

Getting Started with “The Construct”- Simulation Environment

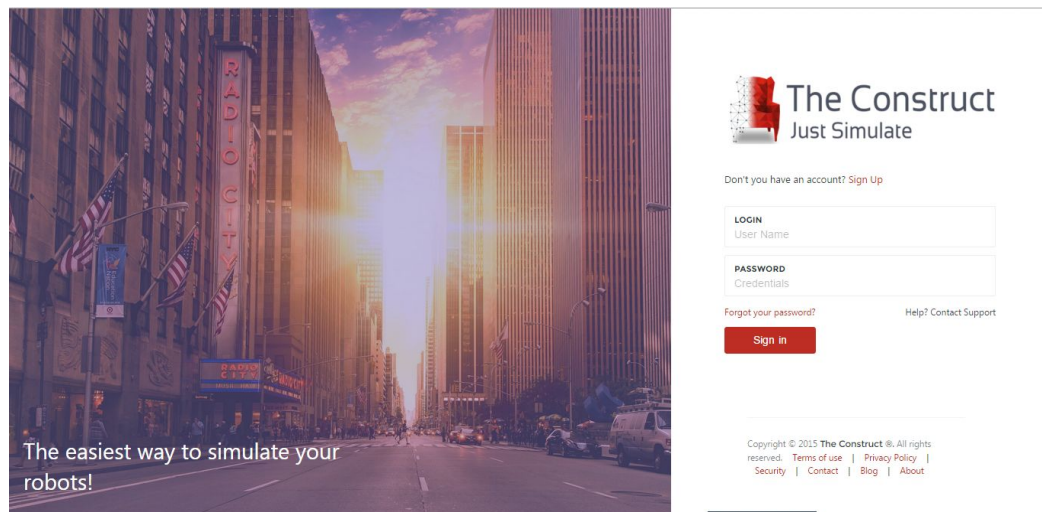
(owner Daniel Hoehener)

Go-cart tutorial

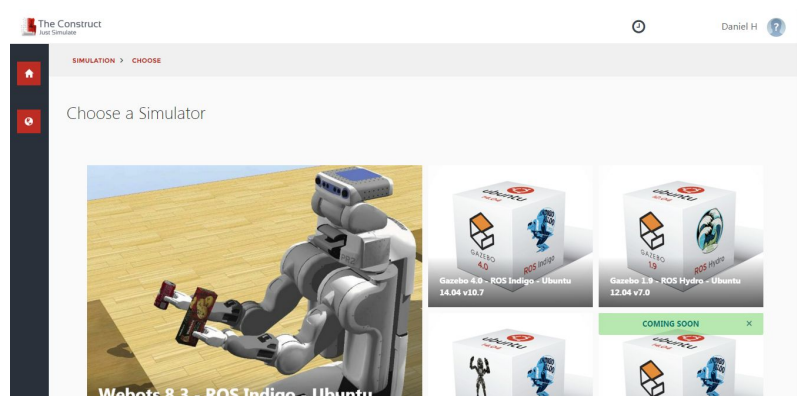
The following will step-by-step lead you through the go-cart tutorial. Alternatively you can watch the instructions to this tutorial on youtube:

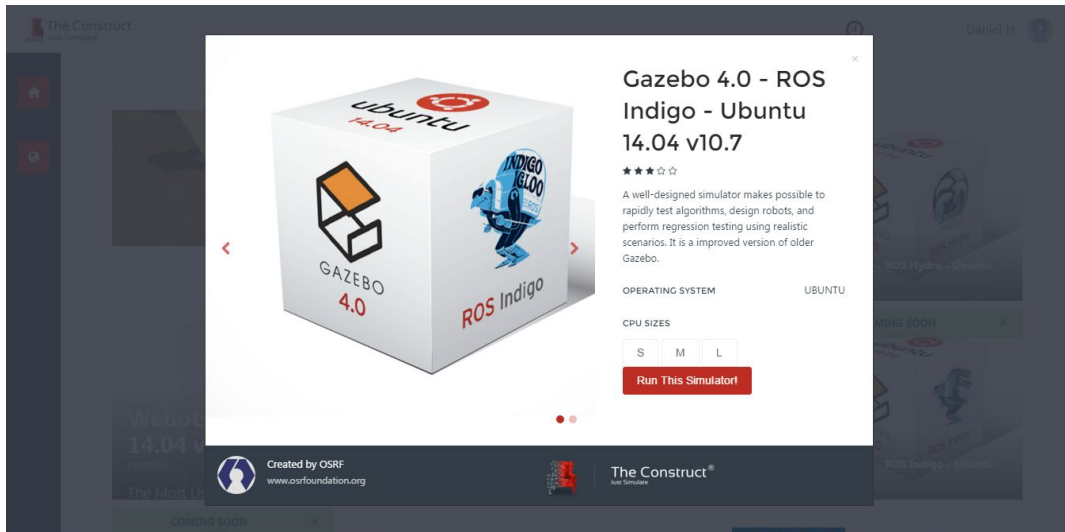
<https://www.youtube.com/watch?v=pzv1hLKNDmE&feature=youtu.be>

1. To use “The Construct” you have to get an account. Contact the account manager who will provide you with a username and a password.
2. To start the tutorial go to sw.theconstructsim.com. You should see the following screen:

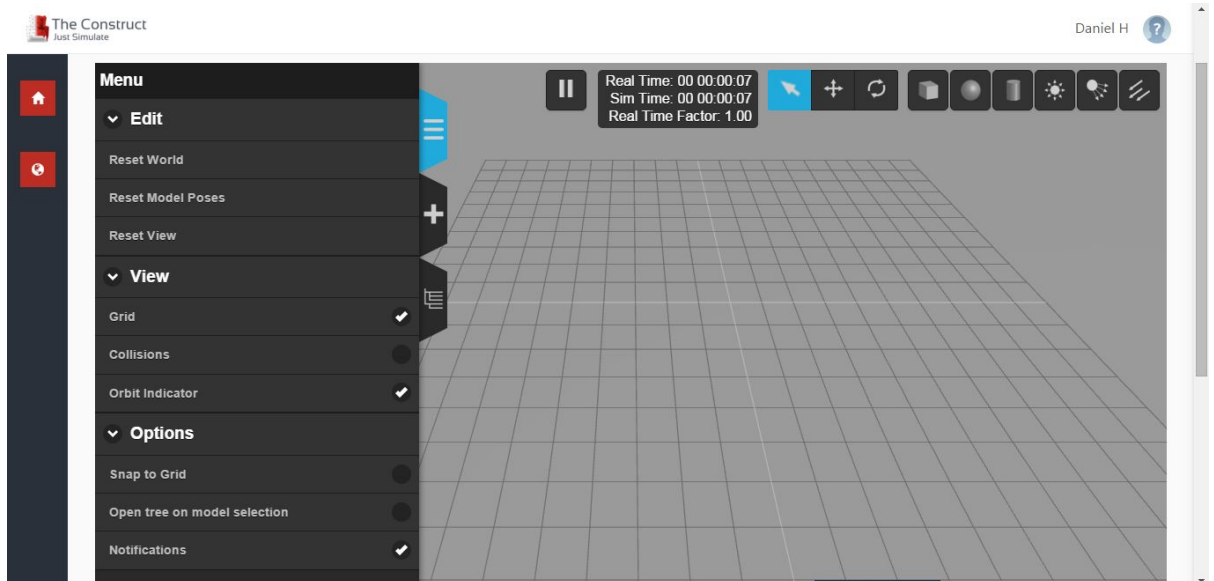


3. Login with your username and password
4. On the appearing Choose a Simulator screen, click on Gazebo 4.0 then on run this simulation

