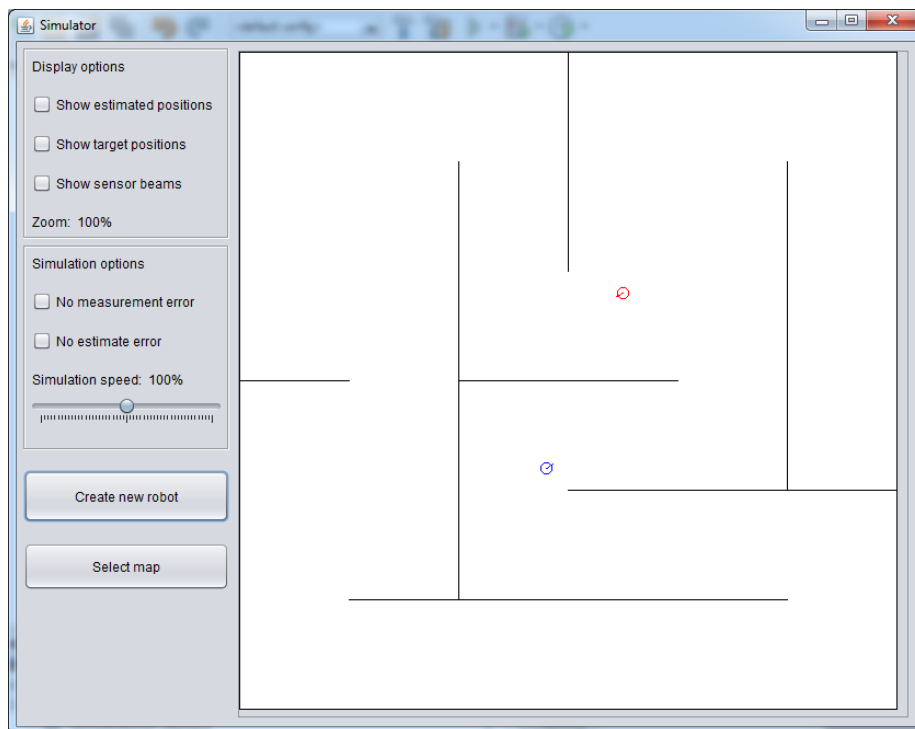# Simulator - Manual

Written by Eirik Thon, 2016

Introduction

Testing with the real robots can be time consuming. The robots needs to be set up properly and it takes a lot of time for them to fully explore an area. The simulator was created to avoid all this effort. It does this by simulating the behavior of a real robot for a number of virtual robots. The simulator is easy to set up and makes repeated testing a lot faster. The goal of the simulator is to guarantee that if a mapping and navigation algorithm performs well on the simulator, it also performs well with the real robots. Hopefully this has been achieved.

The Interface

Shows where the robots
believe they are

Shows the target point
of each robot

Show the line of sight
of the IR-sensors

Current zoom level

Turn off measure-
ment error

Turn of estimation
error

Adjust simulation
speed

Add new robot

Change map

Display

Simulated robot

Obstacle

Simulator

Display options
☐ Show estimated positions
☐ Show target positions
☐ Show sensor beams
Zoom: 100%

