

MODELING OF SERVICE LOGISTIC PROCESSES WITH THE USAGE OF THE DOSIMIS 3,0[®] PACKAGE ON THE BASIS OF THE EXAMPLE OF SELECTED TOURISTS ATTRACTIONS IN THE LIMANOWA DISTRICT LOCATION

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Abstract

The paper presents opportunities of taking advantage of the DOSIMIS 3,0[®] software applied to construct simulation models reflecting the service logistic processes. The DOSIMIS 3,0[®] software has been designed to construct and simulate models of typical logistic processes that are steered by events, in which the most frequently occurred elements would be demonstrated by different types of transport means, machining stations, warehouses or loading units. These elements, in contrast to the humans, are not able to make decision themselves; they only follow the regulations, rules and restrictions that control the elements motion. Modeling the service processes, in which one of the basic elements is a man, requires taking into consideration the autonomous method of people's behavior, both within the structure and within regulations steering the simulation model operation.

Key words: logistic management, modeling and simulation, service processes.

Introduction

Tourism, like other spheres of life, is being developed constantly. Factors forcing the tourist businesses to observe the processes occurring on the market are as follows:

- changing market situation,
- bigger competition,

- globalization,
- organizational and capital concentration.

Tourist companies must search for new solutions in the fields of tourist services, organization, finance management as well as meeting tourists' expectations like: contact with nature, getting to know new cultures or regions and countries local communities.

Logistics of the tourist company is characterized by typical separate features. One of them is certainly the variety of meeting the clients' needs and expectations. The next feature is connected with the parallelism of producing and consuming as well as a remote localization of consumption. It is possible to distinguish many areas that join logistics with tourism. These are for example: customer service, stocks, information management, transport, storage, execution of orders or distribution. The tourist market logistic management is based on creating a chain that joins various companies, which are involved in delivering tourist services within a certain period of time.

The tourist branch is created by some sectors:

- accommodation and gastronomy sector – hotels, motels, guest houses,
- tourist attractions sector – museums, galleries, parks, historical places, active leisure places,
- transport sector – airlines, railway and other carriers.
- travel agency sector,
- tourist information and promotion sector – information units and centers, national, regional and local tourist organizations.

Tourist services can be delivered within the mentioned above sectors. They provide meeting the man's tourist material and nonmaterial needs.

The course literature distinguishes the specific features of tourist services (Gaworecki 2007):

- substitutability of services – a tourist has the right to select a service, for example, a selection between the accommodation at the campground or in a hotel,
- internal disproportion – tourist services meet the tourist complementary and substitution demand, what influences the level and quality of tourist services,
- diversified tourist services demand, which is considered in terms of space, time and type,
- product attractive nature – a customer is not able to check a product,
- creating bases for diverse economic activity,
- services market nature,

Other features which are typical for tourist services include:

- customer's presence. This is not possible to send a service. The service realization is carried out in the presence of a customer and, at the same time, it is "consumed". It means that a tourist service cannot be stored,
- production of tourist services, in comparison to an industry production, is less vulnerable to the technical development,
- tourist services cannot only be provided as single services referring to things or people but also they can be arranged in sets,
- tourist services, similarly to other services, fulfill social functions through delivering relaxation or recreation. These services also give the opportunity to reproduce a man's psychological and biological strength, which has been utilized during the process of learning and working.

The main activities in the service branch should be directed to a potential customer. These are the customers who decide how the final product will look like. Customers' expectations, taste, needs and preferences should be taken into consideration.

The Limanowa District is distinctly targeted to the tourism development. In order to obtain this objective, it is necessary to take advantage of all resources that the region possesses, taking into account those factors that result from the external conditions. The Limanowa District has its nature and environment qualities that are convenient for active leisure activities. The District includes the majority of the Beskid Wyspowy and the Northern slopes of the Gorce Mountains.

