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Modeling of the Process of Purchasing a Public Transport Card through Generalized Nets

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Abstract: The following article considers a two-way scheme of the sale and purchase of a public transport card, purchased from a ticket center – from a cashier and from an automatic machine.
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1 Introduction

Nowadays all people use public transportation to travel from point A to point B. Every municipality provides its citizens with two possible ways of purchasing a public transport card. First, the person chooses where to purchase the card from – from a cashier or from an automatic machine. If they choose to buy from a cashier, consequently they must choose between paying in cash or by card. At the automatic machine a person can pay only by card. The cashier verifies that the client`s information is correct. According to the chosen package, a check-up is made to make sure that the amount of money paid is enough. After all the information input, a final check is made to assure the accuracy of the filled-in data and finally the card is issued.

2 Generalized nets model

Z_1 – The client’s choice;
Z_2 – The cashier checks the payment method;
Z_3 – Verification of personal information;
Z_4 – Verification of ticket package;
Z_5 – Verification of amount of payment;
Z_6 – Final check-up of information accuracy.

The transition Z_1 checks the client`s choice – whether to turn to a cashier - core L_2 or to be assisted by an automatic machine – core L_3. Through position L_1 in the model enters α-core with the characteristic “subscriber”.

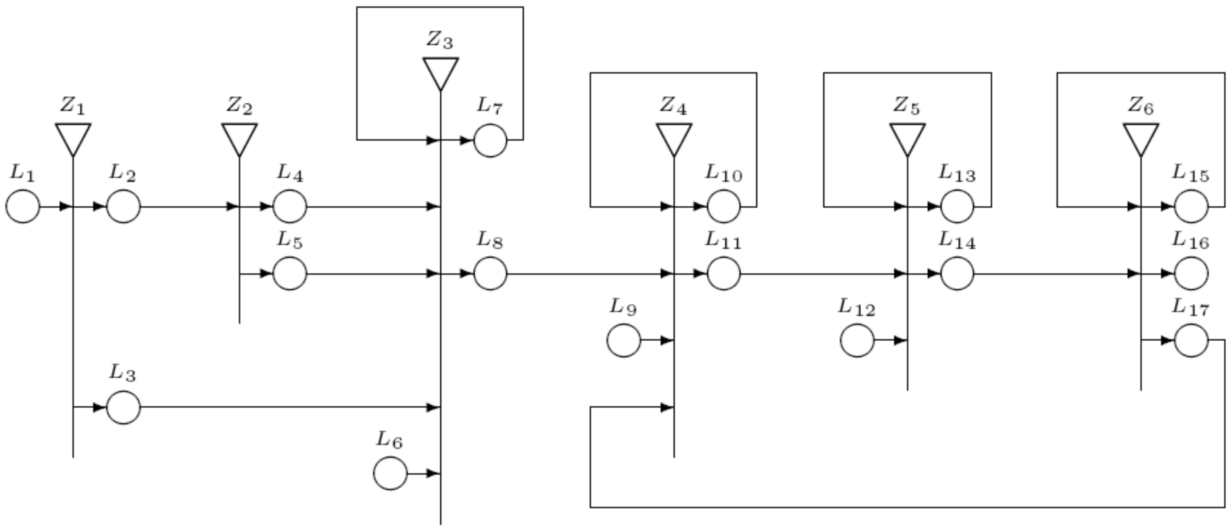

Figure 1. Generalized net model

$$Z_1 = \langle \{ L_1\},\{ L_2, L_3\} , R_1 \wedge(L_1)\rangle$$

$$R_1 = \begin{array}{c|cc} & L_2 & L_3 \\ \hline L_1 & W_{1,2} & W_{1,3} \end{array}$$

where:

$W_{1,2}$ = „The client has chosen to be assisted by a cashier";

$W_{1,3}$ = „The client has chosen to be assisted by an automatic machine".

