SUMO GUI SOFTWARE IN VISUAL INTERACTION TECHNOLOGY

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Abstract: *In order to implement simulation processes in the visualization of transport routes, information is given on the technology of visibility and interaction.*

Key words: *Input interface, graphical interface, user interface, configuration interface, communication protocols, transmission interface, data exchange, communication, real-time communication, system integration, database.*

INTRODUCTION

K interaction with view. Basic navigation. As soon as the network is displayed, the view can be interacted with. Clicking the left mouse button in the view and moving the mouse while holding down the button moves the grid. Moving the mouse up and down while holding down the right mouse button changes the scale of the grid. It is also possible to change the zoom using the mouse wheel (holding *<SHIFT> increases the zoom speed and* holding *<CTRL> decreases it).* The zoom is focused on the center of the screen or the cursor position. Zoom mode can be selected using the button.
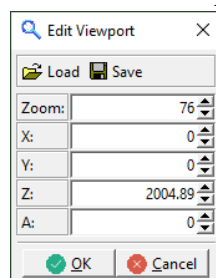
1-rasm. Koʻrish portlarini kuzatish

Also you of the network which part appearance straight away of the screen in the center to be need was network coordinates and scale designation through your control can (a value of 100 account the whole network to the screen suitable will come). This settings button using to see area editor to

open through o ' change possible 🔍. This from the editor current settings save (💾) or first saved ones load (📂view area editor in) is possible .

The viewport is defined as: <viewport zoom="<ZOOM>" x="<X>" y="<Y>" angle="<ANGLE>"/>. This may be in the gui settings file.

✤Clicking the center button ( ) in the menu bar at the top of the view resets the viewport for full grid view.

Stop points. The simulation can be automatically paused to allow you to check specific points in time. Breakpoints can be set using one of the following methods:

- via Edit-> Breakpoints menu;
- by setting the option - breakpoints TIME1,TIME2…;
- by loading configuration files with breakpoint information ;
- by clicking the underlined time value in the message/alert log area.

The breakpoint is set 5 seconds before the time value. This offset can be adjusted via the Settings menu (CTRL+H). It is recommended to set the offset to 305 seconds before the teleport event to investigate the cause of the teleport warning.

Hotkeys. Various menu items can be accessed via keyboard shortcuts. They are documented directly in the menu. (i.e. Ctrl-l Ctrl-e opens the edge renderer, Ctrl-d does one simulation step). Additional tabs are listed below:

- Ctrl-LeftClick: changing the selection state of the object under the cursor;
- Arrow keys: move view;
- Ctrl + Arrow keys: move the view less;
- Alt + arrow keys: move the view a lot;
- PageUp / PageDow: change simulation delay;
- +/-, Keyboard +/-: zoom in/out
- Home/Keyboard Home Page: Refresh View
- F9: Open the View Settings dialog
- Press Shift-Left:
- car: start tracking
- rerouter: change routeProbReroute probability
- Double-click the left button: stop tracking
- Ctrl + J: Toggle "Show Merge Shapes".
- Ctrl + K: Toggle "show secondary edge shape" (loaded with option --alternative-net-file)

Object properties / Right mouse button - Functions

Right-clicking simulation objects provides access to additional information:

- copy object id
- object parameters dialog box (Parameter Show menu)
- location data (x,y and lat,lon)
- select/deselect an object
- The following objects can be accessed by right-clicking:
- Vehicles (some attributes are only available when using a specific simulation model, i.e. MESO or sublane model)
- Persons
- Corridors

- Passages
- Traffic lights (by clicking the green/red lines)
- Detectors
- Redirecters
- Variable speed signs
- POI
- Polygons
- Simulation (by clicking on a background that is not another object). It can also be accessed by clicking the button ⬛.

detailed as departing, operating and arriving vehicles contains all values available through the output . It also includes network statistics such as the number of edges and nodes.

By clicking the right mouse button, the following additional functions are available:

Movement tracking (vehicles and persons)

Tracking can be turned off by double-clicking or using the context menu.

- Enable additional visualization (people and vehicles)
- Select enemy vehicles (cars). *Requires* vehicle selection coloring to be visible
- Closed to traffic (kerbs and lanes)
- Setting a speed limit (variable speed sign)
- Switching programs (traffic lights)
- Visualization of signal plans (traffic lights)

Draw object properties. All objects support *the Show Parameter item in the context menu.* This will open the following dialog in tabular form:

2-rasm. Analiz nazorati oynasi

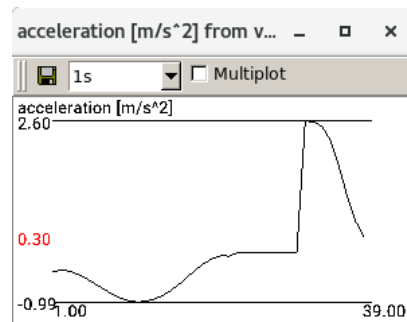Any of the listed attributes or General parameters are accompanied by one of the following symbols:

✗: The attribute does not change

✓: Attribute can be changed but not drawn

⬛: Attribute can be changed and drawn. Clicking the drawing icon with the left mouse button opens the drawing window.

The plot window (acceleration over time) is shown below:

3-rasm. Analiz va sintez grafigi

Clicking on additional Attribute drawing symbols will open new drawing windows. By checking the Multiplot checkbox, any additional attribute plots will be added to this plot window instead of opening a new plot window.

