

GENERALIZED NET MODEL OF THE APPLYING FOR SCHOLARSHIPS AND AWARDS

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Abstract: The main focus in this paper is on the analysis of the applying for scholarships and awards. We use a theory of a generalized net for modelling of the process. The presented model is the next of the series of models that describe the different processes in the educational institution in terms of Generalized Nets.

Keywords: Generalized Nets, University, Modelling.

1. Introduction

For ten years, a team of authors from different countries has been describing a variety of processes that take place in the abstract university in terms of Generalized Nets (for GNs, see [1–3, 6]). The constructed GN-models were collected into two monographs [7, 8] and a series of papers [9–16]. In these models, were discussed the information flows between the basic units of the university, problems connected with teaching and examining students, different methods of their estimation, etc. Some of these papers are published in the website ifigenia.org that can be used as a scientific and educational web-based resource in the area GN [4, 5].

In this sense, the constructed in this paper GN-model is a continuation of the investigation of our colleagues. Here, we model the process of the applying for scholarships and awards. Initially, students have to be registered in the electronic system of Ministry of Education and Science. After a successful registration, they fill in forms for the competition (scholarship form, award form, or both). Then students have to deliver the printed forms in the department of education in the university. If all documents are applied the candidate is admitted for ranking.

The GN-model can be expanded so that it, or its modifications, can be sub-model in a larger system.

2. A Generalized net model

The GN-model is presented in Figure 1. It is a set of transitions:

$$A = \{Z_0, Z_{1,1}, \dots, Z_{1,n}, Z_{2,1}, \dots, Z_{2,n}, Z_3, Z_4, Z_5, Z_6\},$$

where transitions represent:

- Z_0 – Registration and admission of candidates for scholarships and awards;
- $Z_{1,1}, \dots, Z_{1,n}$ – Filling in forms of student i ;
- $Z_{2,1}, \dots, Z_{2,n}$ – Printing forms of student i ;
- Z_3 – Functions of the Department of Education in connection with applying for scholarships and awards;
- Z_4 – Verification of documents;
- Z_5 – Ranking;
- Z_6 – Informing the students.

Initially, the β - and γ -tokens stay in places $L_4, L_{1,5}, L_{2,5}, \dots, L_{n,5}, L_{1,7}, L_{2,7}, \dots, L_{n,7}, L_7$. They will be in their own places during the whole time during which the GN functions and have the following characteristics:

- token β_1 in place L_4 : “An electronic system of Ministry of Education and Science”;
- token β_2 in place L_7 : “Department of Education”;
- tokens $\gamma_{1,1}, \gamma_{1,2}, \dots, \gamma_{1,n}$ in places $L_{1,5}, L_{2,5}, \dots, L_{n,5}$: “Computer to student i ”, $i = 1, \dots, n$;
- tokens $\gamma_{2,1}, \gamma_{2,2}, \dots, \gamma_{2,n}$ in places $L_{1,7}, L_{2,7}, \dots, L_{n,7}$: “Printer to student i ”, $i = 1, \dots, n$.

Below, we shall omit these characteristics in descriptions of the separate transitions.

The students and their activities are represented in the model with α -tokens. If ω is one of these tokens that can be split, then the new tokens will be noted by ω' , ω'' , and so on.

Let everywhere below, i is the number of a student and $i = 1, \dots, n$. n in number α_i -tokens with characteristic “Personal data of student i ” enter the GN through place L_0 .

$$Z_1 = \langle \{L_0, L_2, L_4\}, \{L_{0,1}, \dots, L_{0,n}, L_2, L_3, L_4\}, R_1 \vee (L_0, L_2, L_4) \rangle,$$

where:

$$R_1 = \begin{array}{c|cccccc} & L_{0,1} & \dots & L_{0,n} & L_2 & L_3 & L_4 \\ L_0 & False & \dots & False & True & False & True \\ L_2 & False & \dots & False & True & False & True \\ L_4 & W_{0,1} & \dots & W_{0,n} & W_{4,2} & W_{4,3} & True \end{array}$$

where:

- $W_{0,i}$ = “Successful registration”,
- $W_{4,2}$ = “Registration failed”,
- $W_{4,3}$ = “The candidate is rejected”.

The α -tokens that enter place L_4 do not obtain new characteristic. The α -tokens that enter places $L_{0,1}, \dots, L_{0,n}, L_2$ and L_3 obtain characteristics, respectively:

- “Candidate i , successful registration”, in place $L_{0,i}$,
- “Candidate i , unsuccessful registration”, in place L_2 ,
- “Candidate i , rejection”, in place L_3 .