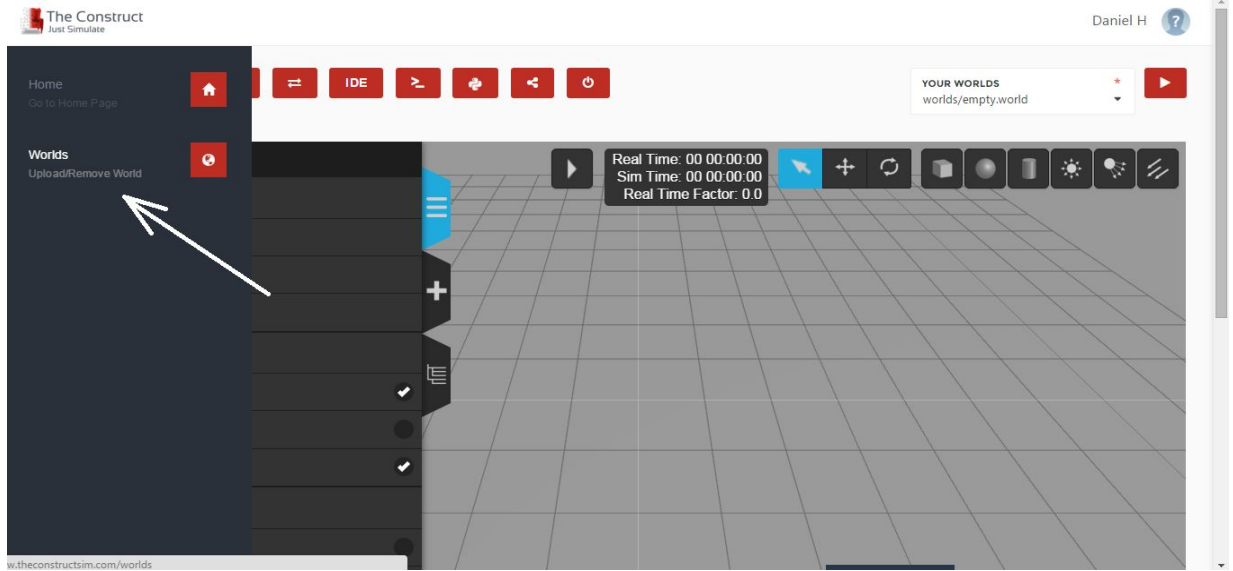




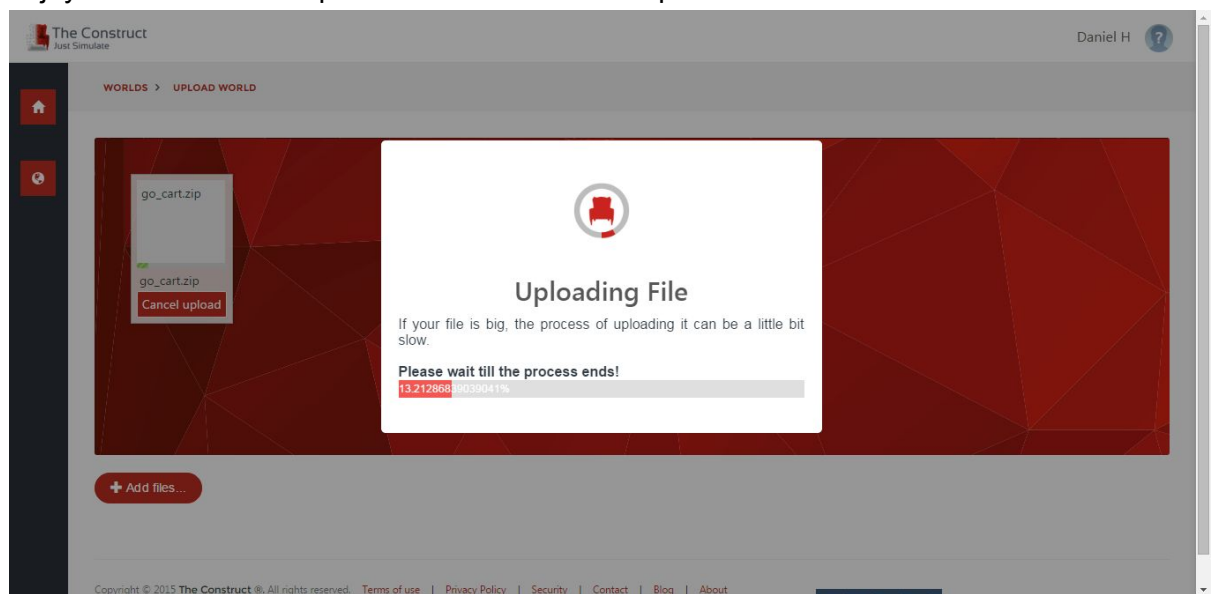
- After a couple of seconds an empty simulation will start, i.e. your screen should look something like this:



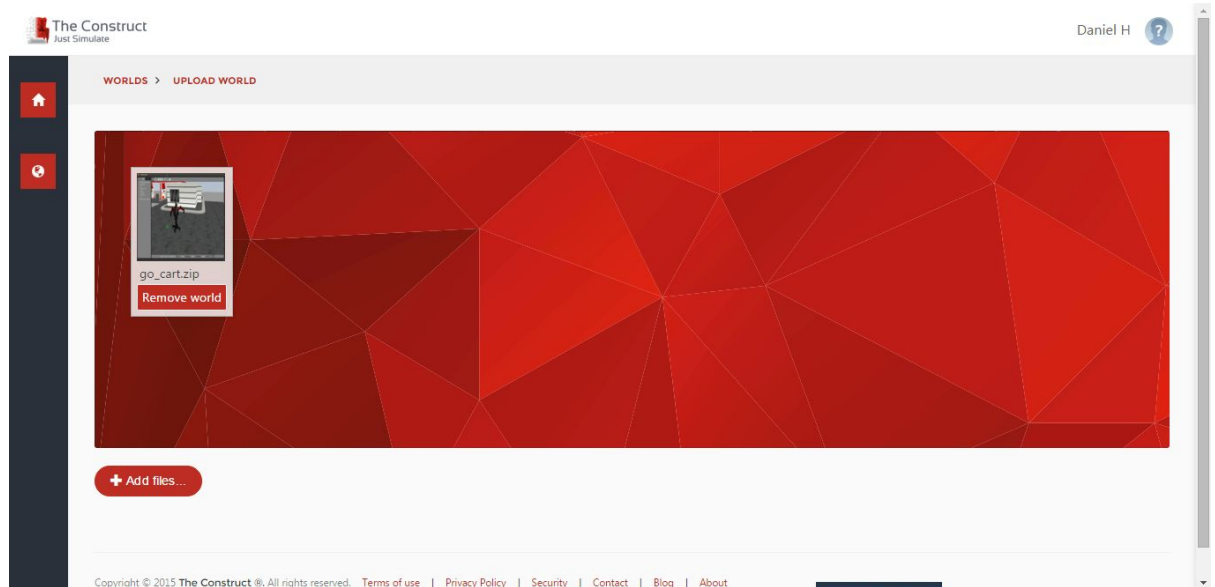
- Next we will populate the simulation by uploading a simulation world. For this move your mouse onto the world symbol on the left side of the screen. Click on upload/remove world



