

**DIFFERENCES IN SIMULATION OF HUMAN OPERATIONS BETWEEN SIMULATION SOFTWARE PROCESS SIMULATE\_HUMAN AND TX JACK**

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**Keywords:** process simulate, human, Tx Jack, simulation, modelling**Abstract:** Article deals with the use of simulation software to design and optimize the work activities in the industrial enterprise. It is a optimization of the manual operation in connection with the elimination of physical stress of workers through ergonomic analyses that are part of software products and are realized in the process of simulation, specifically, two software products Siemens - Process Simulate module Human with a Texnomatic Jack. The article compared the virtual environment in which the project manager works.**1 Introduction**

Most companies looking for savings in purchased materials, overheads, energy. They are looking for ways to achieve these savings. One way is to use software products for the creation of virtual reality and optimization of the current state of business processes without the cost of direct implementation of suggestions for improvement.

The principle of modelling in Tx Jack and Process Simulate Human (Figure 1) is demanding in terms of modelling machines, equipment, vehicles, etc. To create a working environment, it is appropriate to use other softwares, which creates a working environment easier.

Software Tx Jack is compatible with the software, which can create a virtual environment of a particular workplace or halls such as CAD. Thus created environment can be imported into the working environment of Tx Jack and then place a concrete worker in it with concrete working activities

Main function of Tx Jack and Process Simulate Human (Figure 2) are therefore creating a human being with accurate anthropometric parameters, simulation of movements (individual body parts) and determine the burden caused by work's activities and work's

environment (Figure 3). It is not necessary to determine the physical stress on the particular operator, but it is necessary to dimension the workplace in general (Figure 4), (Figure 5). It is possible to use the database ANSUR (Survey of U.S.Army) which contains data collected realization of survey personnel of military of USS in 1988.

Siemens Tecnomatix software package has several modules for each area of usage. For modelling and simulation of the impact of the working environment on staff, creating 3D models of working environment, workers and their activities and detect physical stress through a specific predefined base of ergonomic analysis can be used two modules (Table 1):

- Tx Jack/Jill - it's a 3D simulation tool for evaluating of physical stress during the manual work activities, this is the instrument through which it is possible design workplace in the virtual environment and simulate various solutions that meet ergonomic standards without investing in equipment and technology. Digital human model in this program is a real biomechanical properties of natural motion and joint rang - taken from NASA studies.

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• Process Simulate Human - allows users to verify the design of work stations, verify the achievement of the required safety of the individual parts of a product. The module offers powerful features for analysing and optimizing the ergonomics of human activity, thereby

providing an ergonomic and safe production process according to industry standards. Using simulation tool of human activity, the user can perform realistic simulation of the human tasks and optimize process times of the production cycle according to the standards of ergonomic.