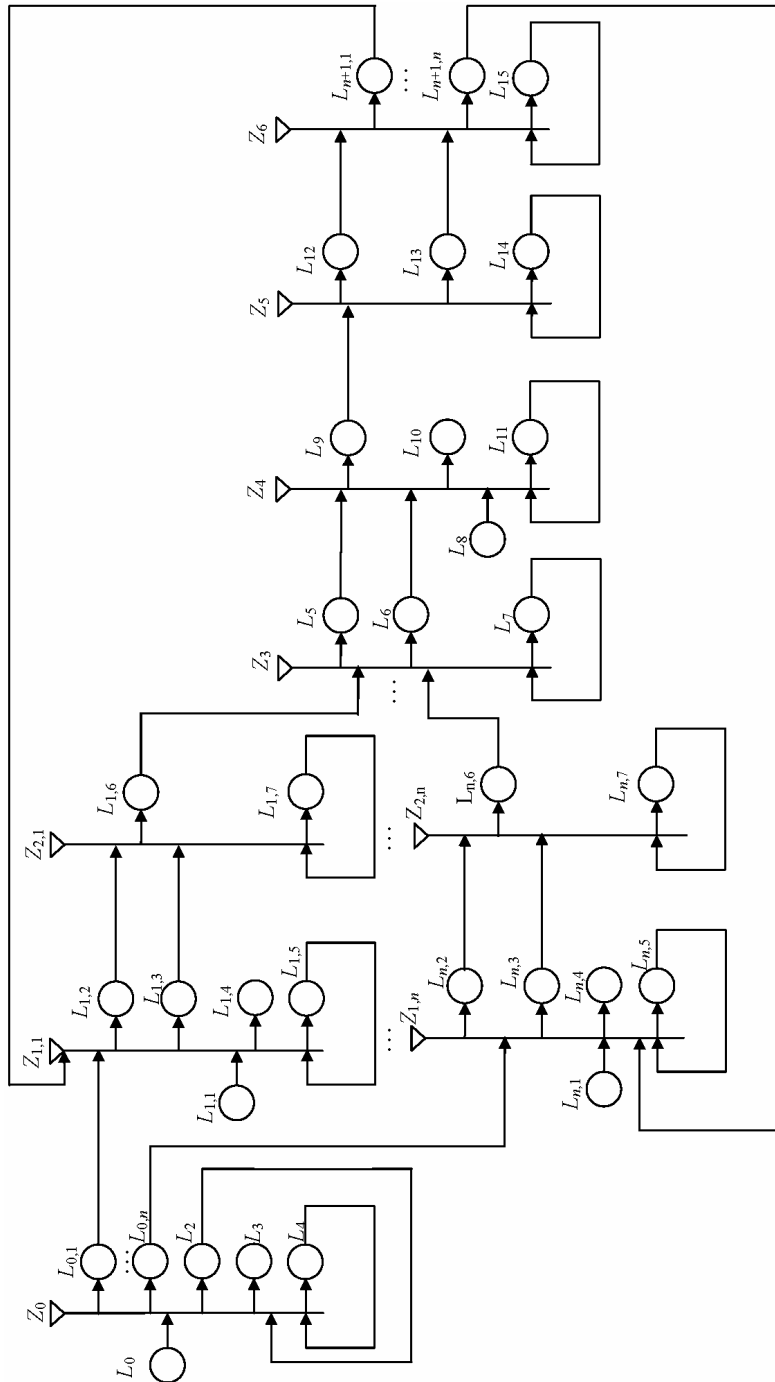


Figure 1. Generalized model of the applying for scholarships and awards

$\alpha_{i,1}$ -tokens with characteristic “Number of official notice” enter the GN-net through places $L_{i,1}$ respectively. For $i = 1, \dots, n$, transitions $Z_{1,i}$ have the following general form.

$$Z_{1,i} = \langle \{L_{0,i}, L_{i,1}, L_{i,5}\}, \{L_{i,2}, L_{i,3}, L_{i,4}, L_{i,5}\}, R_{1,i}, \vee(\wedge(L_{0,i}, L_{i,1}), L_{i,5}) \rangle,$$

where:

$$R_{1,i} = \begin{array}{c|cccc} & L_{i,2} & L_{i,3} & L_{i,4} & L_{i,5} \\ \hline L_{0,i} & False & False & False & True \\ L_{i,1} & False & False & False & True \\ L_{i,5} & W_{i,2} & W_{i,3} & W_{i,4} & True \end{array},$$

where:

- $W_{i,2}$ = “A scholarship form is filled in”,
- $W_{i,3}$ = “An award form is filled in”,
- $W_{i,4}$ = “The candidate is rejected for award, due to the lack of official notice”.

The α -tokens that enter place $L_{i,5}$ (from places $L_{0,i}$ and $L_{i,1}$) do not obtain new characteristic. The α -tokens that enter places $L_{i,2}$, $L_{i,3}$ and $L_{i,4}$ obtain characteristics respectively:

- “Candidate i , a scholarship form filled in”, in place $L_{i,2}$,
- “Candidate i , an award form filled in”, in place $L_{i,3}$,
- “Candidate i , rejection for award, due to the lack of official notice”, in place $L_{i,4}$.

