DESIGN OF SYSTEM FOR MORE EFFECTIVE DATA ACTUALISATION IN SIMULATION

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Abstract: The main object of the article is a design system for faster data actualisation in Tecnomatix Plant Simulation software through the AttributeExplorer function and Microsoft Excel. Many companies that use simulation as the optimisation tool is meet the problem of the models up to date and actualisation time demands. The designed system that uses the AttributeExplorer function of the Tecnomatix Plant Simulation reduces the actualisation time demands for activities. The end part of the article contains a comparison of the normal manual data entry and time demands for using the designed system.

1   Introduction

The use of simulation as a tool to streamline and optimise production and logistics processes is now a common way to improve the functioning of the enterprise. Simulation models are now being used in many sectors of work. It may be air transport, health, road and rail transport, metallurgy, supply chains, etc. [1]. The growing demand for simulation models results in the necessity of processing large amounts of data to remain up to date and reflect the real state of the processes. With the increasing complexity of simulation models, the time requirements for updating both and the risk of unsatisfactory validation of the simulation model are also rising [2,3]. The current progress of technology in sensors allows us to collect data from the manufacturing process actively. When introducing a scanning technique in practice, we can meet two sensor approaches:

- Sensors are used for process control,
- The sensors are used for the management process, and the information is sent to the database.

These data are further processed in companies and are built to update Overall Equipment Effectiveness (OEE), Total Equipment Effective Performance (TEEP) or other key performance indicators. However, data from such databases are an appropriate basis for updating the data needed to create a simulation model. The simulation model loses value if it is not up to date [4]. The article's main objective is to design a system to faster actualisation large volumes of data for simulation models in the Tecnomatix Plant Simulation environment by using the Microsoft Excel software tool and the AttributeExplorer function.

2   Basic scheme

When updating the simulation model data, it can be based on two assumptions either the simulation model is already created or create one. The layout and structure do not affect AttributeExplorer because the function shows the objects that represent the production machines or other devices.

However, the model must be logically correct and the times of machine, material handling, other time and limitations correspond to the real state. On Figure 1 we can see the process of linking between the objects (entities) of the simulation model and actualisation MS Excel [5], which is updated based on Excel to which data is inserted manually, from the database or via a link from the sensors.

When linking Excel and SW Simens Tecnomatix, AttributeExplorer is used to import and export object data. An object can be understood by an entity that represents a production machine or device.

The availability of equipment and its MTTR is not a static element but dynamic and constantly evolves in time. It is, therefore, necessary that the simulation model contains parameters that correspond to the current availability and MTTR.

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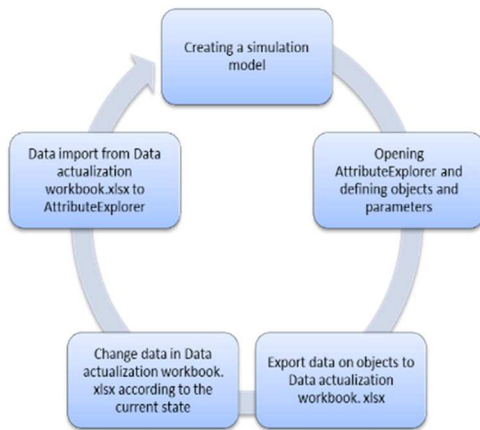Štefan Mozol; Patrik Grznár; Martin Krajčovič

Figure 1 Update cycle between actualisation MS Excel and software Tecnomatix Plant Simulation
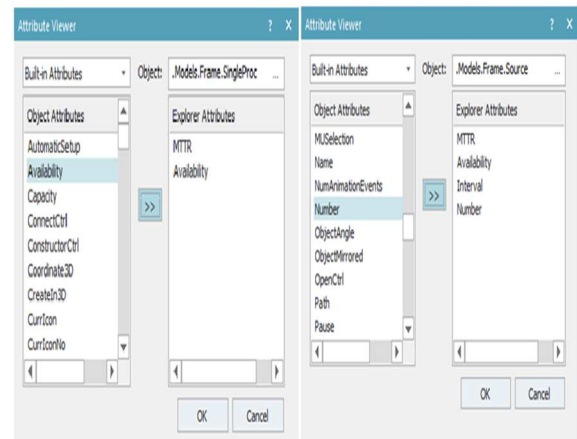

Figure 2 Show Attributes window

2.1   Creating a simulation model

The most important step in creating a simulation model is simplification the real system. The notion of simplification can be understood by the deletion of such elements, which do not affect the simulation and cause an increase in computing difficulty [6-13]. The next step is to create a logical structure that corresponds to the real system.

2.2   Opening AttributeExplorer and defining objects and parameters

After is create the simulation model, it must be inserted AttributeExplorer. He is located in Toolbox under Information Flow. If it is not shown, there is a need to add it manually via the Home/Manage Class Library. After that, Attribute Explorer can be set. In the Objects window, we click on editing and drag and drop objects whose parameters we want to update. It can be any entity that is defined by a parameter. After the Apply changes take effect in other AttributeExplorer windows and you can set parameters in the Attribute window to be updated. After clicking on Show Attribute are with us inserting entities displayed the offered redefined parameters for common objects entities that are MTTR and availability at source, for example, it is interval and number etc. see Figure 2.