The Limanowa District possesses also very rich cultural values. In terms of ethnography, the District population constitutes two separate groups of Górale and Lachy. The fantastic mixture of folklore, tradition, clothes and life styles result from the above. Values of nature and culture attract tourists. The potential for the development of tourism exists in this District. People can choose trekking, hang gliding or rehabilitation holidays etc. However, not only the values contribute to the development of tourism. In order to take advantage of the region qualities, it is necessary to provide the appropriate tourist infrastructure, which is a crucial element of the tourist offer (Burzyński 2001). In the period of the last three years, the local government has been deciding on the implementation of many investments within the tourist infrastructure. The strategic significance is attributed to the thermal water management in Poręba Wielka, where the sources of geothermal water are located. The source output is 360 m³ per 24 hours and water discharge temperature is 42°C. It is the hydro carbonate sodium chloride brine. The "Gorczańskie Wody Termalne" company has been established and the

controlling interest is possessed by the Limanowa District. From the view point of the District's economic growth, the thermal water utilization constitutes the important element stimulating the local economy development and it contributes to the increase of the whole region attractiveness. This issue has a significant importance due to the tourist potential of the Gorce Mountains and the Beskid Wyspowy. The direct objective of this venture is the construction of the recreation center equipped with geothermal swimming pools with additional attractions and sports facilities. The existing thermal brine borehole exploitation is the base for this project. In the region there are four sources of mineral water that are used for medical treatment in the cities like Szczawa – the Kamienica Commune. Water from Szczawa is recommended for people suffering from the respiratory tract diseases, peptic ulcer diseases and neurosis. As a target, it is planned to create the Poręba Wielka – Szczawa – Rabka thermal spa. The next initiative of creating the auto racing mountain route in the Limanowa Region obtained the initial support from the local government. The region's landform provides ideal conditions for this idea. However, the route leading to the "Przełęcz pod Ostrą" required its adaptation to the applicable in sport security standards. Thanks to the reconstruction of the local road, the route of the Mountain Race "Limanowa – Przełęcz pod Ostrą" – length of 6,2 km, has been prepared. It is one of the longest and the most beautiful mountain race routes in Poland. The mountain landform causes that local governments (the Limanowa District initiative) has undertaken actions aiming at making the active tourists be interested in this offer. The bicycle paths (20 routes) with a total length of 320 km, 36 walking trails (445 km) and recreation horse trails with a total length of 988 km, have been prepared. The natural beauty of Beskid Wyspowy and the Gorce Mountains full of fauna and flora can be admired here. The Beskid Wyspowy and the Gorce Mountains represent good climate and terrain conditions to practice skiing. There are 6 ski stations (Śnieżnica Kasina Wielka, Limanowa – Ski, Łysa Góra, Laskowa – Kamionna, Lubomierz, Koninki – Tobołów). Nationwide ski competitions are organized on the Limanowa District ski slopes. Two cross-country ski trails are located also within the administrative boundaries of the District – Mogielnica with the total length of 20,9 km and Lubomierz – the length of one encirclement is 4 km (Puchała 2011). The importance of tourist services in the Limanowa District increases. The natural environment qualities as well as the cultural potential influence the region's attractiveness undoubtedly. Tourism is the basic development opportunity for this relatively weakly industrialized but attractive Limanowa District. The written above arguments let formulate the following conclusions:

- the Limanowa District tourist attractiveness indicates that the region's development potential is big and diversified,

- tourist service in middle-sized districts is a crucial element of these districts development,
- tourist service intensity influences the local governments' budgets. This correlation found in the 80's is still valid – tourist districts' budgets are richer in comparison to districts where the tourist function is less developed,
- tourism development affects also the region residents' wealth, which is measured by the average tax payers' revenues.

1. Modeling service processes

Economic transformation and the necessity to implement the changes management in a company are the factors that cause the increased interest of applying the modelling methods and simulation. The necessity of a quick response to changes occurring in a company and its' environment as well as these changes implementation cause that the processes become more complex. In order to make rational decisions, the number of processes that happen in a company and a huge amount of information that need to be processed force that methods belonging to the area of modeling and simulation should be applied. The process of making decisions in companies is difficult due to the problems complexity. To make the decisions have a positive impact on the supply chains functioning, it is important to understand the company internal and external processes properly. Problems should be solved by means of, for example, simulation methods, what can limit the risk of making wrong decisions. In such a case the decisions consequences can be predicted.

The complexity of a venture such as simulation modelling causes that the correct procedure of the simulation study consists of some stages. The appropriate approach distinguishes the following stages of simulation modeling (Karkula 2013):

- defining the modeling objectives and understanding the system,
- constructing a conceptual model,
- translating concepts into the appropriate language,
- models verification and validation,
- designing simulation experiments,
- simulation performance,
- analyzing results and documentation,
- solutions implementation.

