

Modelling the assembling of the computer configuration using the apparatus of generalized nets

Veselin Stoyanov, Eftim Stoyanov and Petia Ilieva

“Prof. Asen Zlatarov” University
1 “Prof. Yakimov” Blvd, Burgas–8010, Bulgaria
e-mails: veso_1989@abv.bg, eftim55@abv.bg,
pilieva@btu.bg

Abstract: The article analyses the collection of parts and the assembly of computer configuration, as they would be performed in a company. The apparatus of generalized nets is used to describe the processes of the structure of the collection and assembly.

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AMS Classification: 68Q85.

1 Introduction

The assembly of a computer configuration [3] is a complex process, when one pays attention to all the details that make up its structure. The assembly of computers piece by piece requires specialists working in several departments covering different areas of computer knowledge. Discussed here are all the stages, through which the assembly of a laptop passes during the manufacturing process in a company.

The main advantage of having personal computers assembled by people rather than by robots is that it produced in this way have better durability and a longer life, which comes at the expense of a higher price. They cost more, they are more complex to design and their manufacturing takes more time.

In this paper we are focusing in a process of the assembling of the personal computer with one of the most powerful tool for modeling of parallel process – Generalized nets (GNs, [1, 2]). We can use GNs for modeling the different type of process: neural networks [5, 6], university processes [7, 8] and others.

One of the transitions represents the testing of the performance of the computer configuration. Previously situated values that enter in transitions are used for thresholds values. Here we can use different methods for estimation of the performance, for examples we can use intuitionistic fuzzy set [4].

2 Generalized Net Model

A generalized net model has been developed with the following set of transitions (Fig. 1):

$$A = \{Z_1, Z_2, Z_3, Z_4, Z_5, Z_6\},$$

where the transitions describe these processes:

- Z_1 = “Accepting the requests for computer configuration”,
- Z_2 = “Determination of the elements of the computer configuration”,
- Z_3 = “Founding the computer configuration elements”,
- Z_4 = “Assembling the computer configuration”,
- Z_5 = “Performance testing of the computer”,
- Z_6 = “48 hour tests performance of the computer”.

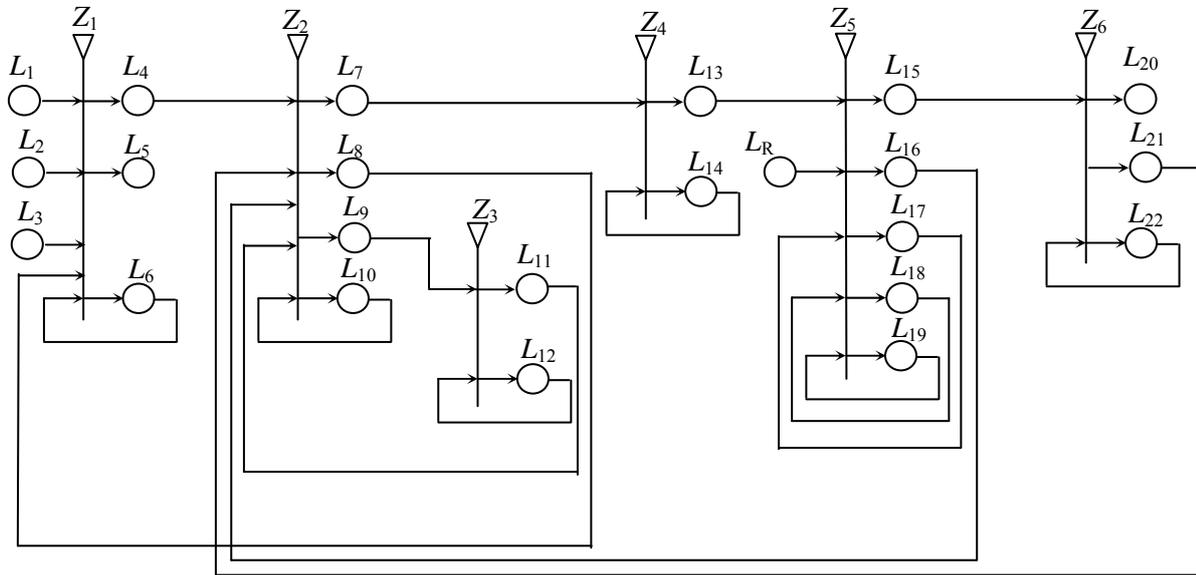


Figure 1. Generalized nets of the process of assembling computer configuration

Initially in the place L_{10} there is one β -token. It will remain there for the whole time of GN functioning. It has the following characteristic: “Data base with available computer components”.