For $i = 1, \dots, n$, transitions $Z_{2,i}$ have the following general form:

$$Z_{2,i} = \langle \{L_{i,2}, L_{i,3}, L_{i,7}\}, \{L_{i,6}, L_{i,7}\}, R_{2,i}, \vee(L_{i,2}, L_{i,3}, L_{i,7}) \rangle,$$

where:

$$R_{2,i} = \begin{array}{c|cc} & L_{i,6} & L_{i,7} \\ \hline L_{i,2} & False & True \\ L_{i,3} & False & True \\ L_{i,7} & W_{i,6} & True \end{array},$$

where $W_{i,6}$ = “The form/forms are printed”.

The α -tokens that enter place $L_{i,7}$ (from places $L_{i,2}$ and $L_{i,3}$) do not obtain new characteristic. The α -tokens that enter places $L_{i,6}$ obtain characteristic “Candidate i , a printed form”.

$$Z_3 = \langle \{L_{1,6}, \dots, L_{n,6}, L_7\}, \{L_5, L_6, L_7\}, R_3, \vee(L_{1,6}, \dots, L_{n,6}, L_7) \rangle,$$

where:

$$R_3 = \begin{array}{c|ccc} & L_5 & L_6 & L_7 \\ \hline L_{1,6} & False & False & True \\ \dots & \dots & \dots & \dots \\ L_{n,6} & False & False & True \\ L_7 & W_5 & W_6 & True \end{array},$$

where $W_5 = W_6$ = “A certificate for results of candidate i is issued”.

The α -tokens that enter place L_7 do not obtain new characteristic. The α -tokens that enter places L_5 и L_6 obtain characteristics, respectively:

- “Candidate i , a printed form” (in place L_5),
- “Candidate i , a certificate for results” (in place L_6),

ε -token with characteristic “Criteria” enters the net through place L_8 .

$$Z_4 = \langle \{L_5, L_6, L_8, L_{11}\}, \{L_9, L_{10}, L_{11}\}, R_4, \vee(L_{11}, \wedge(\vee(L_5, L_6), L_8)) \rangle,$$

$$R_4 = \begin{array}{c|ccc} & L_9 & L_{10} & L_{11} \\ L_5 & False & False & True \\ L_6 & False & False & True \\ L_8 & False & False & True \\ L_{11} & W_9 & W_{10} & W_{11} \end{array},$$

where:

- W_9 = “There is a candidate admitted for ranking”,
- W_{10} = “There is a rejected candidate”,
- W_{11} = “There are more candidates for verification of documents”.

The tokens that enter places L_9, L_{10} and L_{11} obtain characteristics respectively:

- “Candidate i , documents” (in place L_9),
- “Candidate i , inaccurate documents” (in place L_{10}),
- “Candidate i , documents for verification” (in place L_{11}).

$$Z_5 = \langle \{L_9, L_{14}\}, \{L_{12}, L_{13}, L_{14}\}, R_5, \vee(L_9) \rangle,$$

$$R_5 = \begin{array}{c|ccc} & L_{12} & L_{13} & L_{14} \\ L_9 & False & False & True \\ L_{14} & W_{12} & W_{13} & W_{14} \end{array},$$

where:

- W_{12} = “The list of the ranked candidates is ready”,
- W_{13} = “The list of the dropped-out candidates is ready”,
- W_{14} = “The ranking is not completed”.

The α -tokens that enter places L_{12}, L_{13} и L_{14} obtain characteristics, respectively:

- “A list of the ranked candidates”, in place L_{12} ,
- “A list of the dropped-out candidates”, in place L_{13} ,
- “Candidates for ranking”, in place L_{14} .

$$Z_6 = \langle \{L_{12}, L_{13}, L_{15}\}, \{L_{n+1,1}, \dots, L_{n+1,n}, L_{15}\}, R_6, \vee(L_{12}, L_{13}, L_{15}) \rangle,$$

where:

$$R_6 = \begin{array}{c|cccc} & L_{n+1,1} & \dots & L_{n+1,n} & L_{15} \\ L_{12} & False & \dots & False & True \\ L_{13} & False & \dots & False & True \\ L_{15} & W_{n+1,1} & \dots & W_{n+1,n} & False \end{array},$$

where $W_{n+1,i}$ = “The ranking is completed”.

The α -tokens that enter places $L_{n+1,1}, \dots, L_{n+1,n}$ obtain characteristics respectively: “Ranking result for student i ”, in places $L_{n+1,1}, \dots, L_{n+1,n}$.

3. Conclusion

The constructed generalized model presents a typical process in the university. The university obtains and transmits information to external institutions and these information processes run parallel in time. The organization of the communication of the students with the different units of an university and the interaction with external institutions (in our case Ministry of Education and Science) is of major importance for the quality of the organization of the applying for scholarships and awards. Using the model, we can analyze the processing and distribution of the information, so we can improve the distribution of the resources in the university.

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