After confirming click on Show Explorer there is a possibility to change the parameters. Due to an error in the software is necessarily insert one parameter that will be as recent in the table and just one object that will be the same last in the table and after the updates can be erased and must be inserted after the update.

2.3   Export data on objects to the Data actualisation workbook. xlsx

Most companies use MS Excel to keep up-to-date information that is possible to link precisely with AttributeExplorer. We click the right mouse button to click on its blue bar, and we will select the Export and file with the data then save as a Data actualisation workbook.xlsx.

2.4   Change data in the Data actualisation workbook.xlsx according to the current state

When you open this created Excel, we see that the parameter values are displayed in cells. In this way, Excel can then be linked to cells or pivot table that summarise data with databases by using cells. Figure 3 Preview of Excel view.

Figure 3 Example of simulation model parameters transferred to cells using Export

2.5   Data import from Data actualisation workbook.xlsx to AttributeExplorer

After updating Excel with up-to-date data or forecast data, it is select in AttributeExplorer by right mouse click Import and chooses Data actualisation workbook. xlsx then is select Apply. By this confirmation changes take effect on whole simulation model. An example is shown in Figure 4.

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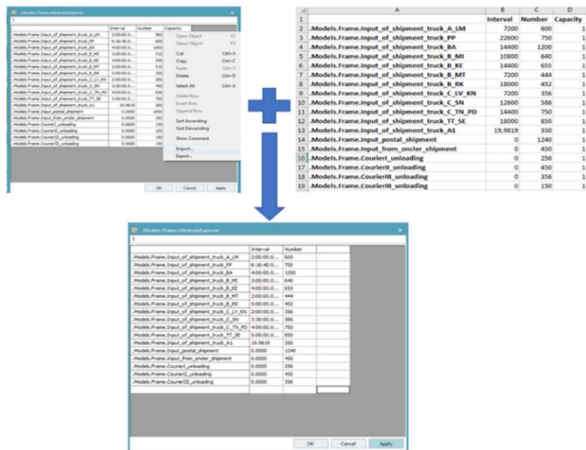Štefan Mozol; Patrik Grznár; Martin Krajčovič

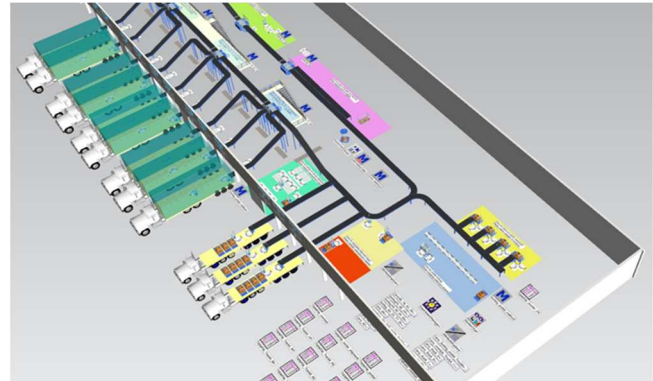*Figure 4 Example of Import MS Excel data to the simulation model*

Figure 5 Simulation model on which experiments were carried out

2.6 Time demands comparison

To compare the creation time elaborateness and benefits that the AtrributeExplorer offers has been created based on a simulation model Figure 5, Table 1. This table contains the time demands on the setting of the AttributeExplorer, and the time demands to update the simulation model manually in the simulation model and through AttributeExplorer.

Table 1 Table of experiments and results

Activity	The setting of 17 parameters	The setting of 34 parameters	The setting of 100 parameters	Average
Basic settings for Attribute Explorer	1 minute 20 seconds	2 minute 2 seconds ago	4 minutes 12 seconds	
Manual actualisation in simulation model	2 minutes ago 50 seconds	5 minutes 55 seconds	18 minutes 45 seconds	
Manually actualisation via Attribute Explorer	51 seconds	1 minute 45 seconds	4 minutes 47 seconds	
Decrease of time demands in (min)	-1 minutes 59 seconds	-4 minutes 10 seconds	-13 minutes 58 seconds	
Decrease of time demands in (%)	-70%	-70.42%	-74.49%	71.63%

3 Conclusion

The use of simulations in the business process is on the rise in Slovakia and abroad. Their main advantage is the ability to answer the question "What happens if". The ability to predict consequences is largely dependent on the accuracy of the simulation model, and it is up to date. Business processes are very dynamic, and the actuality is growing in importance. The article presented the design of a system for data actualisation in one of the most widespread software's Tecnomatix Plant Simulation by using MS Excel and the function AttributeExplorer. Updating the data of more complex simulation models is high time-consuming, so it is advisable to simplify such work. Tecnomatix Plant Simulation includes a feature that helps to update larger amounts of data. Excel as a tool allows you to link Database tools and sensors that describe the state of processes. With this data, we can actualise and import them using AttributeExplorer into the simulation model to help reduce the time demands of update activities. An example of work can be seen on creating a simulation model according to experiments on simulation model time demands can decrease by up to 71.63%.

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