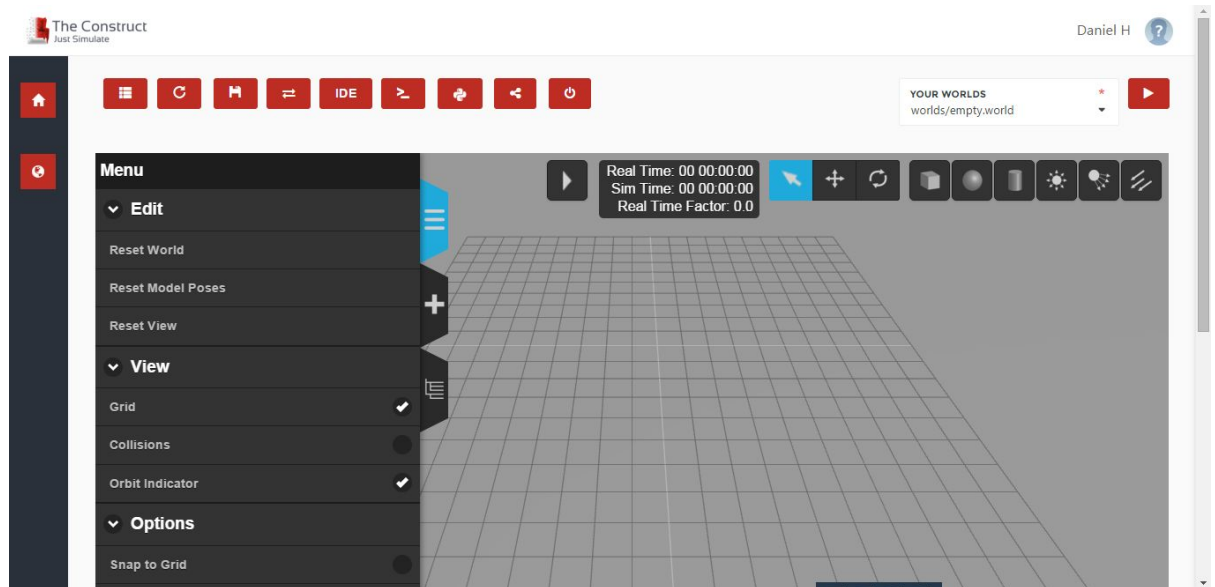
7. On the next screen click on Add files... Go to Google Drive/duckietown/duckietown-public/Modules/M09-CO and select the file go_cart.zip. Enjoy "The Construct"'s precision while the file is uploaded .



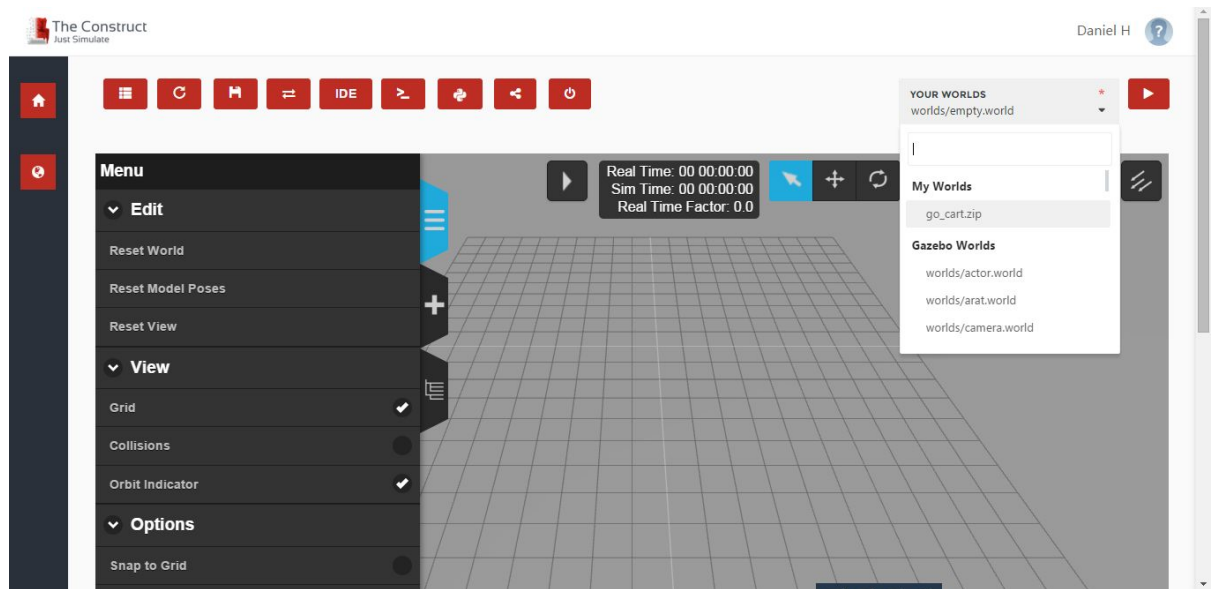
8. If successful your screen should now look like this:



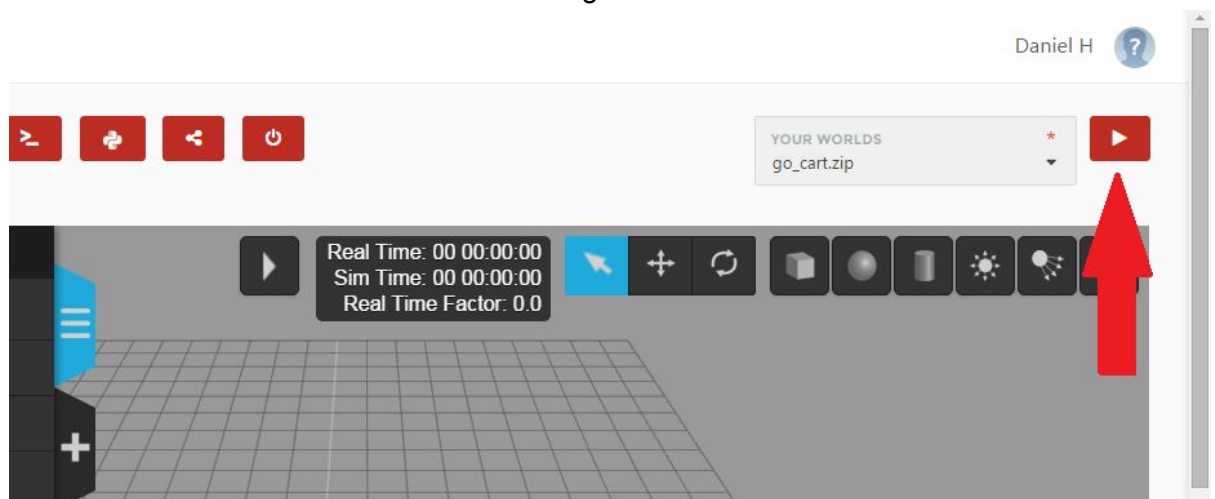
9. Return to the simulation by clicking on the home symbol on the left. When you hover the mouse over it it says go to home page. Back on the homepage you should still see an empty simulation:



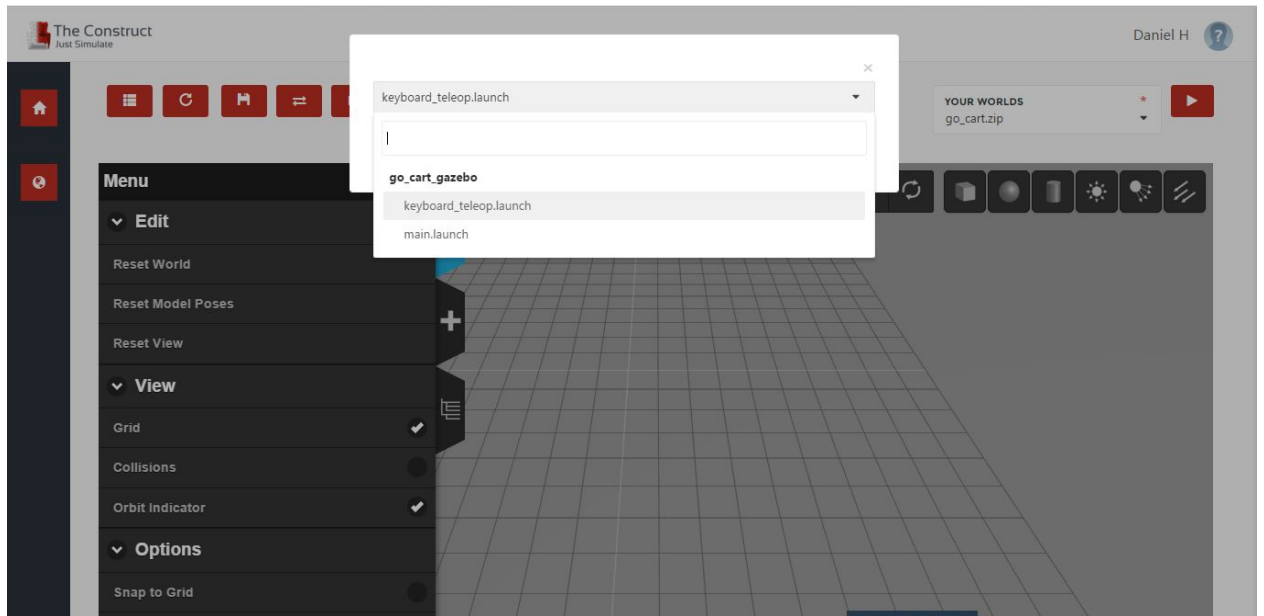
10. To launch the loaded go_cart simulation go the YOUR WORLDS selection and choose the go_cart.zip:



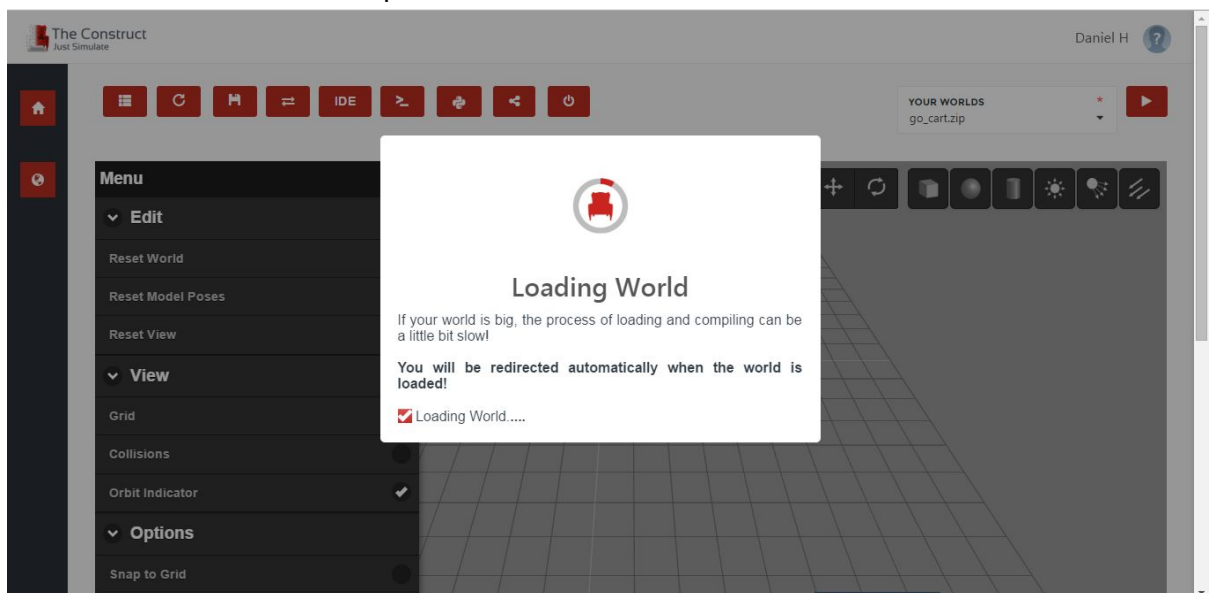
11. Then click on the run button located on the right of YOUR WORLDS selection.



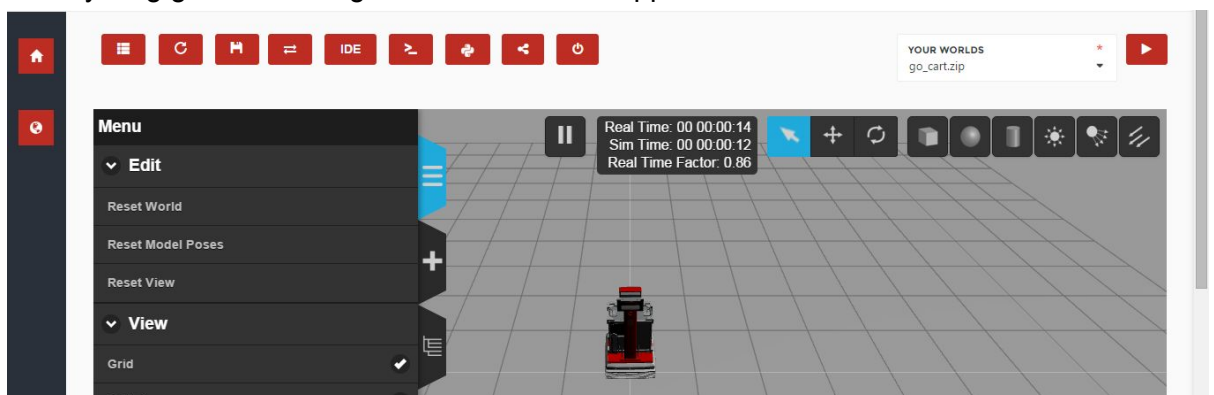
12. Next you will be presented the launch list:



13. Choose the main.launch and press run. The simulation will start to launch:

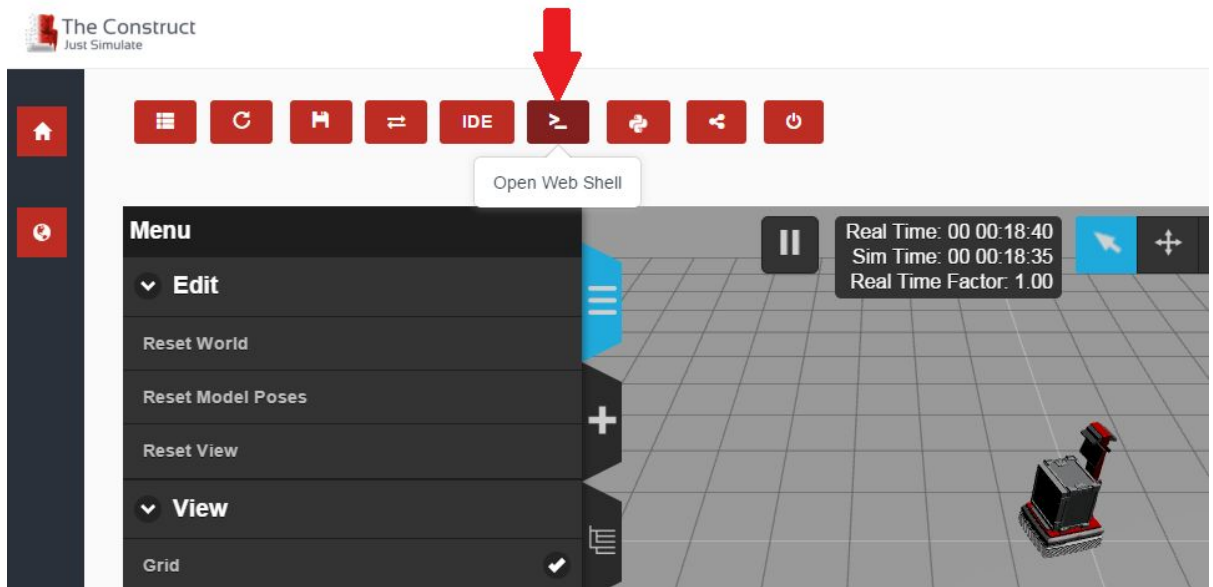


14. If everything goes well the go-cart robot should appear in the simulation:



If robot is not fully loaded try reloading the webpage by pressing F5.

As a next step we are going to launch an application from the console. For this click on the open web shell button:



15. A second window with the web shell pops up:



16. The shell is connected to the computer running the simulation and a catkin workspace is already built there. If you like you can type
`$ rostopic list`
and you should see the following list of topics:

```
/clock
/cmd_vel
/gazebo/link_states
/gazebo/model_states
/gazebo/parameter_descriptions
/gazebo/parameter_updates
/gazebo/set_link_state
/gazebo/set_model_state
/odom
/rosout
/rosout_agg
/tf
```

18. Now we are going to launch the keyboard demo that will allow to steer the robot by keyboard. For this type
`$ roslaunch go_cart_gazebo keyboard_teleop.launch`

You should see the following output and be able to steer the robot via your keyboard:

```
* /turtlebot_teleop_keyboard/scale_linear: 0.5

NODES
 /
   turtlebot_teleop_keyboard (turtlebot_teleop/turtlebot_teleop_key)

ROS_MASTER_URI=http://localhost:11311

core service [/rosout] found
process[turtlebot_teleop_keyboard-1]: started with pid [14865]

Control Your Turtlebot!
-----
Moving around:
   u    i    o
   j    k    l
   m    ,    .

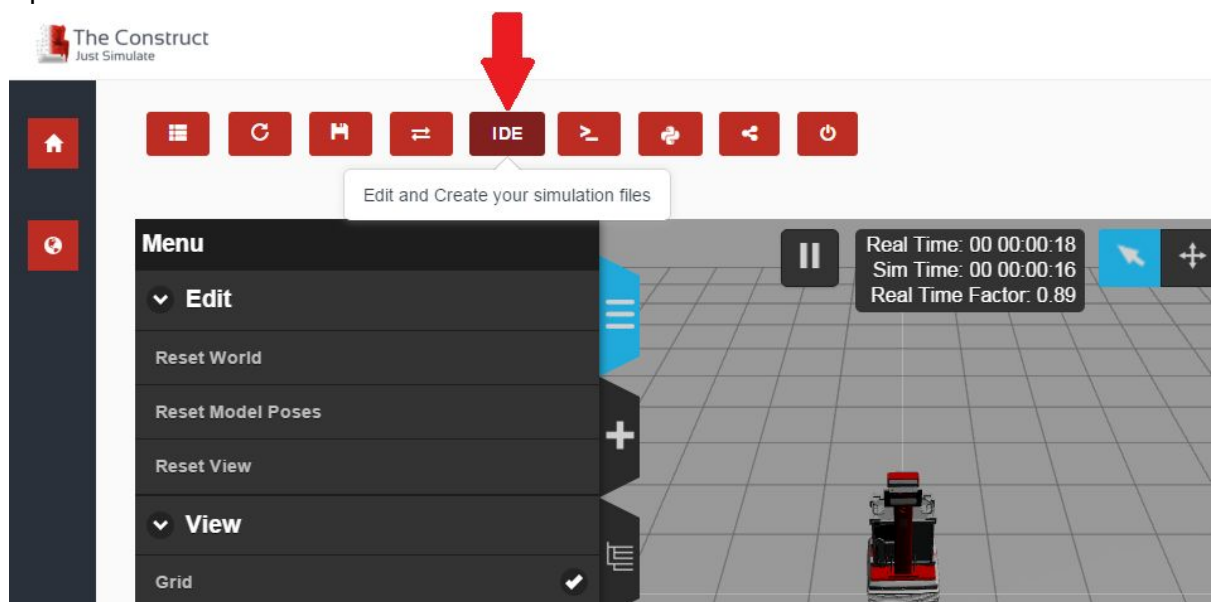
q/z : increase/decrease max speeds by 10%
w/x : increase/decrease only linear speed by 10%
e/c : increase/decrease only angular speed by 10%
space key, k : force stop
anything else : stop smoothly

CTRL-C to quit

currently:      speed 0.2      turn 1
```