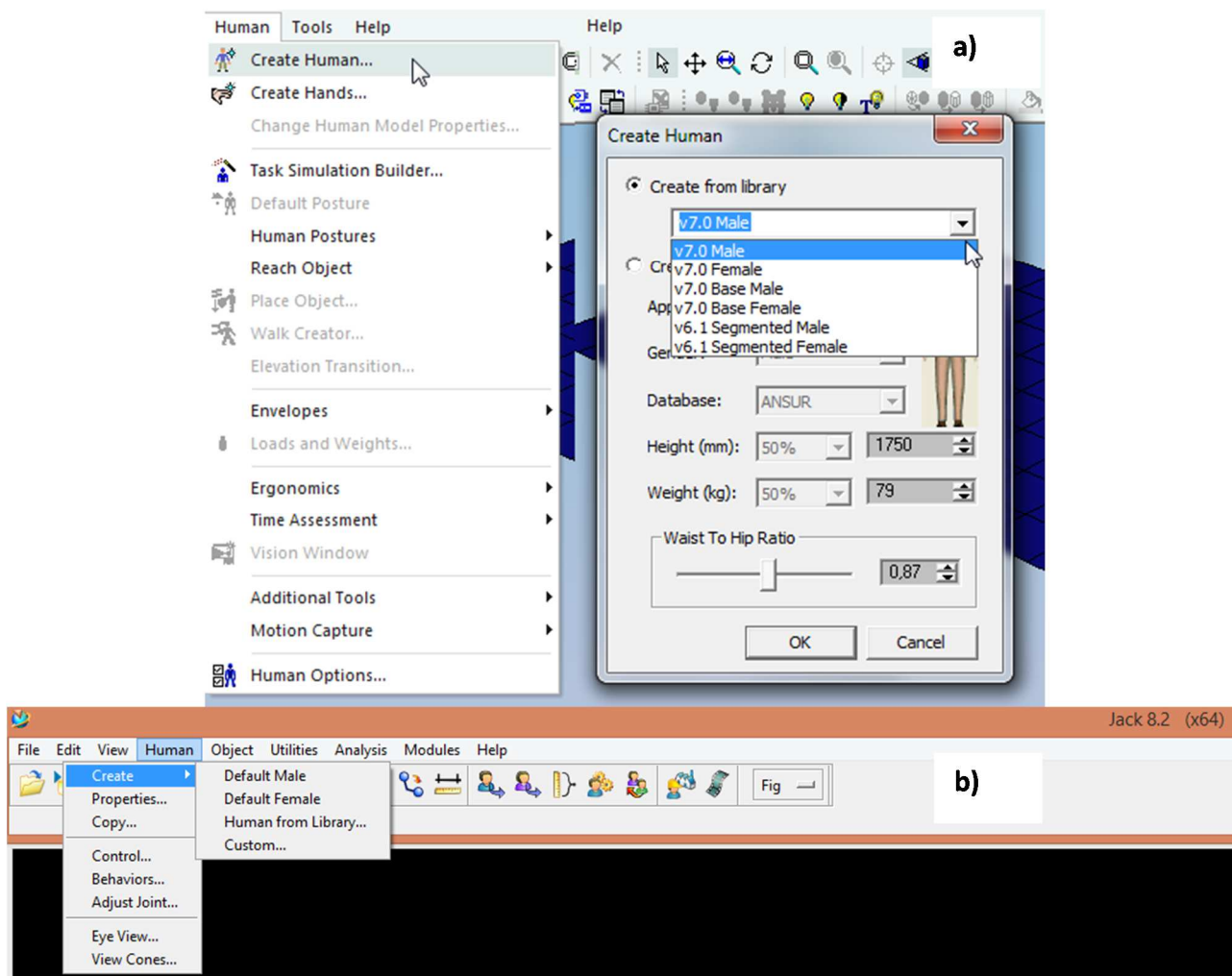


Figure 1 a) Process Simulate - Create Human; b) Tx Jack - Default Male/Female

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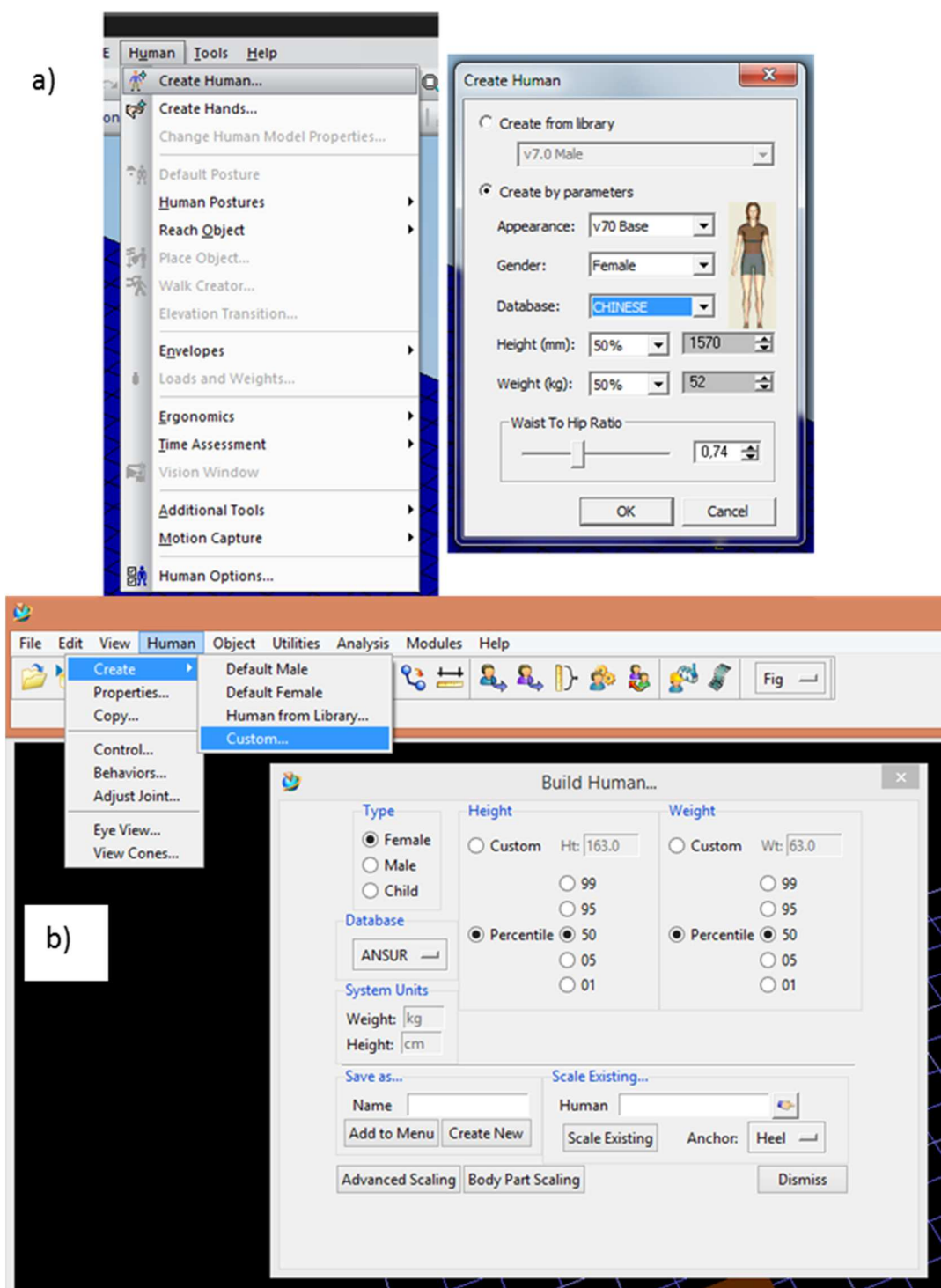


Figure 2 Create human in a) Process Simulate - Create by parameters; b) Tx Jack 8.2 – Human - Custom...

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Table 1 Description of the figures

	<b>Tx Jack/Jill</b>	<b>Process Simulate Human</b>
<b>Figure 1</b>	It is showing the exact steps how to setup human model. (or posture library), colors of every part of human model (human body), user defined ergonomic reports and some other features.	
	Open Tx Jack, on the top menu Human_Create_Default – male, female.	Left click on the top menu Human and choose Create Human, we can see new window with option Create from library.
<b>Figure 2</b>	In the top we can choose if we want to create a human from the library. Also there is another way (create by parameters) how to create a human in the Process Simulate. In this second option you can choose from predefined parameters of the human model. We can choose clothes type, gender, nationality and also height and weight.	
	Customize the parameters of human Human_Create_Custom...	Create a human model which starts by clicking on the option Human from the main menu and selecting Create Human - Create by parameters where we can edit multiple attributes of a potential worker.
<b>Figure 3</b>	For basic human operation we can consider walking. Transfer of human position from one point to another point begins by choose in the both software differently.	
	It needs to click in the main menu Modules_Task Simulation Builder. It opens a working environment in which it is possible to create human movements that are in the menu - eg. Go, Get, Put, position, pose, touch, regrasp ATC.	Chose the requested human model in the graphics window and selecting Walk Creator - from the main Human menu. In the window Operation Walk - Jack 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.
<b>Figure 4</b>	Selecting a human model and choosing option Posture Library is very similarly.	
	In work environment Task Simulation Builder_Modules by the option Pose is possible to choose from predefined human poses which is required, but also define other characteristics such as reach and grasp, loads and weights, adjust and joint.	From the main menu Human_Human Postures, the new window Posture Library - Jack will be open. 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.
<b>Figure 5</b>	Object handling in terms of its grip can be made in both software is describe below. In both software, as regards the ways how to catch an object there are more of variant, 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	
	In this environment, it needs to select Get from the menu and define parameters it necessary for grasp of concrete object. For the location of the object needs to be defined further step and it is Put. This software allows you to define the work activities through the definition of individual tasks.	Select Auto Grasp from the main menu Human_Reach Object opens a new window Auto Grasp - Human, where it is possible to set multiple attributes of the object grasp.

