}), \dots\} \\ 1'(ci, cu) & \text{if } a \in \{(\text{computer, determine the user}), \dots\} \\ \text{if } ci = "1000" \\ \text{and also } cu = "001" \\ \text{then } 1'(ci, cu) & \\ \text{else empty} & \text{if } a = (\text{determine the use, reception nurse-use}) \\ \text{if } ci = "2000" \\ \text{and also } cu = "010" \\ \text{then } 1'(ci, cu) & \\ \text{else empty} & \text{if } a = (\text{determine the use, inspection doctor-use}) \\ \text{if } ci = "3000" \\ \text{and also } cu = "001" \\ \text{then } 1'(ci, cu) & \\ \text{else empty} & \text{if } a = (\text{determine the use, medicine nurse-use}) \\ \text{if } ci = "3000" \\ \text{and also } cu = "010" \\ \text{then } 1'(ci, cu) & \\ \text{else empty} & \text{if } a = (\text{determine the use, medicine doctor-use}) \\ 1'(dn, tt, dp) & \text{if } a \in \{(\text{doctor, lead to doctor}), \dots\} \\ 1'(cd) & \text{if } a = (\text{condition, need inspection}) \\ \text{if } cd = "well" \\ \text{then "success discharged"} & \\ \text{else "not approved"} & \text{if } a = (\text{condition result, approved to leave}) \end{cases}$$

8. Set of initialisation functions

$$I(p) = \begin{cases} AllPatient & \text{if } p = patient \\ AllNurse & \text{if } p = nurse \\ AllDoctor & \text{if } p = doctor \\ AllComputer & \text{if } p = computer \\ 1'("1000", "001") & \text{if } p = reception\ nurse - use \\ 1'("2000", "010") & \text{if } p = inspection\ doctor - use \\ 1'("3000", "001") & \text{if } p = medicine\ nurse - use \\ 1'("3000", "010") & \text{if } p = medicine\ doctor - use \\ 1'"" & \text{if } p = approved\ to\ leave \\ 1'("well") \text{ and } 1'("notwell") & \text{if } p = condition \end{cases}$$

3 Part 3