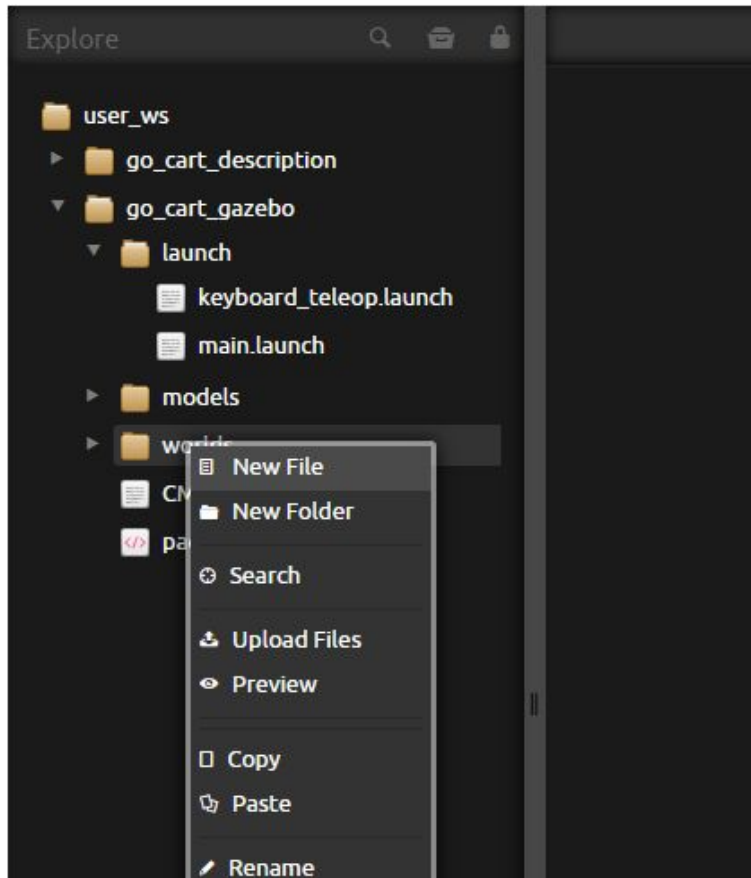
19. Press CTRL-C to quit and then close the web shell.

20. Next we add a box to the simulation world. First step is to create an “empty” world file. For this open the web IDE by clicking on the IDE button on the menu bar on the top of the screen:

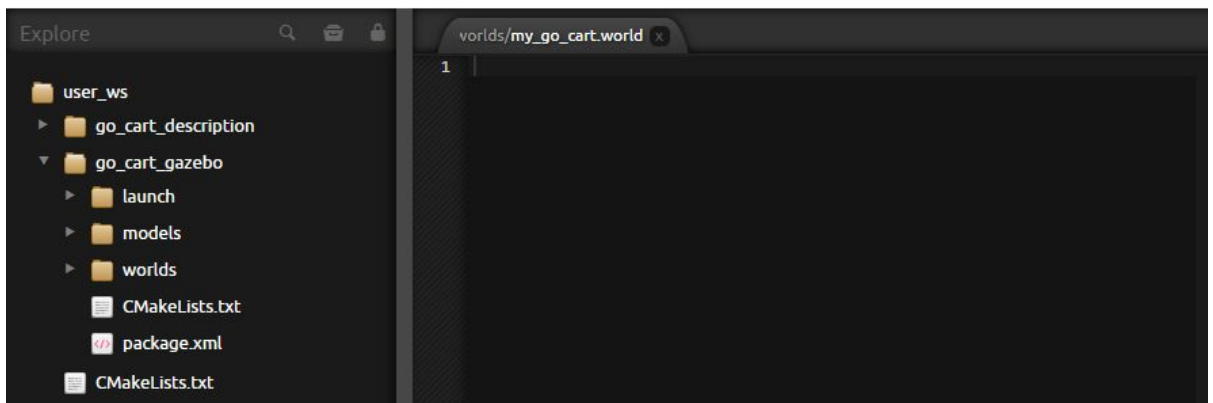


- Remark: Instead of using the web IDE you can do the following also in the web shell with a text editor of your choice.

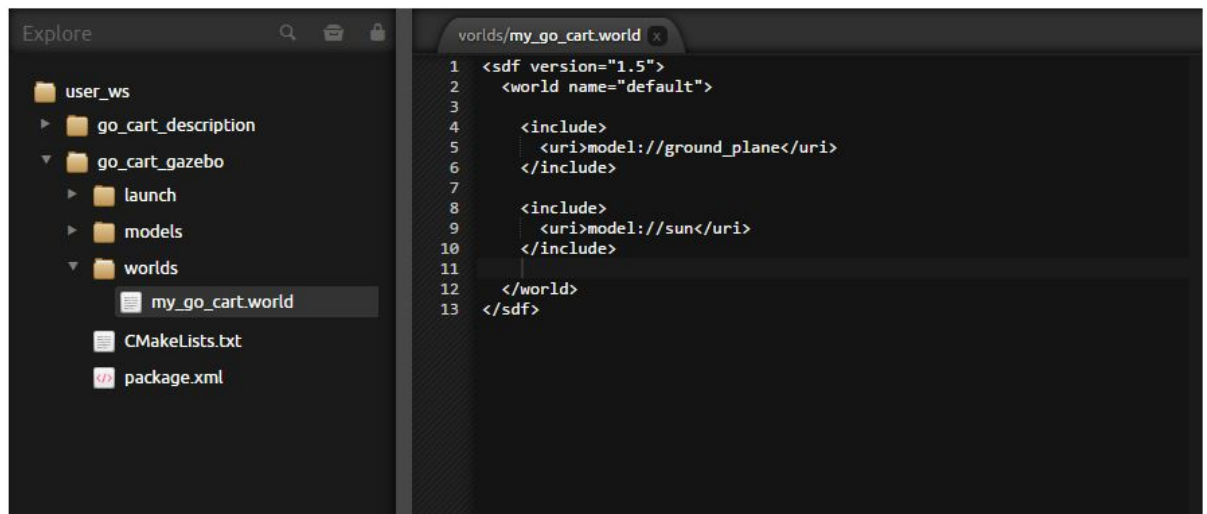
21. The web IDE opens in a new window. Navigate to the `go_cart_gazebo` folder and then right click on the `world` folder:



22. Select `New File` and name the file `my_go_cart.world`. In the editor of the IDE (main part of the screen) you now see the empty newly created file.

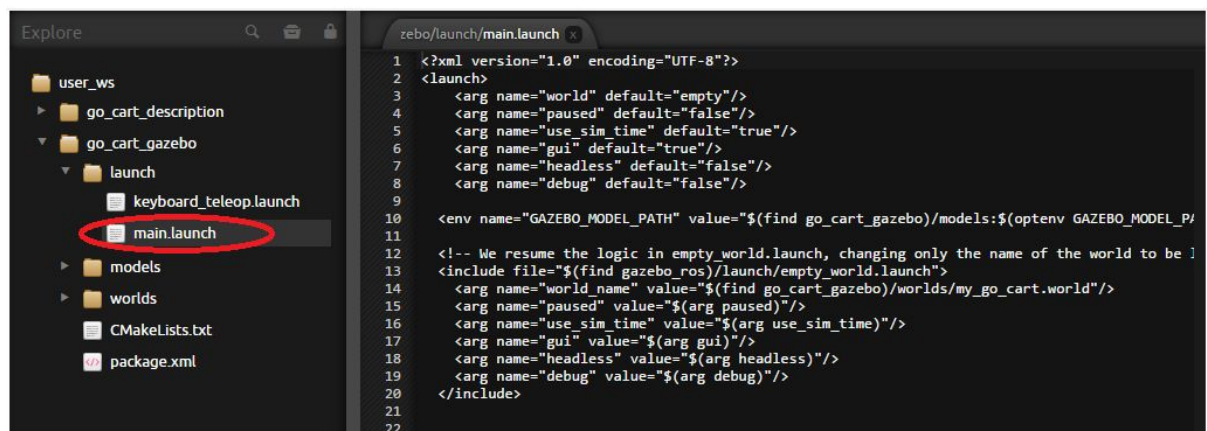


23. Add the following lines to this file:



Instead of copying from here you can also copy paste my_go_cart_world file that is provided in the google drive folder: [duckietown-public/Modules_and_labs/M09-CO](https://drive.google.com/drive/folders/1M09-CO). This world just contains the ground plane and a light source. Save the changes with CTRL+S.

