Warehouse Simulation
ulSimulator

Technical white paper

Consulting Engineering
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1 Warehouse3D

1.1 What is Warehouse3D?

Warehouse3D is a tool that can be used for surveillance of a real or a simulated warehouse, for upgrading a warehouse so in can increase its' throughput, removing warehouse bottlenecks, building a warehouse vision and anything that the user can find appealing for his use.

2 Warehouse3D – Technical Overview

Warehouse3D is a suite of applications for creation, simulation, analysis and 3d presentation of real warehouses.

Warehouse3D is comprised of these software components: Warehouse3D Plug-in, Warehouse3D Client, Warehouse3D Simulator, Warehouse3D Statistics and Analysis Tool.

2.1 Components

2.1.1 Warehouse3D Plug-in

The Warehouse3D Plug-in is a tool for modeling warehouses. With this tool warehouses can be modeled so other tools from Warehouse3D can be applied to them. Also it is used as a tool for modifying already modeled warehouses.

2.1.2 Warehouse3D Client

The Warehouse3D Client uses data that is generated by the real warehouse or data that is a result of a simulation to represent the palette movement through the warehouse, and to represent movement and status of the systems and subsystems in the warehouse.

2.1.3 Warehouse3D Simulator

The Warehouse3D Simulator uses data entered by the user as an input to a simulation for a warehouse's work. The user enters the initial state of the warehouse and dynamic changes in the warehouse, defines what should be the storage places in the warehouse and the movement of the palettes (their

entering/leaving points and rates of entering/leaving), and after that the Warehouse3D Simulator generates data for the whole warehouse actions so the Warehouse3D Client can visualize the generated simulation (if the simulation is of type Real-Time), or the Warehouse3D Statistics and Analysis Tool (if the simulation is of type Analyze-Only).

2.1.4 Warehouse3D Statistics and Analysis Tool

The Warehouse3D Statistics and Analysis Tool is tool for analyzing and visualizing the statistical data that is gathered from either simulation of any kind or real warehouse actions data.

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Warehouse Simulator

The Warehouse3D Simulator uses data for palette movement entered by the user and then simulates the warehouse and its traffic.

The simulator has couple of specific groups of information that should be entered by the user:

- initial state

- dynamic changes

- storages

- movement matrix

- inputs and outputs and commission points

Using all of this a simulation is generated that can be used for real time visualization with the help of Warehouse3D Client or it can be used for analysis with the help of Warehouse3D Statistics and Analysis Tool.

2.2 Initial state

Initial state is information about the state of the warehouse when the simulation begins.

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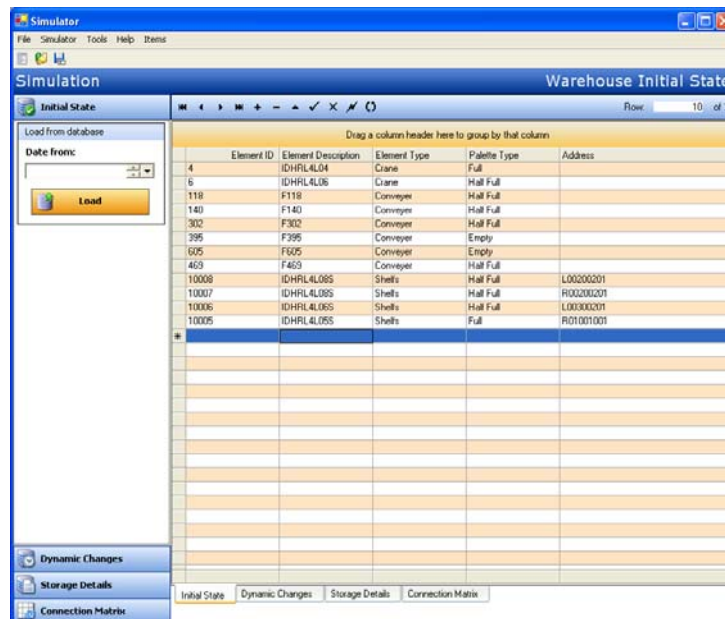
As you can see on the picture information about the element on which the palette is on and information about the type of the palette is entered. With this data the simulator populates the warehouse with palettes on the start of the simulation.

Initial state data can be read from the database (the data from the real warehouse in a certain moment).

2.3 Dynamic changes

Dynamic changes are information about the changes of the states of subsystems in the warehouse.