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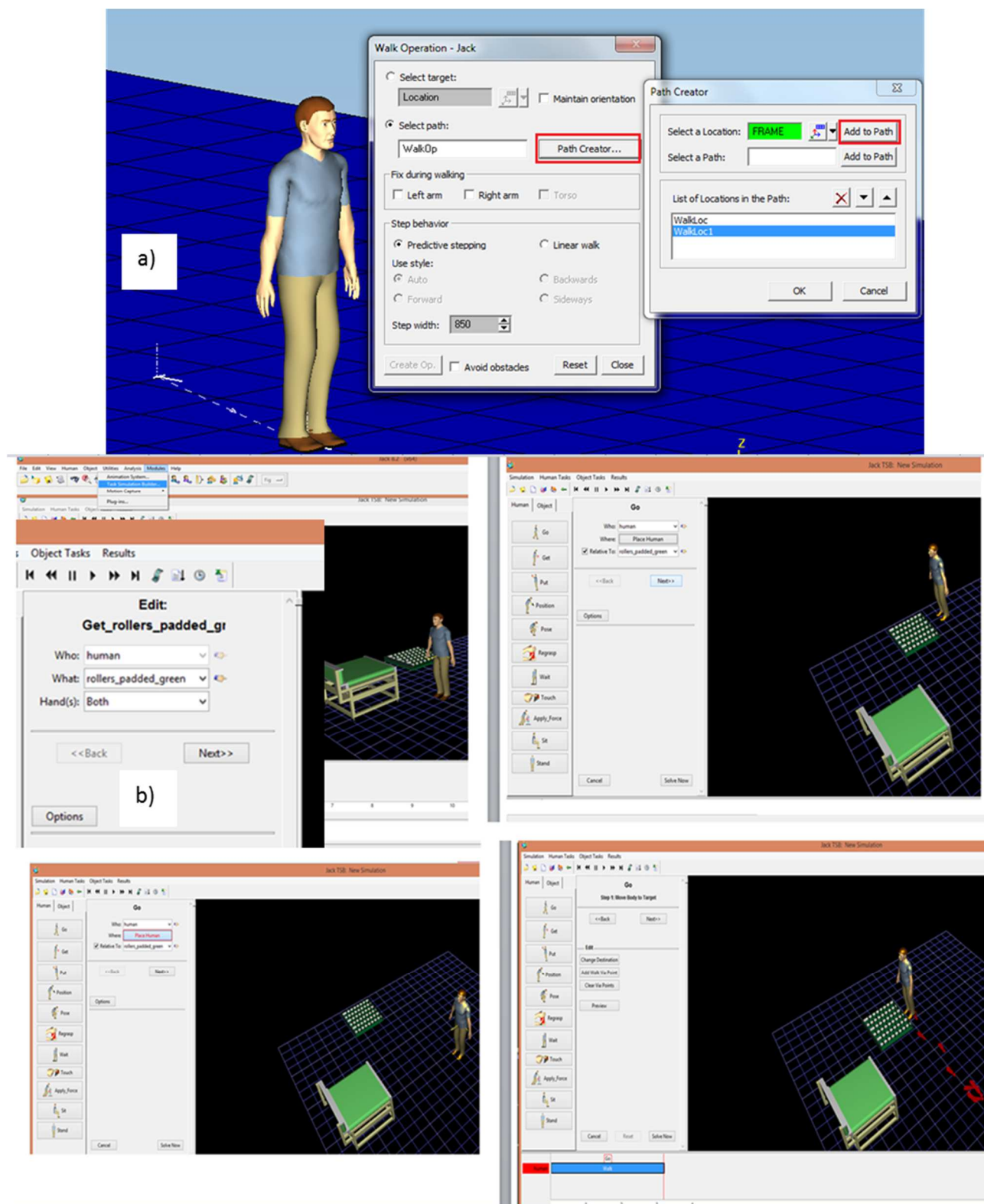


Figure 3 Definition of motion in a) Process Simulate - Walk creator  
b) Tx Jack 8.2 – Modules\_Task Animation Builder