24. Next we have to include a reference to the world file in the main launch file. For this navigate to the go_cart_gazebo/launch folder and open the main.launch file:

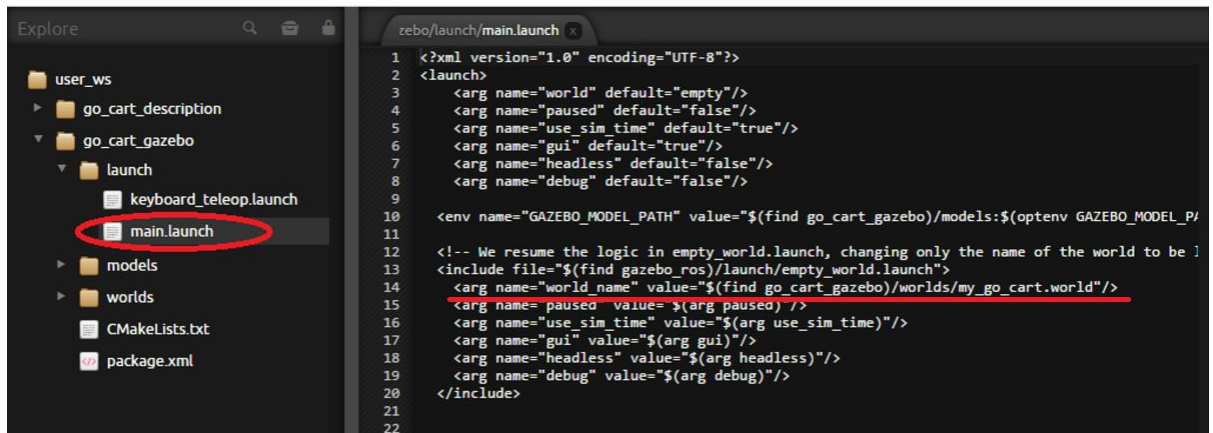


25. Line 14 of this file is commented out and should say


```
<!-- arg name="world_name" value="$(arg world)"/> -->
```

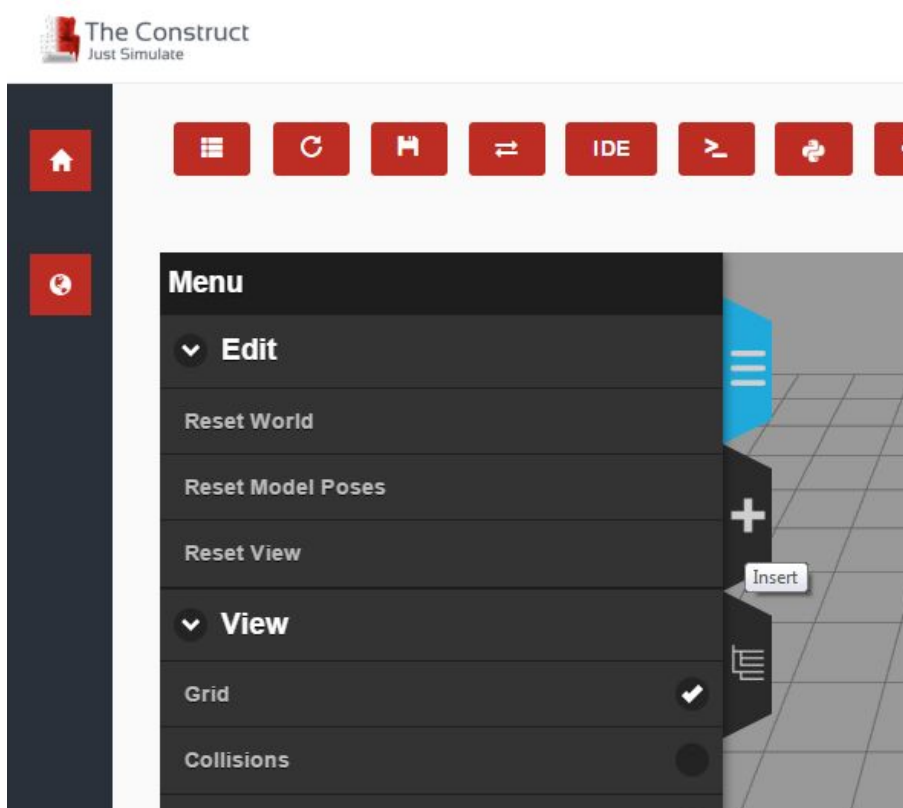
You should replace this line by the following:

```
<arg name="world_name" value="$(find
go_cart_gazebo)/worlds/my_go_cart.world"/>
```

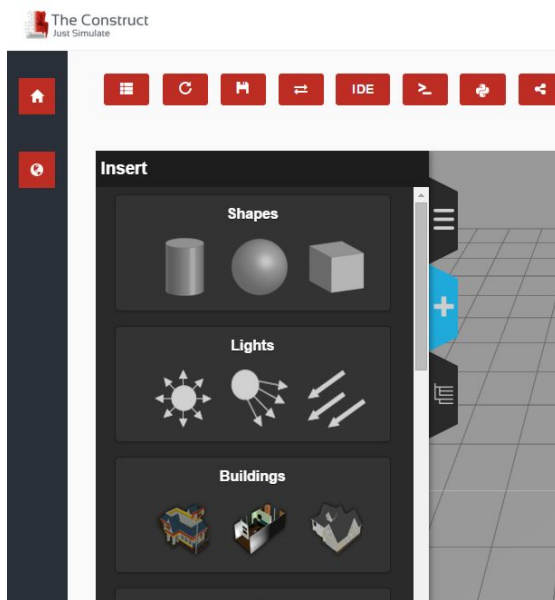


Safe changes with CTRL-S.

