

# Potential Field Navigation

ROB 102: Introduction to AI & Programming

2021/10/11

# Administrative

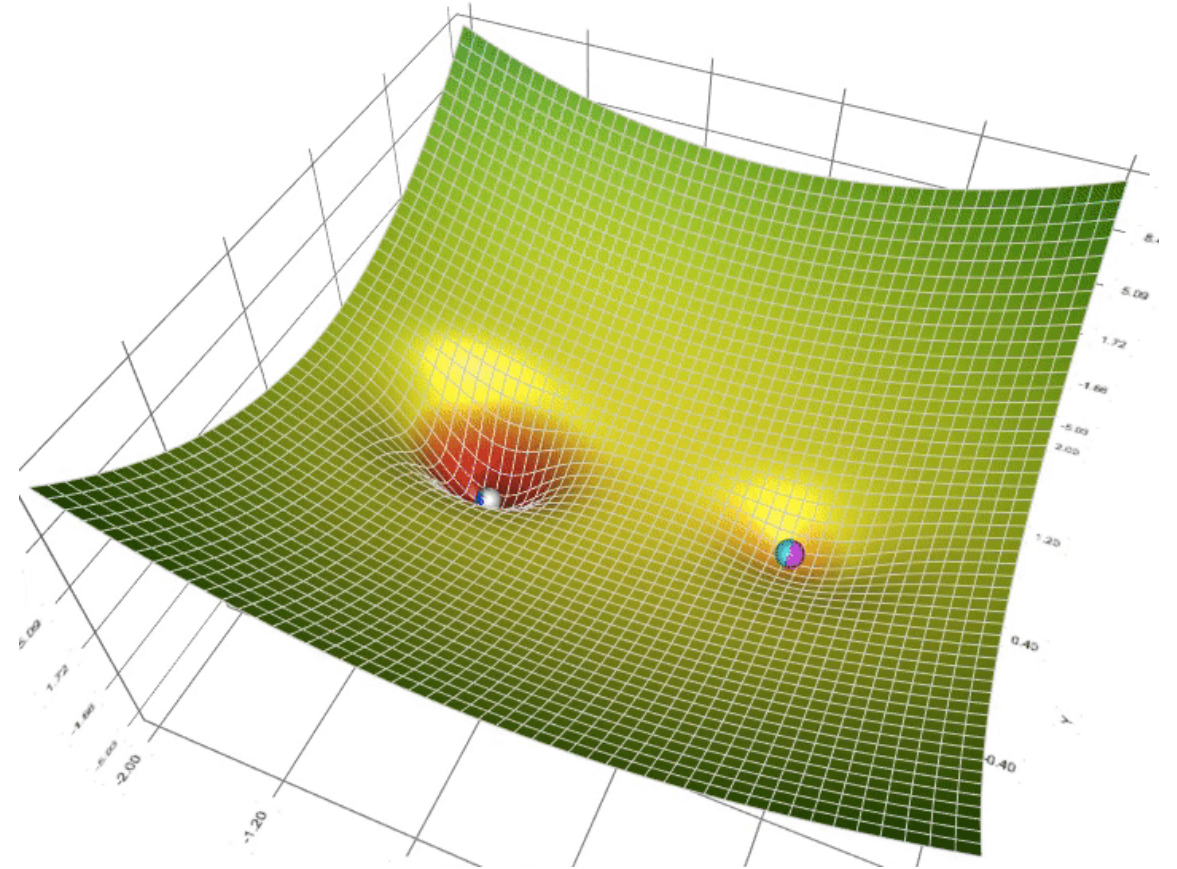
Project 2 is out!

Watch Distance Transform lecture before Wednesday's class.

# Today: Potential Field Navigation

A **potential field** has *high* value in areas the robot should avoid and *low* value where the robot should go.

The robot navigates by moving to the area in its local region with the lowest potential.



# Today: Potential Field Navigation

You will create a potential field and use it to drive the robot from its current position to a goal position.