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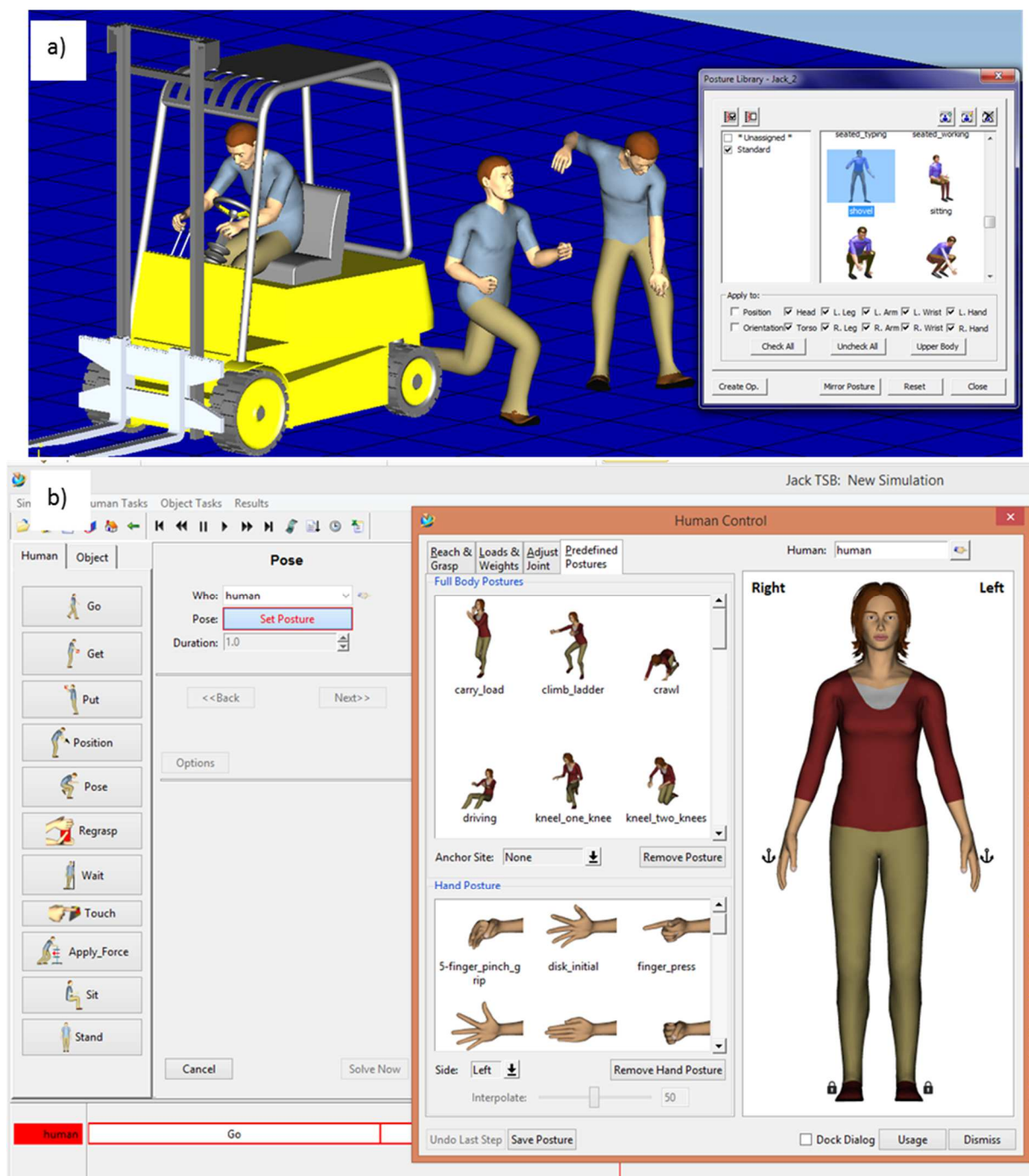


Figure 4 Posture library in a) Process Simulate Human\_Human Postures  
b) Tx Jack 8.2 – Modules\_Task Animation Builder