The transition Z_2 checks whether the client has chosen to pay in cash – L_4 or by card – L_5. Since the payment by card must be reported separately, it is labeled as a subnet.

$$Z_2 = \langle\{L_2\},\{L_4, L_5\}, R_2, \wedge(L_2)\rangle$$

$$R_2 = \begin{array}{c|cc} & L_4 & L_5 \\ \hline L_2 & W_{2,4} & W_{2,5} \end{array}$$

where:

$W_{2,4}$ = „The client has chosen payment method – cash";

$W_{2,5}$ = „ The client has chosen payment method – by card".

The transition Z_3 performs a check-up for correctly filled information. A new core L_6 enters, which has the characteristic "subscriber data" – for example PIN (Personal Identification Number), full name, status. Transition L_7 demands the input of data, until it is correct.

$$Z_3 = \langle\{L_4, L_5, L_6, L_7, L_3\},\{L_7, L_8\}, R_3, \vee(L_4, L_5 ,L_6, L_7, L_3)\rangle$$

$$R_3 = \begin{array}{c|cc} & L_7 & L_8 \\ \hline L_4 & false & true \\ L_5 & false & true \\ L_6 & W_{6,7} & true \\ L_7 & true & W_{7,8} \\ L_3 & false & true \end{array}$$

where:
$W_{6,7}$ = „Incorrect data";
$W_{7,8}$ = „Data is correct".

Transition Z_4 checks if the chosen ticket package corresponds to the particular client. Core L_9 receives the characteristic "Ticket package".

$$Z_4 = \langle \{L_8, L_9, L_{10}\}, \{L_{10}, L_{11}\}, R_4, \vee(L_8, L_9, L_{10})\rangle$$

$$R_4 = \begin{array}{c|cc} & L_{10} & L_{11} \\ \hline L_8 & false & true \\ L_9 & W_{9,10} & true \\ L_{10} & true & W_{10,11} \end{array}$$

where:
$W_{9,10}$ = "The chosen impulses are incorrect";
$W_{10,11}$= „Impulses are chosen correctly";
Transition Z_5 checks if the amount of money paid is enough. Core L_{12} receives the characteristic "Payment".

$$Z_5 = \langle \{L_{11}, L_{12}, L_{13}\}, \{L_{13}, L_{14}\}, R_5, \vee(L_{11}, L_{12}, L_{13})\rangle$$

$$R_5 = \begin{array}{c|cc} & L_{13} & L_{14} \\ \hline L_{11} & false & true \\ L_{12} & W_{12,13} & true \\ L_{13} & true & W_{13,14} \end{array}$$

where:
$W_{12,13}$ = „The sum is insufficient";
$W_{13,14}$= „The sum is accepted".

Transition Z_6 performs a check-up of the data about the particular client, the chosen ticket package and the sum paid. Core L_{16} has the characteristic "Card issued".
L_{17} – receives the characteristic "Declined";

$$Z_6 = \langle \{L_{14}, L_{15}\}, \{L_{15}, L_{16}, L_{17}\}, R_6, \wedge(L_{14}, L_{15})\rangle$$

$$R_6 = \begin{array}{c|ccc} & L_{15} & L_{16} & L_{17} \\ \hline L_{14} & W_{14,15} & false & W_{14,17} \\ L_{15} & true & W_{15,16} & W_{15,17} \end{array}$$

where:
$W_{14,15}$ = "Mandatory check of final result";
$W_{15,16}$ = „Card issued to subscriber";
$W_{14,17}$ = „Return to data input";
$W_{15,17}$ = „Error in data".

3 Conclusion

The article considers a two-way scheme of the sale and purchase of a public transport card, purchased from a ticket center – from a cashier and from an automatic machine. The given model allows for a consideration of the different possible ways of purchasing, payment and issuing of a public transport card. By inputting real data, this model can be used to draw actual statistics about the number of clients using the services of cashiers and automatic machines. The information derived can allow us to make conclusions on how to modify the options for better customer service.

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