Defining the researched system and setting modeling targets are the primary steps, which every process of simulation modeling should start with. At the beginning the boundaries between a system and its' environment

should be precisely defined. It is not possible to obtain the transparent and credible conclusions without clearly specified objectives. At this stage the separation between the essential relations, which join the system elements with the external world, and the little importance relations should be conducted. It is also necessary to select the system variables and parameters in order to choose possible inputs and outputs.

The next stage, namely the construction of the conceptual model, is connected with defining the quality and quantity of the researched system dynamic and static structure representation. The main problem appearing at this stage is the specification of the model level of detail regarding the model objective. At the beginning the simple models are constructed. It is done in order to obtain the desired level of detail as well as the complexity in the next approximations. The bigger the number of details is the better match of the model to the real system appears. The increase of model implementation, verification and validation difficulties are caused by the introduction of details that, from the simulation point of view, do not add anything substantial. Applying the model modular structure lets obtain the appropriate level of detail.

On the basis of information obtained from the real system or on the basis of theoretical considerations, the data preparation and analysis occur. Data analysis results can be used as direct data or as a base to define the theoretical and empirical probability distributions that are used to generate numbers.

The model translation is connected with bringing this model to such a form that is accepted by digital machines. This process provides the model creation by means of using the available simulation package or implementing the model in a selected language. The model creator's availability, cost and skills as well as the nature of a being solved problem influence the selection of the appropriate tool.

Verification and validation aim at checking whether the constructed model describes the modeled reality in a proper way. They also have to minimize the risk of making the wrong decision, which would be the result of the inappropriate model application. Verification and validation should be treated as a continuous process, which takes place during the modeling cycle because they are not individual single stage processes. Verification provides checking the model and answering a question: Is the model the accurate representation of a conceptual model and does it comply with the real behavior of a researched system sufficiently?

Designing simulation experiments provides the description of research scenarios for the model parameters, value and numbers. These can be the constants describing a process as well as input and output parameters.

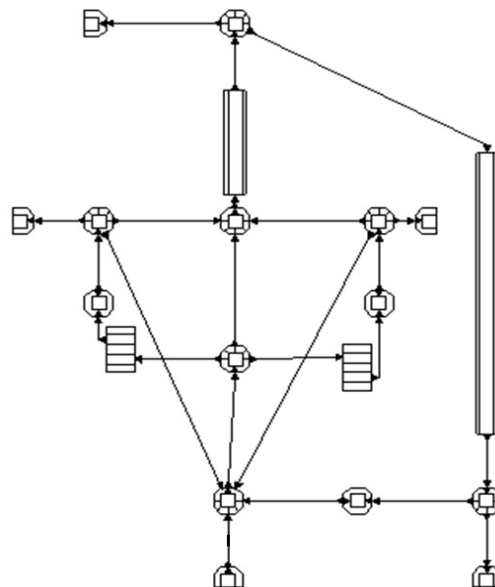
The aim of correct experiments system is obtaining the bigger amount of information, assuming that calculations are at minimal level. Conducting simulation provides running the planned experiments on the basis of the ready-made model. This step can adopt various courses depending on a simulation tool. The last stage is the solutions implementation – taking advantage of obtained results by means of a planned method.