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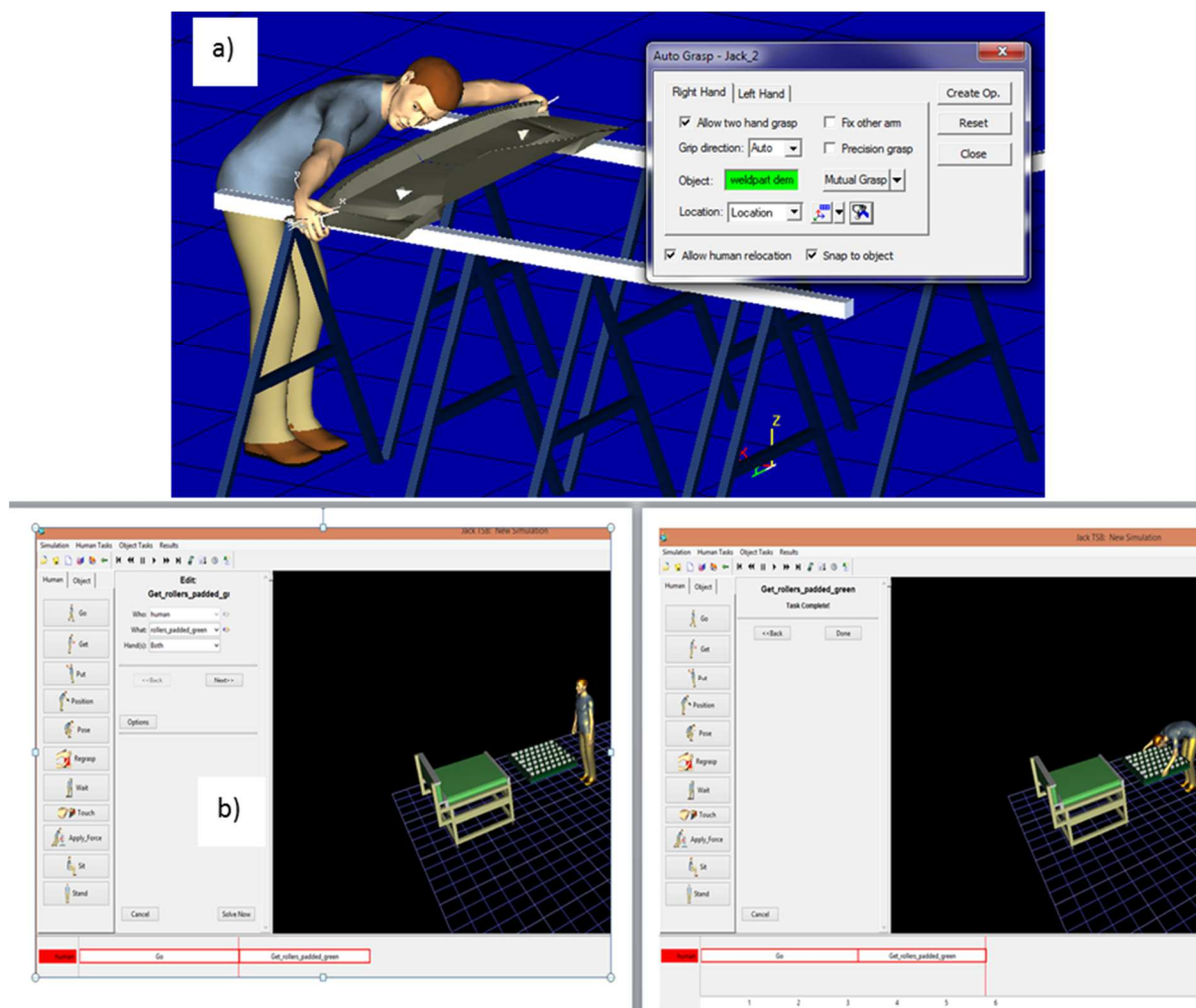


Figure 5 Get object in a) Process Simulate - Auto grasp  
b) Tx Jack 8.2 – Modules\_Task Animation Builder

## Conclusions

Choosing the right tool for the purposes of optimization is important for the desired output. Regarding the ergonomic optimization is therefore necessary to know what should be the content of the simulation. Whether it will be act as a simulation of work activities, then temporary staff and monitoring their physical stress, or a requirement to include simulation and workplace as a function part of the working environment, i.e. it is necessary to bestir not only workers but also workplaces. Software product Tx Jack allows to create simulation work activities, which bind to a specific worker. Regarding the software product Process Simulate there are greater opportunities for optimization, because Human is just one of the modules of this software product. One of the differences is also that Process Simulate has no library after installation in the PC. On the other hand Tx Jack has a basic library with some objects necessary for simulation and analysis, e.g. chairs, tables, conveyor, container, accessories.

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