METHODOLOGY OF THE CREATION OF HUMAN AND ROBOT OPERATION IN THE TECNOMATIX PROCESS SIMULATE

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Abstract

Simulations of the productive processes are one of the most important outputs of digital factory project. Every company, which is using a concept of digital factory and its project managers have a need to see how the processes will look like in the future, especially before they will be implemented into the productive system. We can call this phase as a development phase. 3D Simulation can reflects the actual status and conditions on the running system and of course, after some improvements, it can show the future Picture of the production system. You can imagine if the project will be successful or some processes are not as planned. Making a simulation of the company’s processes you can simulate many modifications and tests of real production and also present it to managers which are necessary for the approval of project implementation. Nowadays we have many possibilities how to create a simulation, but not all software offers the same. It’s very important to choose the right one, which can be tailor-made for the company.

Keywords: digital factory, Process Simulate, process simulation.

1. Introduction

Process Simulate is a part of the software package Tecnomatix produced by Siemens company. Process Simulate can offer many possibilities of the process simulation. It can also take a static 3D models of the productive processes and in the same time you create a realistic video of the running system with all employees, machines, products and all that stuff. Every simulation consists of huge small processes which are associated by the relationships between

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them. This article is showing some basic processes of the simulation, which are human operation and robot operation.

2. Creation of the human operation

Before than the human operation will be created, first we need to create a 3D model of a human and place it to the workplace. Workers imported to libraries in the module Process Designer represent static models of people which can be downloaded from the website dedicated to the CAD models. Of course, those static models cannot be used in the simulation. In Process Simulate module, it is necessary to work with a model of objects, which allow for movement in their’s axis. Create a human model starts by clicking on the option Human from the main menu and selecting Create Human where you can edit multiple attributes of a potential employee (Fig. 1).

For basic human operation we can consider walking. Transfer of human position from one point to another point begins by choose requested human model in the graphics window and selecting Walk Creator... from the main Human menu. In the window Operation Walk - Jack (Fig. 2) there is a possibility to propose the walk operation by positions - either by entering the human target positions (Select Target), where human has to move, or selecting Path Creator and then entering a path along which go human model to the desired destination.
Another basic human operation can be grasping of the object, or taking a certain posture.

Selecting a human model and choosing option Posture Library... from the main menu Human - Human Postures, the new window Posture Library - Jack will be open (Fig. 3). There you can choose from one of the predefined human poses (working,-relaxing, sitting pose) as well as there is a possibility of fixing individual joints of human and edit the new requested poses. Subsequently, using the option Create Op. the new human pose will be created and saved with the selected positions of human model.

Next necessary human operation should be grasping the object. Selecting Auto Grasp... from the main menu Human - Reach Object opens a new window Auto Grasp - Human (Fig. 4), where it is possible to set multiple attributes of the object grasp. Also there can be more ways how to catch an object, for example using both hands, clutching automatic mode, grasping of selected objects from the workplace and permissions to change locations for a grasping an object.
3. Creation of the robot operation

To create any robot operation it is necessary to import new 3D dynamic model of the robot (e.g. Kuka) to the Process Simulate libraries. Process Simulate module contains of creating a simulations and also you can connect this software with real robot system using adapter and required translation software. Consequently, all activities of the robot, which will be created in Process Simulate module will be translated into the appropriate data type for programming a real robot. Partial movements as well as details of the operation, it is possible to test them before the implementation into the real production system.

The new robot operation begins selecting the desired robot model and selecting New Weld Operation from the main menu. Subsequently, a new window (New Weld Operation ) opens with the possibility of editing an operation. (Fig. 5)
After entering the name and designation of the corresponding robot it is still possible to choose the robot head (Gun), which is the functional part needed for drilling, screwing, application of seals, etc. Consequently, it is necessary to specify the current position of the robot by option Add Current Location from the main menu by selecting Operations - Path Editing. Then we need to create requested movements of the robot using Path Editor to adjust the partial positions of the robot (Fig. 6) and the time which is needed to reach these locations.
4. Conclusion

This article shows the basic operations in the Tecnomatix module Process Simulate. Human and robot operations are necessary for nearly all production processes in the company. Those two types of operation are described by step by step instructions and a real simulation of the company processes can be done in a short time of the project’s development phase.

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