2. DOSIMIS-3® package

The DOSIMIS-3® package belongs to the simulation environment, which uses modeling mechanisms of events discrete steering. It is a tool which is adapted to plan and create the logistic processes models. DOSIMIS-3® is the graphic interactive simulator. Simulation research of complex logistic processes can be conducted by means of this simulator. Events and time flow included in the simulation model are the basis of calculations conducted by the simulator. Mathematical apparatus applied during the simulation is based on the theory of mass service as well as on the theory of finite state machine. The construction of the Limanowa District simulation model of the ski resort – ski lift type, which includes the parking and restaurant infrastructure, has been chosen as an example of the package application. This model type is characterized by the fact that it maps not only the complex structure of different building types or facilities but also behavior of tourists who are the elements of the modeled system. A man who is an autonomic creature can always make decisions concerning his behavior, direction of dislocations or the order of using available services. The correct simulation model should take into consideration these types of events. In the presented simulation model, a tourist as an object is considered as a basic element. At every stage practically, the tourist has the opportunity to choose among services: he can use a parking place, a restaurant or a ski lift. Anytime tourists are able to change their decisions and use other offered services. After arriving to parking place tourists can visit a restaurant, use a ski lift or they can leave an area included into the simulation model. After using a ski lift tourists can decide whether they want to use it for the second time or go to a restaurant or a parking or they can leave the recreation center. The exemplary model constructed on the basis of DOSIMIS-3® is presented in Picture 1. The model has been prepared with the application of the pre-defined elements that are available in the DOSIMIS-3® program. Only some elements belonging to the broad spectrum of the available in the program objects have been used. The selected simulation package has been designed to model and simulate logistic or transport processes. That is why in the program range there are many elements that let imitate the typical

logistic systems objects in the simulation model. The basic elements that are used to construct the model are as follows: a source, a confluence, transport systems, storehouses and buffers. The element such as a source is responsible for generating different types of objects in the indicated model location. In the presented example, three types of objects generated by a source have been defined: Parking type, Restaurant type and Ski lift type. The parameters mask of the source type element is presented in Figure 2.

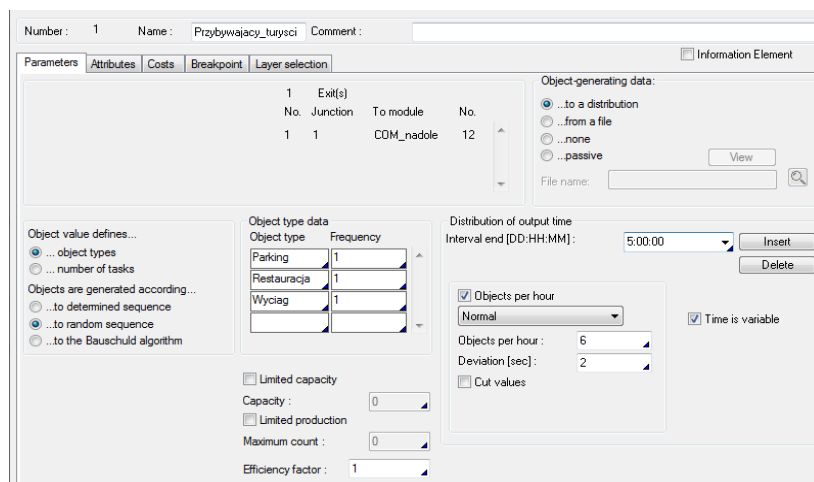
Figure 1. System model in the DOSIMIS-3® program



Parking places and a restaurant have been imitated by the element of the storehouse type. In a given case it does not present the typical storehouse structure that usually takes into consideration the types of stored items or the number and the size of shelves. Only the function that let limit this element capacity has been used.

Probable changes of tourists' decisions have been imitated by means of the element of a workstation type. This element enables to change one type object into another thanks to differently defined strategies. The next element used to construct a model is a distributor. It, according to the selected strategy, directs objects to the appropriate elements. The example of a program strategy selection is presented in Figure 3.

Figure 2. Exemplary mask of the parameters of the element of the source type



Number : 1 Name : Przybywajacy_turyści Comment :

Parameters | Attributes | Costs | Breakpoint | Layer selection ☐ Information Element

No.	Junction	To module	No.
1	1	CDM_nadole	12

Object-generating data:
☒ ...to a distribution
☐ ...from a file
☐ ...none
☐ ...passive View

File name:

Object value defines...
☒ ... object types
☐ ... number of tasks

Objects are generated according...
☐ ...to determined sequence
☒ ...to random sequence
☐ ...to the Bauschuld algorithm

Object type data

Object type	Frequency
Parking	1
Restauracja	1
Wyciąg	1

☐ Limited capacity
Capacity :

☐ Limited production
Maximum count :