When you move the mouse over the drawing window, the drawing point closest to the mouse cursor is highlighted and its *x* and *y* values are printed in blue along the drawing axes.

Selection of objects. *sumo-gui* allows you to select arbitrary mesh elements such as edges, paths, and connections that can be saved to (and loaded from) a file for later processing. The selection is made by choosing "Add to selection" from the context menu of the item (right-click) or by left-clicking on the item while pressing the "Manage" button.

Selected items can be viewed in the "Edit Selections" dialog box, available in the Save / Load and Edit menu. The list contains entries of the form objectType:objectId, each of these entries on a separate line:

edge :someEdge

edge :someOtherEdge

junction :myJunction

Many network objects can be colored according to their selection state (*color by selection*) *and selected network objects can be managed as a group* in netedit .

Identify objects. All simulation objects can be positioned based on their ID using the positioning dialog 🛈. Clicking this button will open a submenu for selecting the object type. There are the following types:

- *Node Descriptions*

Within node files, which typically have the extension ".nod.xml" (see Known extensions), each node is described in a single line that looks like this: <node id="<STRING>" x="<FLOAT>" y="<FLOAT>" [type="<TYPE>"]/>- square brackets ('[' and ']') indicate: the parameter is optional. Each of these attributes has a specific meaning and value range

- *Foreign descriptions*

In the edges file, each description of a single edge looks like this: <edge id="<STRING>" from="<NODE_ID>" to="<NODE_ID>" [type="<STRING>"] [numLanes="<INT >"] [speed="<FLOAT>"] [priority="<UINT>"] [length="<FLOAT>"] [shape="<2D-POSITION>[<2D-POSITION>]*"] [spreadType="center"] [allow="<VEHICLE_CLASS>[<VEHICLE_CLASS>]*"] [disallow="<VEHICLE_CLASS>[<VEHICLE_CLASS>]*"]/>.

- *Vehicle*

Definition of vehicles, types of vehicles and routes. There are various applications that can be used to determine the vehicle demand for SUMO from the available inputs. Traffic demand can also be created and edited visually with netedit. All of these applications eventually generate XML definitions.

- *On foot*

One moves through the grid by walking or using vehicles. Walking behavior can be customized by choosing a walking model. A person's element contains key elements that define the stages of his plan. Phases are a linked sequence of walk, walk, and stop elements, as described below. Everyone should have at least one stage in their plan.

```
<person id="foo" depart="0">
<walk edges="ab c"/>
<ride from="c" to="d" lines="busline1"/>
<ride .../>
<walk .../>
<stop .../>
</person>
```

- **Containers**

A container moves through the network by being transported by vehicle or loaded between two stations. A container element has sub-elements that define the stages of its plan. The steps are a linked sequence of transport, carry and stop elements as described below. Each container must have at least one stage in its plan.

```
<container id="foo" depart="0">
<transship edges="a b"/>
<transport ../>
<transport ../>
<tranship ../>
<stop ../>
</container>
```

- **Traffic light ;**

Typically, netconvert and netgenerate generate programs for traffic lights and intersections when calculating networks. However, these computer programs are quite different from what actually exists. Sumo / sumo-gui can be run with additional program definitions to provide the simulation with real traffic light programs. In addition, sumo / sumo-gui allows you to load definitions describing when and how a set of traffic lights will switch from one program to another. Both are discussed in the following subsections. Another option is to visually edit traffic light plans in netedit.

- **Point of View (PoI);**

POI Definitions

A point is defined as:<poi id="<POLYGON_ID>" type="<TYPENAME>" color="<RED>,<GREEN>,<BLUE>" layer="<LAYER_NO>" [(x="< X_POS>" y="<Y_POS>") | (lane="<LANE_ID>" pos="<LANE_POS>")]/>

- **Polygon ;**

A polygon is defined as:<poly id="<POLYGON_ID>" type="<TYPENAME>" color="<COLOR>" fill="<FILL_OPTION>" layer="<LAYER_NO>" shape="<2D-POSITION >[<2D-POSITION>]*"/>

After selecting an object type, a dialog box opens that provides a text box for entering the object ID. The search for objects begins after the first characters are entered, until an object ID that begins with these characters is found. Once an object is selected in the list, the view can be centered on that object.

The Hide Unselected button shows the list of objects kind of selected restricts to objects . *The Locate menu* on the main menu bar , as well as internally in the Locate Object dialog box edges and interior contains a symbol that toggles the display of the list of connections .

This summary helps you determine the functions you need to manage your network system and view network objects. Allows you to change the network system and optimize it. The features we discussed are:

Users use a graphical interface to view and modify the network. Mouse clicks allow you to identify network elements and change their properties. Allows you to set grid coordinates and scale appropriate for the center of the screen. This makes it easier for the user to decide where they want to see you. Allows you to automatically stop the simulation at certain points. This provides a convenient way to stop and check the simulation in extreme and rare cases. By setting up quick access buttons, users can quickly and accurately perform viewing and editing processes. It provides the following functions for selecting network elements and managing their properties. Provides the following functions for drawing network elements and displaying data. Allows you to select simulation objects and view and modify their properties. Define simulation objects and enter their IDs.

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