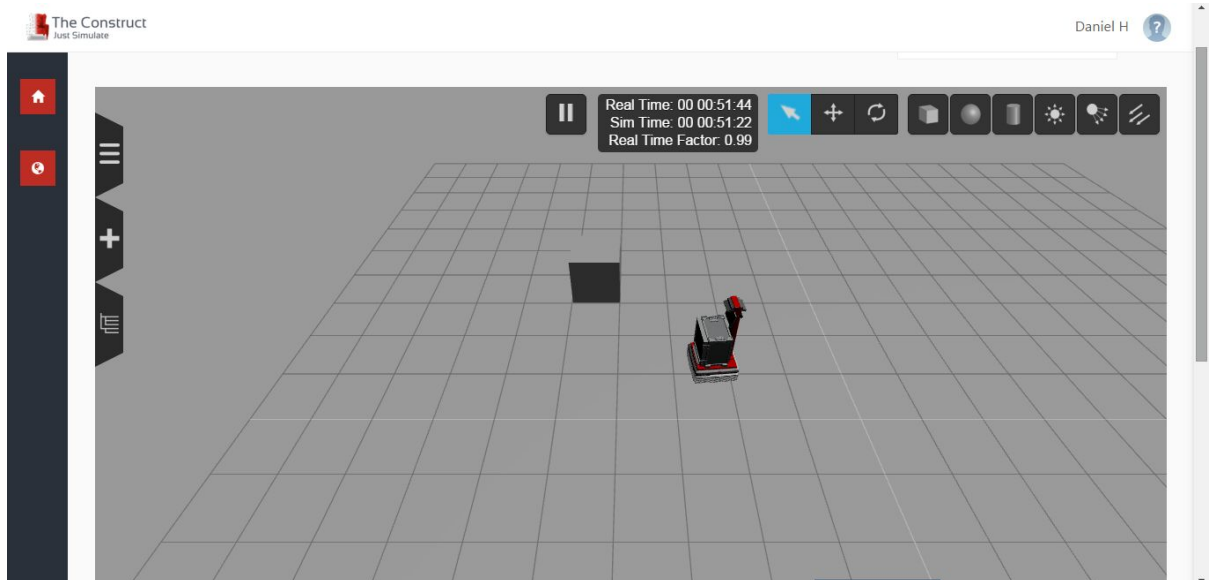
26. If you would go back to the main window and relaunch the simulation using the relaunch button  in the menu bar on the top, nothing would change. However, now that the world file is created we can use the menu to add more things to the simulation.
27. For this click on the plus symbol next to the menu bar. When your mouse hovers over it, it says insert:



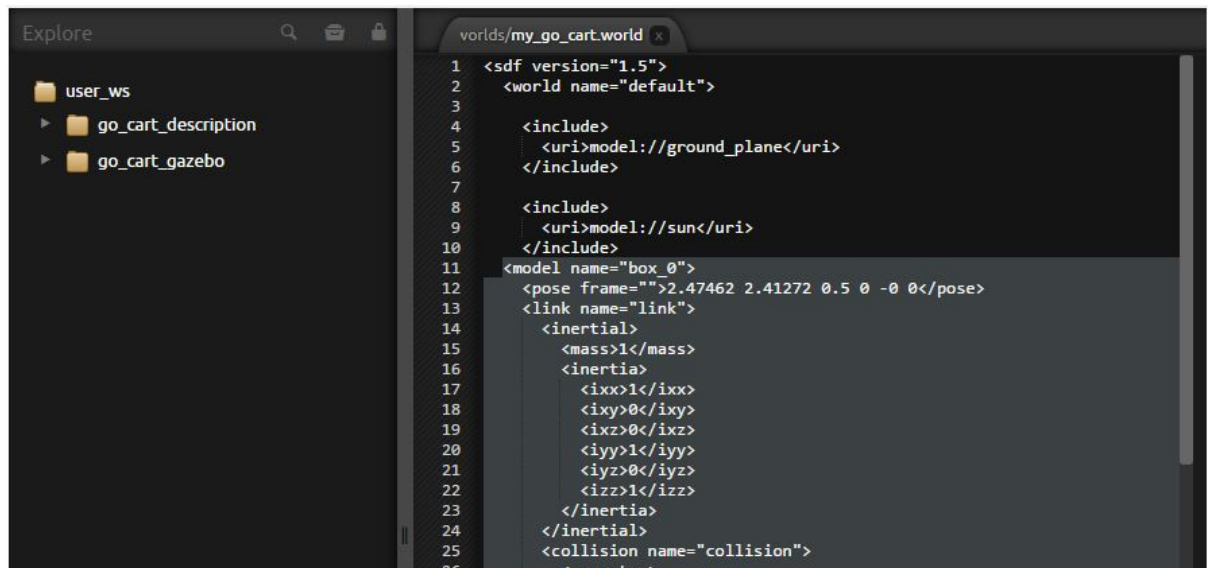
28. After clicking you should see the insertion menu:



29. Select the box, then place it anywhere you like. After this your simulation should look something like this:



30. If you open the IDE again and go to the previously created my_go_cart.world file then you will see that the box has been added to the world:



31. Finally you can save your updated simulation. For this click on the floppy disk symbol on the top menu bar:



You will be asked to provide a filename. Then click ok. Your newly saved world can now be launched like the go_cart one.


32. To quit the construct **don't forget to terminate the simulation** by clicking on the corresponding button in the menu bar on top:



This will bring you back to the login screen where you can logout.

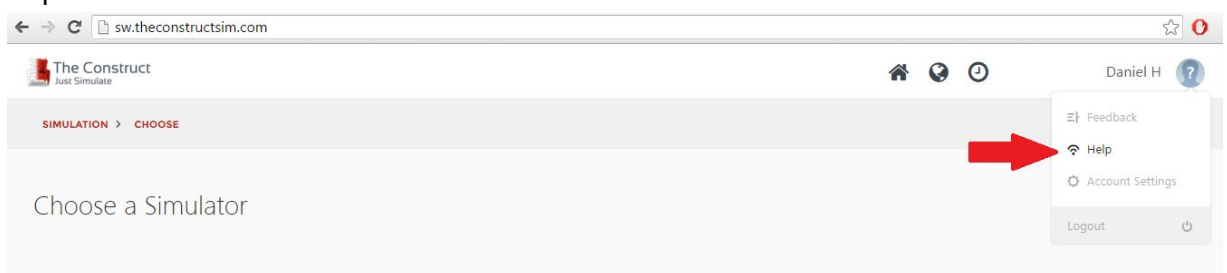
If you do not terminate the simulation “The Construct” will keep decreasing your simulation time. The Construct has a safety mechanism that will stop your simulation after 30 minutes of inactivity, and will send you an email indicating so but it is strongly encouraged not to waste simulation time.

This completes the basic tutorial. Here a reminder of the typical workflow in “The Construct”:

- 1- Use the IDE to modify packages
- 2- Use the web shell to compile the modified packages (catkin_make)
- 3- Errors showed in the web shell indicate how to modify the packages until everything is ok
- 4- Hence, modify packages again with the IDE until everything compiles ok
- 5- Finally relaunch using the relaunch button  to see the results on the simulation
- 6- Don't forget to save your simulations before terminating
- 7- Don't forget to terminate the simulation before leaving “The construct”

Additional Resources

- Once you log in to “The Construct” you can find 12 short tutorials by clicking on the help tab



- There is a video (filename: How_to_launch_duckietown_simulation.mp4) explaining how to launch the duckietown simulation in the Dropbox folder: [duckietown-data/pictures/simulation_vidoes/](#)