Simulation options
☐ No measurement error
☐ No estimate error
Simulation speed: 100%
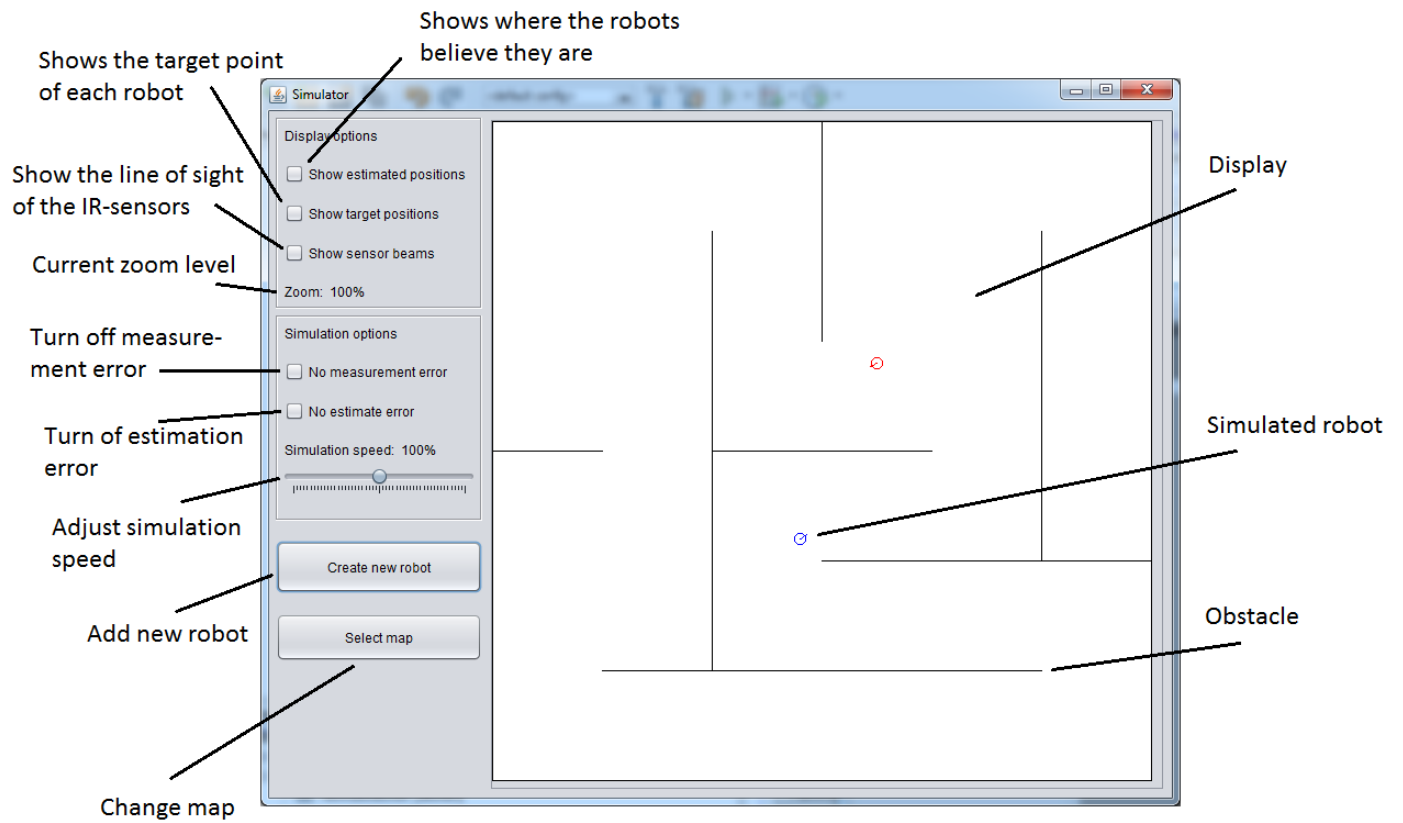
Create new robot

Select map

Figure 1:

How to use the Simulator

Using the simulator consists of only two steps:

1. Select the map

2. Add the robots

Pressing the "Select map" button shows the select-map-dialog. Here a new map can easily be selected. The maps are stored in the same place as the source files for the main software system, in a folder called "maps".
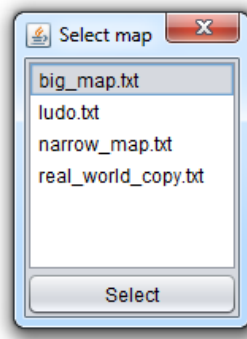

Figure 2:

When the desired map has been selected the user must add and place the robots. The "Create new robot" brings up the new-robot-dialog. here the user must specify the initial position and orientation of the new robot. The numbers for the x- and y-values are in cm and the orientation is in degrees. Unfortunately there is no reference for the position relative to the map and so a bit of experience is required to correctly place the robots.
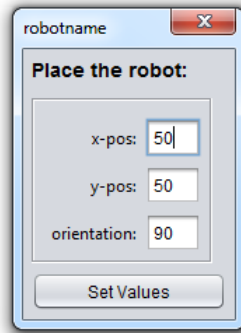
Figure 3:

After a robot has been added it will not do anything. That is because it is not connected to the control software. At this point the user must go to the main application and scan for new robots. The robots added to the simulator will now be listed in the application. When the user connects to the simulated robots through the application, they begin their normal operation. To see how to connect to the robots, check out the manual for the application which can be found in the help menu

Details and Features

The simulator has some functionality that is not visible at first glance, and some of the features may need some explanation:

- Estimated position: By default the estimated pose has an error that grows when moving and turning. The "Disable estimate error"-option will only stop the error from accumulating further. To get an completely error-free simulation, the error must be turned off before connecting the robots.

- Collision detection: The robots can not go through obstacles or each other. If a robot collides it stops moving, however the estimated pose will continue to be updated as if the robot was still moving forward.

- Measurements: In addition to the obstacles, the IR-sensors are also able to see other robots.

- Zoom and scroll: Ctrl+mouse-wheel can be used to zoom inn and out. While zoomed the mouse can be used to drag the map around.

- Unlimited robots: The maximum number of robots that can be simulated is only limited by the computational power of the machine-ware. However adding more then 10 robots will give an error simply because the simulator only has 10 robot names stored.