

Mission planner test instructions

Before starting

- Make sure that everything is running (instructions for this on GitHub: <https://github.com/joakimgrutle/Multi-robot-mission-planner>)
- Refreshing the webpage will put everything back to default, so if anything goes wrong, or you just want to reset, simply refresh the page
- DISCLAIMER: this is not a finished product, it is more of a proof of concept, the system contains some bugs, poor error handling, limited amount of robots and actions, the user interface design is suboptimal, and algorithms (and such) that are used are not optimised for the system and all of this is open for improvements. However the functionality of the system should be in place to see that the concept would work (in theory), and this is what you are testing by going through these instructions.

Connecting to Webots simulation stream

- Connect to the simulation stream by scrolling down to 'Webots streaming viewer' and click on connect (should by default be set to 'localhost' and '1234')
 - A simulation player should then show up, and be connected to the local running instance of Webots
 - Now everything should be ready for running missions in the browser
 - NB! The stream from the simulation has a tendency to start lagging after being used for a while, if this happens, simply press disconnect and then connect again. You could also refresh the page, but this is not recommended for later because this will remove all changes to missions

Running a mission

- The simulation is interactive, meaning that missions can be sent and altered during execution. Running a mission is a simple two step process:
 1. Start the simulation, this is done by pressing play in the simulation window at the bottom of the screen



2. Press the 'Send mission' button to send a mission, and the robots in the simulation should start moving (if you successfully started the simulation).
 - Pressing 'send mission' before the simulation is running will not do anything until you press play on the simulation to start it
 - The order of these steps does not matter, but the server will stop trying to send the mission into the simulation after trying for one minute.
- To reset the simulation, simply press the '|<<' button (see image above), this makes everything in the simulation go back to how it was in the start
- The mission planner comes with some predefined missions, you can try to run them by selecting a mission from the top, run it as described above, and reset when you are happy
- The missions will pause automatically every minute in order to not use too much processing power, just press play to continue a mission if it pauses

The mission timeline

- Pressing the 'Show mission timeline'-button will show the timeline of when each robot will execute each simple action, and the order of execution. This should be useful to see how a mission will execute. The mission timeline should look something like this:



- A task cannot be executed before tasks who points to it has finished executing
- You can drag and zoom on the timeline if parts of it is outside of the view

Modifying missions

- You can try to change the predefined missions by simply drag and dropping around the 'tasks' or the 'simple actions', or removing them by pressing the red X

- Dragging around the tasks will have little effect unless there are more than one task for one robot (this would then change the order of which that robot does its tasks)
 - Dragging around simpleactions will change the order of how a robot will execute, and this might change the mission or possibly break it, depending on how you position the simpleactions
 - You can mess around with the missions as much as you want and try to run the mission by following the instructions above
- 'Test mission' is a mission made for use in this test.
- This mission has no assigned robot to its tasks, so you can try to press the 'task allocation' button to run an algorithm that automatically proposes which robot should do which task in the mission
 - If the task allocation happens correctly, then the mavic2pro drone should be assigned to both missions
 - You can manually change which robot is assigned to which task by pressing the dropdown menu next to the task name. You can only select robots that are able to execute the simpleactions within that task
- You can now try to add a 'go forward' simpleaction to the 'test mission'.
- Select 'test mission' from the top, then select the 'test: forward turn' task.
 - Then either drag 'go forward' from the list to the right (under robot simpleactions), or search for a 'go forward' using the 'search for simpleactions' button. This would add a 'go forward' simple action to the task, but with no argument (empty box next to the name).
 - 'Go forward' takes an argument which is how many seconds should it go forward. So adding the number 5 to the box next to the name will make that robot go forward for 5 seconds.
 - After you have done this, it should look something like this:
 - You can change the order of when the robot will go forward by drag and dropping the simpleaction up and down
 - After you have made everything ready, you can try to run the test mission again, and see that the robot will go forward
 - You can add more simpleactions if you want and try to see how they work

Missions

Quarantine delivery

Scout location and deliver item

Scout area and deliver item

Testmission

Mission name

Add new mission

Tasks

Test: forward turn	mavic2pro	X
Test: backward turn	mavic2pro	X

Task name

Add new task

Simpleactions

1	Go forward	5	X
2	Go forward	10	X
3	Turn left	5	X
4	Turn right	5	X

Search for simpleaction▼

Creating a new mission

- You can now try to create an own mission.
 - Start by typing in the name of that mission in the box at the top that say 'mission name' and press 'add new mission'.
 - You will now have a mission with no tasks or simpleactions. To add a new task, do the same thing as with mission, but under 'task name' and 'add new task'. You will now have a task with no simpleactions, and you can add simpleactions in the same way as described above.
 - You can create the mission by adding multiple tasks and simpleactions, and then press the task allocation button to get a proposed best robot distribution for your mission, which you can manually change if you would like to.
 - You can try to run your mission and change it as much as you'd like
- Finally, you can try to create a mission where two robots communicate. The implemented simpleactions for the system only allow for sending the current location of the 'mavic2pro'-drone to the 'moose'-rover.
 - To do this, add a new mission, and add two new tasks 'send location' and 'receive and go to location'.
 - In 'send location' you first need to add a simpleaction that specifies (which is 'moose') which robot is the target for the message you want to send, and then 'send location'.

- In 'receive and go to location' you need the following simpleactions: 'receive location from robot', 'go to location'. 'go to location' in this case needs to contain two empty brackets "[]", because we get the location from the drone.
- After you are done, the mission should look something like this:

The screenshot shows a web interface titled 'Missions'. At the top, there are five tabs: 'Quarantine delivery', 'Scout location and deliver item', 'Scout area and deliver item', 'Testmission', and 'New mission'. Below the tabs is a 'Mission name' input field and an 'Add new mission' button. The main content area is divided into two panels. The left panel, titled 'Tasks', contains a list of tasks: 'Send location' (selected) and 'Receive and go to location'. Each task has a dropdown menu for selecting a vehicle (mavic2pro and moose respectively) and a red 'X' button. Below the tasks is a 'Task name' input field and an 'Add new task' button. The right panel, titled 'Simpleactions', contains a list of simple actions: 'Set message target' and 'Send location'. Each action has a dropdown menu for selecting a vehicle (moose and an empty field respectively) and a red 'X' button. Below the simple actions is a 'Search for simpleaction' dropdown menu. At the bottom of the interface, there are three buttons: 'Show mission timeline', 'Send mission', and 'Automatic task allocation'.

•If

everything was done correctly, you can see the connection between the 'send location' and 'receive location from robot' simple actions in the mission timeline. If you run the mission, then the moose should try to get to the location of the drone

- You can try to move the drone by using other movement simpleactions, and then make the rover move to it.

After you are done, you can answer the questionnaire that is given. Thank you for participating!