As it can be seen on the picture in the dynamic changes there is information about the element which changes state, the error code that it will generate and the time when this event happens. The element parameter here can be any element in the system. And the error code can be different but in principle it either puts the element in an error state or it puts the element in a ready state.
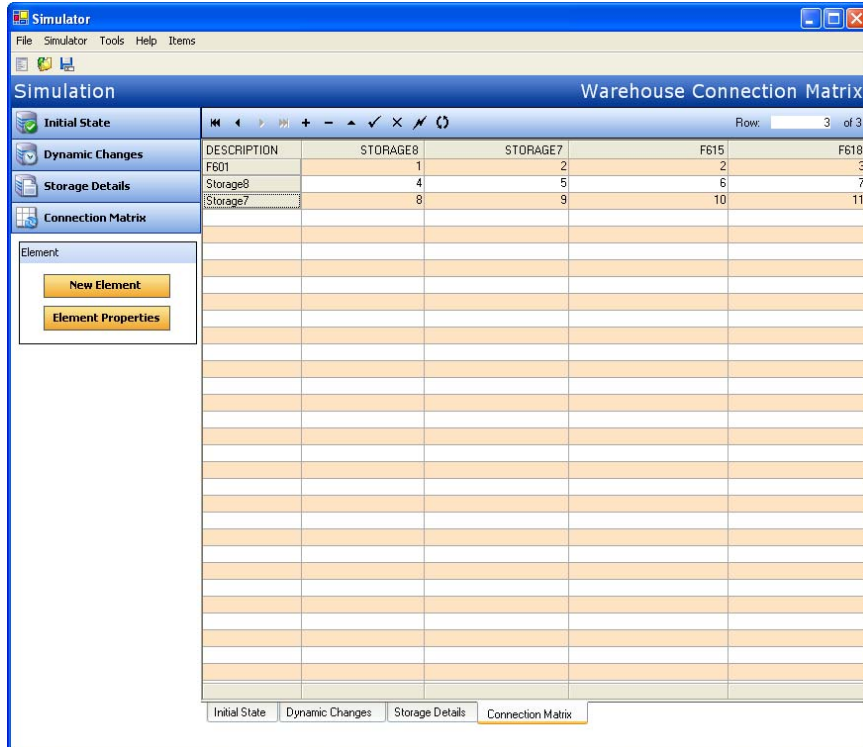
2.4 Storages

Storages are groups of shelf places in the warehouse that can be used as ends for inputs or start for outputs in the system. Storages are consisted of as many as the user wants storage details. Storage details are rectangle like areas from one side of one shelf.
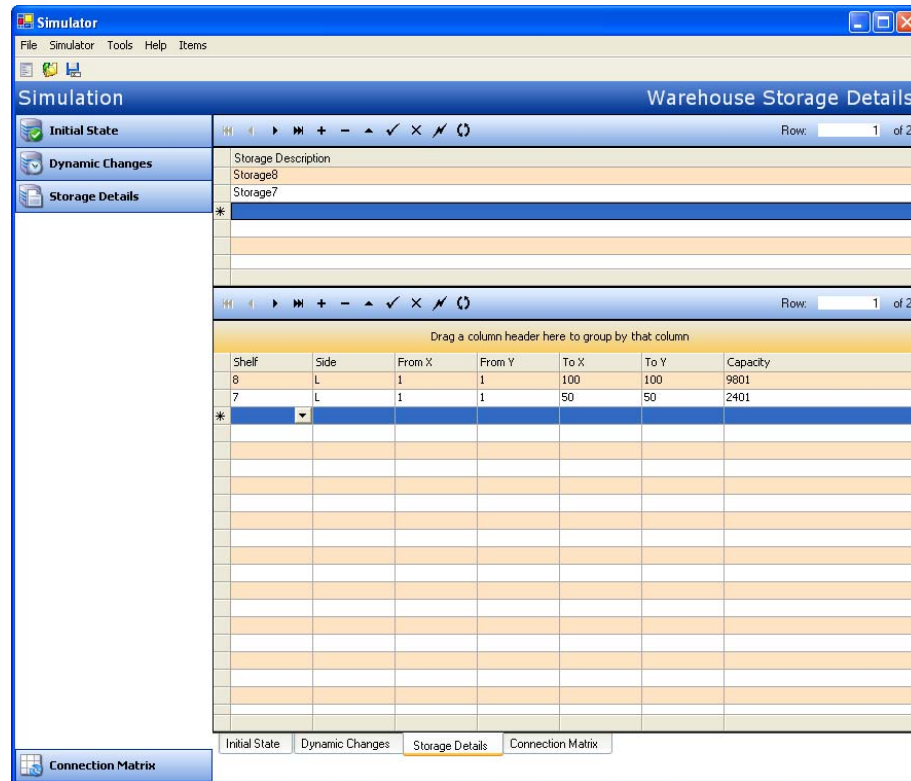
For the storage only the description is needed. Storages need their details. The details of the storage have the capacity field automatically filled. A storage place can have many details and the details can be located in different shelves. The only rule that has to be satisfied is that the any two storage details that are on the same shelf and same side of the shelf must not define areas that overlap.

2.5 Movement matrix

Movement matrix defines the movement rates of palettes between the elements in warehouse.

In the movement matrix the user needs to define the palette rate (in palettes per hour) from every input and storage to every output and storage.

With the help of this matrix the generation of palettes is then calculated and then it is used for palette movement throughout the warehouse.

2.6 Inputs, Outputs and Commission points

Inputs are places in the warehouse that generate new palettes. Generation of new palettes is based on one of the random distributions laws or real data previously generated by the real warehouse.

Outputs are places that palettes leave the warehouse and they also generate the palettes using some random distribution law or real data from the warehouse.

Commission points are places in the warehouse that palette can pass through when going from one place to another. The time spent on a commission point is defined with some of the random distribution laws or real data.

So movement matrix defines movements between inputs, storages and outputs and if we want to on which commission point will they pass through.