

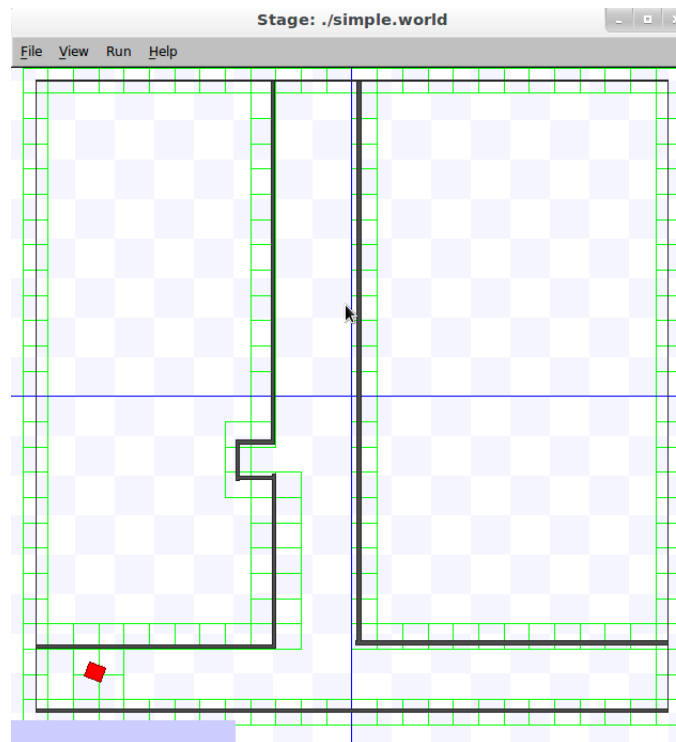
Report 1 - Simulation and Occupancy Grids

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Task

The task, for this report, is to get your simulated robot to create and display a map of its environment using a technique called ‘Occupancy Grid Mapping’. This should be done using the Player/Stage simulation environment. To create an occupancy grid, you break down your ‘world’ into a 2D grid of cells. As you explore, in this case as your robot moves around, you mark cells as empty or full. This decision is based upon whether your robot can fit into the space represented by the cell. If you are having trouble visualising this, you can turn on an occupancy grid in Stage. Click View - Debug - Occupancy. It will outline occupied cells in green.



To complete this task it is suggested that you take the following steps:

1. Finish the tasks outlined in the first practical worksheet.
2. Get your robot to ‘explore’ the environment. It could randomly wander around the environment or move in a specific pattern.
3. Take the input from the sonars, process it and use it to mark cells as empty or full.

A sensible way of representing an occupancy grid may be a 2D array containing integers. Each member of the array represents one ‘cell’. Every time you decide a cell is occupied you could increment the value in the array representing that cell. Once you have finished mapping the environment you could threshold the values to remove falsely occupied cells. **There are SOME constraints:**

- Each cell should represent a 60 cm by 60 cm square. This is large enough for a pioneer to fit in, with a little room to spare.
- All code should be your own.

If you would like to work on the simulator at home, there are several wikis on line that detail the compilation and installation of Player and Stage for both Linux and Windows.

Deliverables

The report should contain bits of code, diagrams, results and descriptions in order to make clear how you approached the problem, and the algorithms that you selected. In your report you should:

1. Briefly explain what Player and Stage are and why they might be useful for developing robots.
2. Use an example execution of your controller to discuss and explain your solution and present results.

These two aspects will be equally weighted in the marking scheme. Whilst we expect to see functioning code and results of some experimental work, you will also receive credit for the design and intelligent use of algorithms and methods. For example, you might choose to describe how you would improve your system and why you chose the approach that you did.

Write-up and hand-in

You should not write more than 1500 words for this assignment although you may use as many diagrams as you wish to help you explain the decisions that you have made. You may also wish to comment upon possible design options that you chose to reject in order to highlight why you believe the design that you selected is a good one. This work should be handed in **as a PDF** using Blackboard before midnight on Friday 15th March. This assignment will make up **20%** of the module marks. The report is due in on the **15th of March** and should be handed in via **Blackboard**.

Document History

Version	Date	Author(s)	Description
1.1	Semester 2, 2013	Tom Blanchard	Initial Version.
1.2	Semester 2, 2013	Tom Blanchard & Mark Neal	Added Hand-in section and marking scheme.