# Potential Field Navigation

1. Create a map on the robot
2. Upload the map to the web app
3. Draw a potential field & test it in the app
4. Download the field and run it on the robot

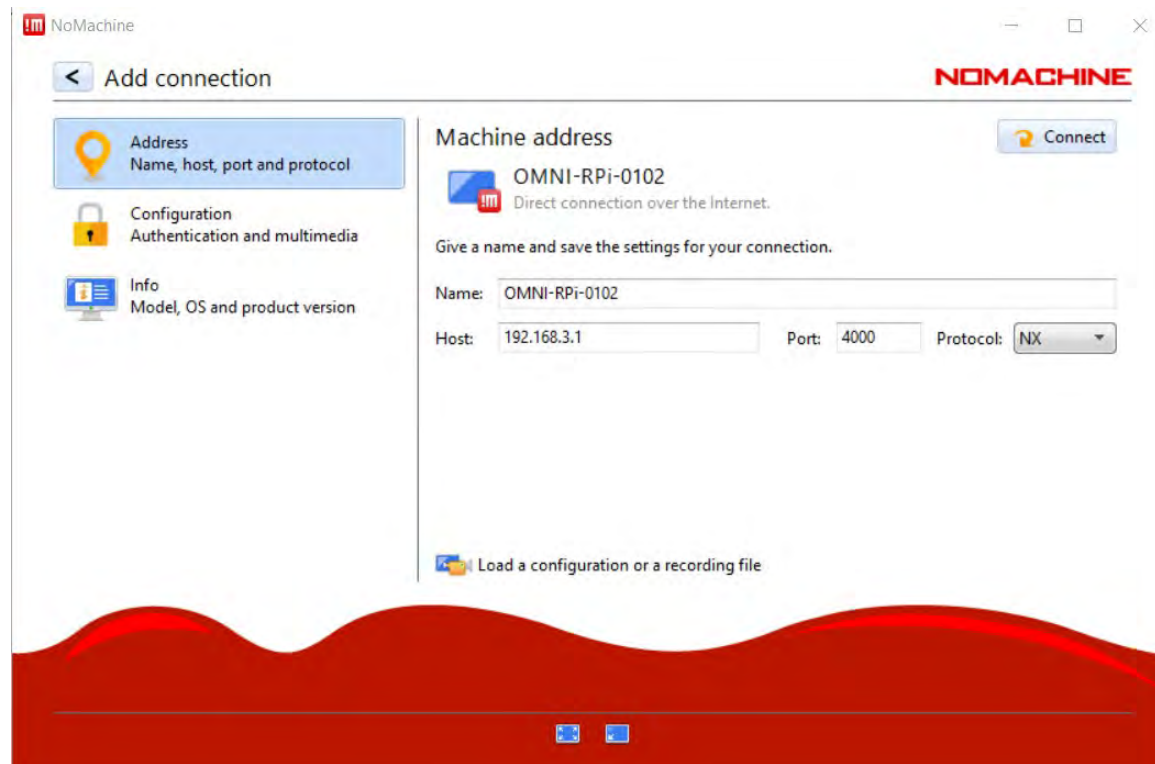
# Potential Field Navigation

- 1. Create a map on the robot**
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4. Download the field and run it on the robot

# Building a Map on the Robot

Download the program NoMachine: <https://www.nomachine.com/>

Create a new connection to the Raspberry Pi.



# Building a Map on the Robot

You will see the robot's desktop!