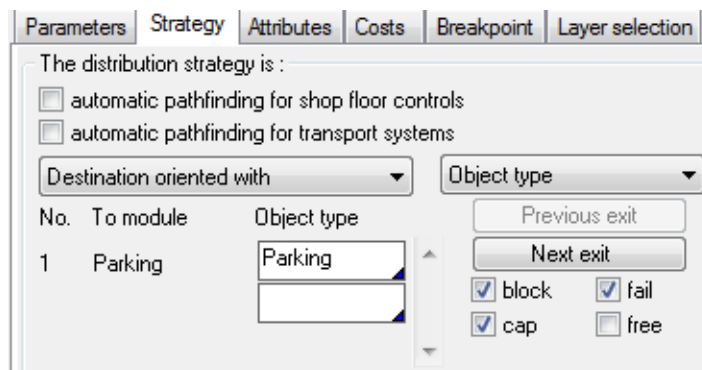
Efficiency factor :

Distribution of output time
Interval end [DD:HH:MM] : 5:00:00 Insert Delete

☒ Objects per hour
Normal
Objects per hour :
Deviation [sec] :
☐ Cut values

☒ Time is variable

Figure 3. Exemplary mask of a strategy selection in a distributor



Parameters | Strategy | Attributes | Costs | Breakpoint | Layer selection

The distribution strategy is :

☐ automatic pathfinding for shop floor controls
☐ automatic pathfinding for transport systems

Destination oriented with Object type

No.	To module	Object type
1	Parking	Parking

Previous exit Next exit

☒ block ☒ fail
☒ cap ☐ free

In the presented model the object-oriented strategy has been applied. For example, if the object of the Parking type is generated in a simulation model, it will be directed to the element that corresponds to a Parking. If the object of the Restaurant type is generated, it will be directed to the element that corresponds to a Restaurant. In the case of the element of the Ski lift type, it will be directed to the next merging element. It is done in order to make the element move to the element imitating the ski lift structure.

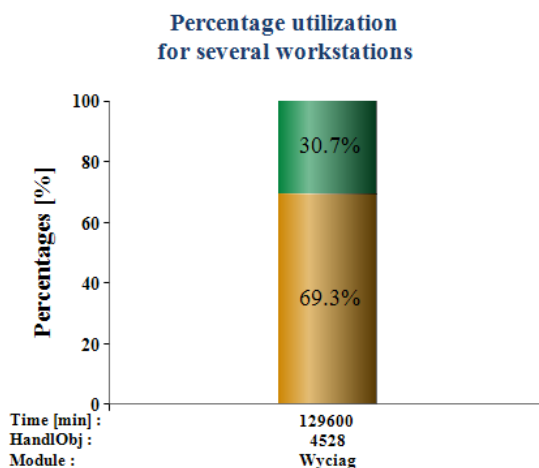
Figure 4. Exemplary mask of a decision table

Conditions					
1	act_module.f_obj.type=1	Y	Y	N	
2	uniformly_dist(0, 1)<0.300000	Y	N	-	
3	act_module.f_obj.type=2	-	-	Y	
4					

Actions					
1	selfdef:=1	X			
2	selfdef:=2		X		
3	selfdef:=3			X	

The decision tables have been used to define different types of model objects “behavior” strategies. The decision table is a universal element which lets conduct advanced definitions concerning conditions of the individual model events sequences. The example of the table is presented in Figure 4. By means of decision tables, it is practically possible to imitate every process that occurs in logistic and transport systems. Programming takes place through the application of a simple language that defines the conditions, variables and assigned to them actions. The results of such procedure are the opportunities to define dependencies very fast as well as to model data flow management. Thanks to the animation, it is possible to conduct the step-by-step observation referring it to the problems: how objects move within the system, what is the queues location and time – the so called bottlenecks. The analysis of obtained results is possible thanks to the DOSIMIS-3[®] package.

Figure 5. Example of the data graphic analysis – average occupancy of a ski lift



Simulation model operation analysis results in the form of various types of graphs and tables or data are available. The data can be sent to other programs providing the data analysis. The Figure 5 presents one of the exemplary graphs providing the average occupancy of a ski lift.

Conclusions

The paper describes the opportunities of the DOSIMIS-3® package usage. The program is beneficial for modeling and the service logistic processes simulation. Possibilities of taking advantage of the software have been presented. The ski center together with the supporting facilities simulation model construction was presented as an example. The paper also demonstrates differences referring to the method of typical logistic processes modeling in relation to the processes, in which a man possessing the ability to make autonomic decisions is the main element.

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