Also initially, in the place L_{12} there is one β -token that will remain there for the whole time of GN functioning. It has the characteristic: “Data base on the external firms with computer configuration components”.

The transitions can be described as follows.

Tokens α_1 , α_2 and α_3 enter the net via places L_1 , L_2 and L_3 with initial characteristics respectively:

“Customer, requirements for computer configuration via email” in place L_1 ,

“Customer, requirements for computer configuration via phone” in place L_2 ,

and “Customer, requirements for computer configuration submitted manually” in place L_3 .

$$Z_1 = \langle \{L_1, L_2, L_3, L_8, L_6\}, \{L_4, L_5, L_6\}, R_1, \vee(L_1, L_2, L_3, L_8, L_6) \rangle,$$

	L_4	L_5	L_6
$R_1 =$			
L_1	<i>False</i>	<i>False</i>	<i>True</i>
L_2	<i>False</i>	<i>False</i>	<i>True</i>
L_3	<i>False</i>	<i>False</i>	<i>True</i>
L_8	<i>False</i>	<i>False</i>	<i>True</i>
L_6	$W_{6,4}$	$W_{6,5}$	<i>False</i>

where:

- $W_{6,4}$ = “The request is accepted”;
- $W_{6,5}$ = “The request is rejected”,
- $W_{6,6}$ = “There are requests for considering”.

The tokens, entering in place L_6 do not obtain new characteristic. The α_4 - and α_5 -tokens entering places L_4 и L_5 , obtain characteristics, respectively: “*Customer, requirements for computer configuration*” in place L_4 , and “*Customer, rejected request*” in place L_5 .

$$Z_2 = \langle \{L_4, L_{21}, L_{16}, L_{11}, L_{10}\}, \{L_7, L_8, L_9, L_{10}\}, R_2, \vee(L_4, L_{21}, L_{16}, L_{11}, L_{10}) \rangle,$$

	L_7	L_8	L_9	L_{10}
$R_2 =$				
L_4	<i>False</i>	<i>False</i>	<i>False</i>	<i>True</i>
L_{21}	<i>False</i>	<i>False</i>	<i>False</i>	<i>True</i>
L_{16}	<i>False</i>	<i>False</i>	<i>False</i>	<i>True</i>
L_{11}	<i>False</i>	<i>False</i>	<i>False</i>	<i>True</i>
L_{10}	$W_{10,7}$	$W_{10,8}$	$W_{10,9}$	<i>True</i>

where:

- $W_{10,7}$ = “The entire computer configuration is approved ”;
- $W_{10,8}$ = “Some of the components of current computer configuration are totally unavailable”;
- $W_{10,9}$ = “Some of the components of current computer configuration are unavailable in this data base”;

The tokens, entering in place L_{10} do not obtain new characteristic. The α_6 -, α_7 - and α_8 -tokens that enter places L_7 , L_8 and L_9 obtain characteristics, respectively: “*Hardware components for assembling the computer configuration*”, “*Hardware components for assembling the computer configuration are unavailable*”, and “*Hardware components necessary for assembling the computer configuration*”.

$$Z_3 = \langle \{L_9, L_{12}\}, \{L_{11}, L_{12}\}, R_3, \vee(L_9, L_{12}) \rangle,$$

	L_{11}	L_{12}
$R_3 =$		
L_9	<i>False</i>	<i>True</i>
L_{12}	$W_{9,11}$	<i>True</i>

where $W_{9,11}$ = “Components of computer configuration are found”.

The α_{10} -token, entering place L_{11} obtains the characteristic: “*Components for the computer configuration*”.

$$Z_4 = \langle \{L_7, L_{14}\}, \{L_{13}, L_{14}\}, R_4, \vee(L_7, L_{14}) \rangle,$$

$R_4 =$	L_{13}	L_{14}
L_7	<i>False</i>	<i>True</i>
L_{14}	$W_{14,13}$	<i>False</i>

where $W_{14,13}$ = “The computer configuration is assembled”.