# Building a Map on the Robot

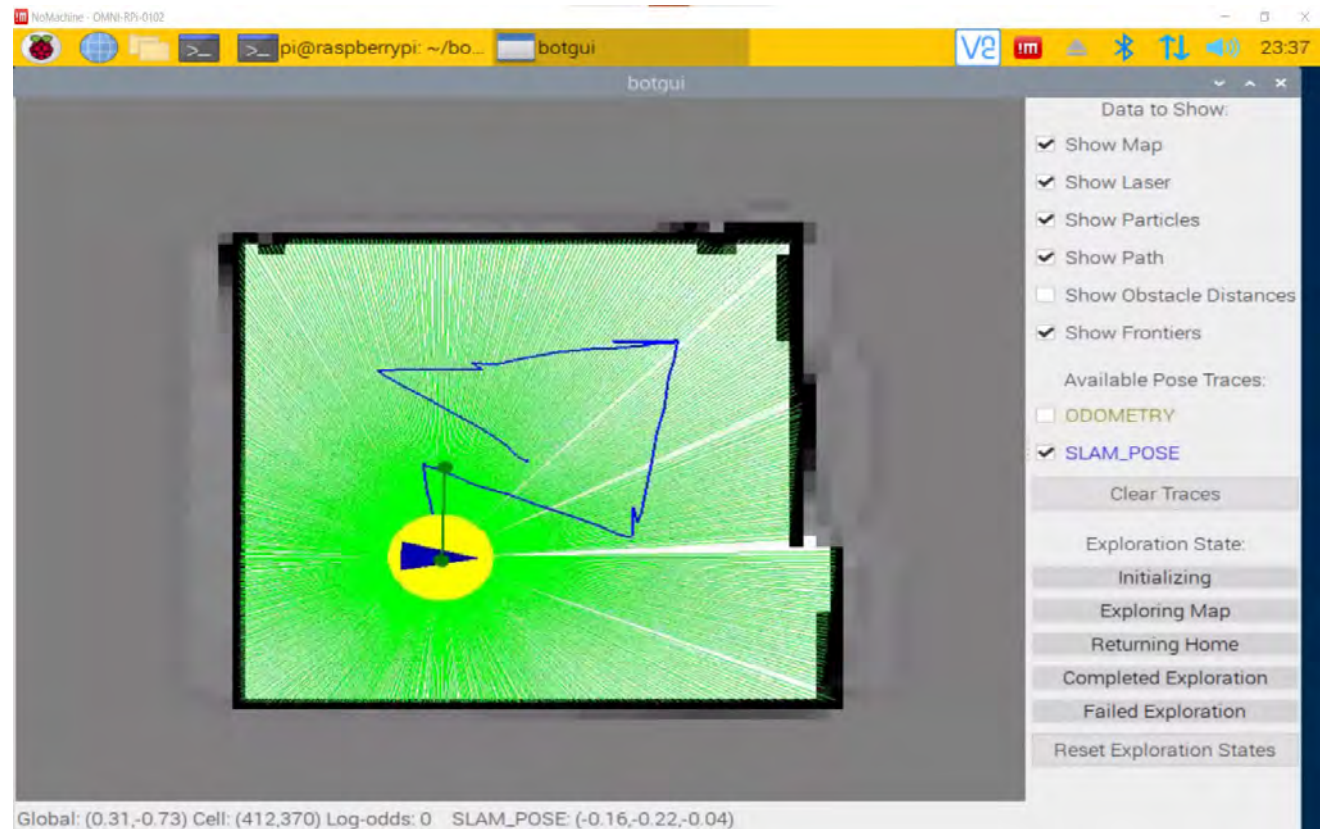
Open a terminal in NoMachine.  
Run:

```
cd botlab-bin  
./launch_botlab.sh
```

Then run:

```
./bin/botgui
```

Use Ctrl+Click on the GUI to  
move the robot.



# Building a Map on the Robot

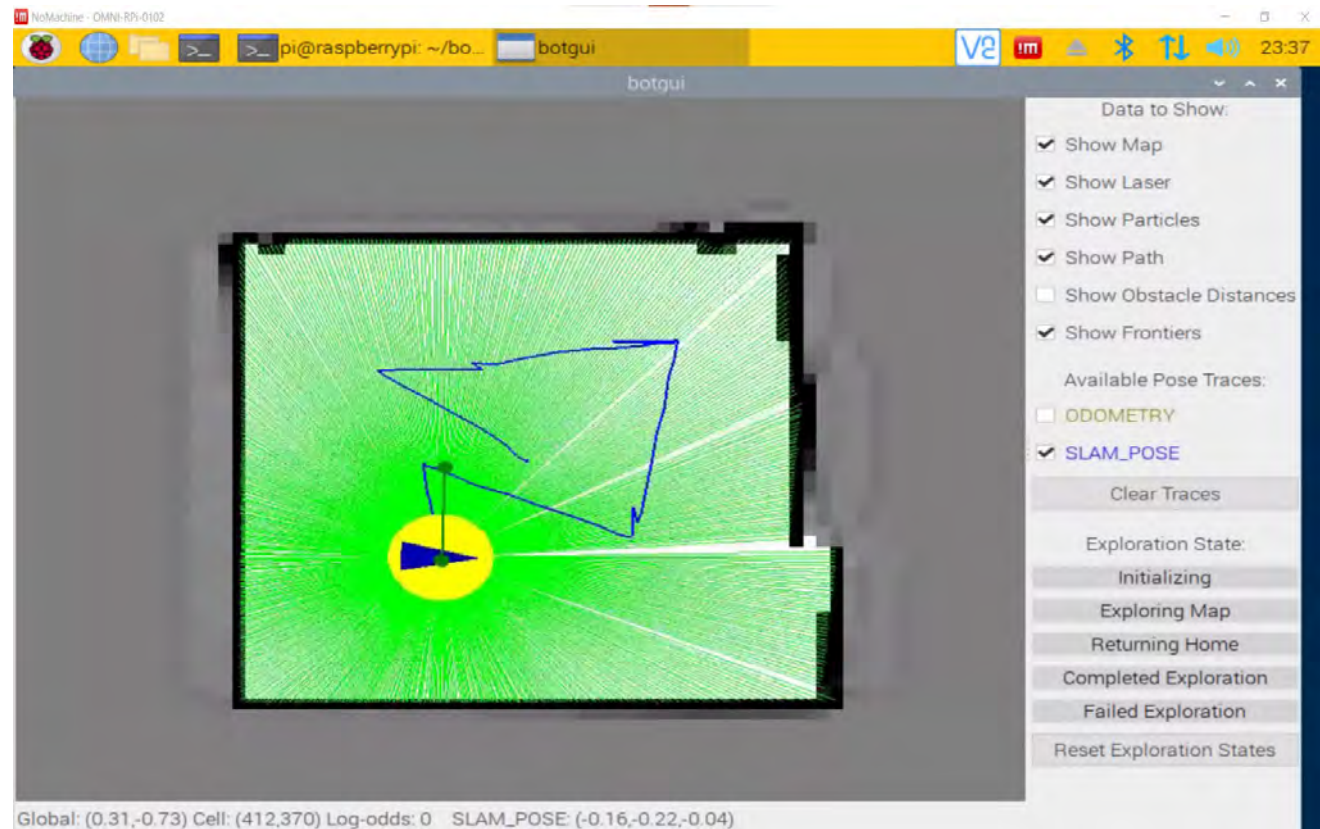
To stop the mapping:

```
cd botlab-bin  
./cleanup_botlab.sh
```

Then crop the map:

```
cd botlab-bin/maps  
python crop_map.py current.map
```

Open `cropped_map.map` in VSCode and download it to your computer by right clicking and selecting "Download."



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- 2. Upload the map to the web app**
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# Uploading a map to the app

Go to:

<https://robotics102.github.io/demo/potential-field/>

Click “Choose File” and select the cropped map. Click “Upload Map.”

Note: This is a different app than the navigation web app you use in Project 2 (but looks very similar!)

## Potential Field Control Demo

Choose File cropped\_map2.map ← Select the map file from the robot

Upload Map Download Field Clear Field Start!

Show Field:



# Uploading a map to the app

Toggle “Show Field.” Draw on the map to create a field.

“Brush Size” controls the radius of the brush. Toggle “Increase Field” to add back to the field.

Move the robot and click “Start!” to see how the robot would move in your field.

Click “Download Field” when you’re done.



# Potential Field Navigation

1. Create a map on the robot
2. Upload the map to the web app
3. Draw a potential field & test it in the app
4. **Download the field and run it on the robot**

# Potential Field Navigation on the Robot

Start localization on NoMachine, using the map you drew the field on:

```
cd botlab-bin  
./launch_botlab.sh -m maps/cropped_map.map
```

Start the GUI:

```
cd botlab-bin  
./bin/botgui
```