The token, entering place L_{13} obtain characteristic: “*Assembled computer configuration*”.

Tokens δ_1 , δ_2 and δ_3 enter the net via place L_R with initial characteristics respectively: “*Criteria for the Hard disk drives, CPU, memory and main board performance*”, “*Criteria for the Video card, audio card, LAN card, touchpad and keyboard performance*”, and “*Criteria for the other computer elements performance*”.

$$Z_5 = \langle \{L_{13}, L_R, L_{17}, L_{18}, L_{19}\}, \{L_{15}, L_{16}, L_{17}, L_{18}, L_{19}\}, R_5, \vee(L_{13}, L_R, L_{17}, L_{18}, L_{19}) \rangle,$$

$R_5 =$	L_{15}	L_{16}	L_{17}	L_{18}	L_{19}
L_{13}	<i>False</i>	<i>False</i>	<i>False</i>	<i>False</i>	<i>True</i>
L_R	<i>False</i>	<i>False</i>	$W_{R,17}$	$W_{R,18}$	$W_{R,19}$
L_{17}	$W_{17,15}$	$W_{17,16}$	$W_{17,17}$	<i>False</i>	<i>False</i>
L_{18}	<i>False</i>	$W_{18,16}$	$W_{18,17}$	$W_{18,18}$	<i>False</i>
L_{19}	<i>False</i>	$W_{19,16}$	<i>False</i>	$W_{19,18}$	$W_{19,19}$

where:

- $W_{R,17}$ = “There are criteria for computer component performance”,
- $W_{R,18}$ = “There are criteria for Video card, audio card, LAN card, touchpad and keyboard performance”,
- $W_{R,19}$ = “There are criteria for Hard disk drives, CPU, memory and main board performance”,
- $W_{19,16}$ = “Hard disk drives, CPU, memory and main board not satisfy requirements”,
- $W_{19,18}$ = “Hard disk drives, CPU, memory and main board satisfy requirements”,
- $W_{19,19}$ = “The test for Hard disk drives, CPU, memory and main board do not finish yet”,
- $W_{18,16}$ = “Video card, audio card, LAN card, touchpad and keyboard not satisfy requirements”,
- $W_{18,17}$ = “Video card, audio card, LAN card, touchpad and keyboard satisfy requirements”,
- $W_{18,18}$ = “The test for Video card, audio card, LAN card, touchpad and keyboard do not finish yet”,
- $W_{17,15}$ = “Other computer elements satisfy requirements”,
- $W_{17,16}$ = “Other computer elements not satisfy requirements”,
- $W_{17,17}$ = “The test for other computer elements do not finish yet”.

The δ - and α -tokens entering in places L_{17} , L_{18} and L_{19} do not obtain new characteristics. The α_{11} - and α_{12} -tokens that enter places L_{15} and L_{16} obtain characteristics, respectively:

“Hardware components that satisfy requirements” and “Hardware components that not satisfy requirements”.

$$Z_6 = \langle \{L_{15}, L_{22}\}, \{L_{20}, L_{21}, L_{22}\}, R_5, \vee(L_{15}, L_{22}) \rangle,$$

$R_6 =$	L_{20}	L_{21}	L_{22}
L_{15}	<i>False</i>	<i>False</i>	<i>True</i>
L_{22}	$W_{22,20}$	$W_{22,21}$	<i>False</i>

where:

- $W_{22,20} =$ “The computer pass 48 hours test”,
- $W_{22,21} = \neg W_{22,20}$.

The α_{13} - and α_{14} -tokens, entering places L_{20} and L_{21} obtain characteristics respectively: “Ready computer configuration” and “Computer configuration for new components”.

3 Conclusion

The article has examined the assembling of a computer configuration in a company. For this purpose, all departments must work together to create it that correspond with the customers’ orders. The model allows the consideration of different stages of computers production in a company. In the future it can be simulated and implemented in practice. For the purpose we use generalized nets as tools for modelling the parallel process.

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