COSC343 Assignment 1

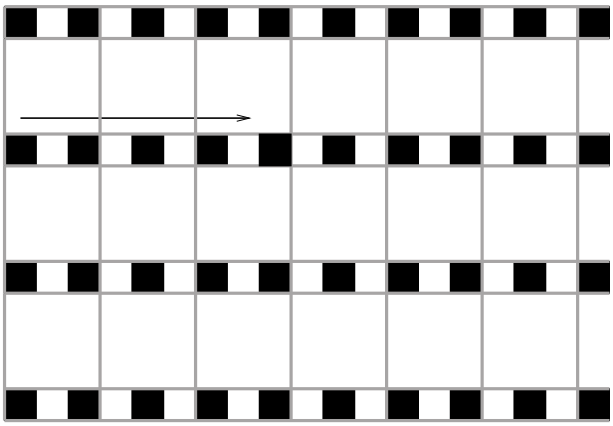
Robots on a chessboard

Weight:14% Lecturer: Alistair Knott

For this assignment, you will be working in the group that you were assigned to during Tutorial 1, when you first used the LEGO robots. Any students who weren't at that tutorial should email Chris (`343tutor@cs.otago.ac.nz`), and they'll be assigned to an existing group. If you have any other questions about group allocation, you should also mail Chris. If you have problems with your group, you should again contact Chris as early as you can.

Task 1 (5 marks)

Your group's first task is to write an ROBOTC program which will allow a LEGO robot to between two points in the lobby of the Owheo building. The lobby is laid out with black and white tiles, in a pattern that looks like this:



Your robot will start on a tile marked 'start' (in a direction of your choice); it has to reach a plastic tower placed on a tile marked 'finish', which is positioned on a diagonal from the start tile. The robot must travel to the tower in two stages. In the first stage, it must travel in the direction shown by the grey arrow in the figure, a distance of 15 black tiles. In the second stage, it must turn 90 degrees to the right, and travel to the plastic tower placed at the finish square, a distance of seven large tiles. It must make contact with the tower, and push it off the square it's sitting on, then make another sound to indicate it has finished.

Here are some additional specifications for the task.

- During the first stage, your robot must explicitly count the black tiles it passes, making a distinctive sound when it encounters each one.

- During the second stage, there is no requirement to count tiles: the robot can move by 'dead reckoning', turning a prespecified angle and driving forward a prespecified distance. But counting tiles may allow more accuracy.
- You can use the sonar sensor to locate the tower, and the bump sensors to detect contact with the tower.

One important feature of the lobby environment is that the light is very variable: it changes throughout the day, and also from point to point in the corridoor. To sense different surfaces on the floor, your robot may need to adjust for ambient light levels. Note also that the big white tiles and the small ones are not exactly the same colour. (In fact the big tiles are grey, not white, but the light sensor can't distinguish the grey and white accurately.)

Note also, your code should work on *any* robot, at *any* level of battery power. The power of the robot's motors depends on the battery levels, and also varies from robot to robot, so it's safer to give commands using rotations as units, rather than time.

We will test your robot in tutorial time. The idea is that it is completely autonomous during the test: you'll lose marks for any interventions. There will be a block of chocolate awarded to the team that completes the task fastest in each tute stream.

Task 2: Group report (4 marks)

Your group should also write a report about your robot solves Task 1. The report will comment on:

- The algorithms that your robot uses: how they work (in reasonable detail) and why you chose them;
- The problems that you overcame (or not) while coding and testing your robot.

You should include a *hard copy of the code (including comments)* as an appendix.

Task 3: Individual report (1 mark)

Each group member must also write an individual report about how the group worked on the assignment. You should say how your group decided to divide the work up, and what your own contribution was. Feel free to discuss any lessons you learned about working in groups! This report can be very brief—it doesn't need to be longer than a page.

Marking scheme (Total: 10 marks)

Marks will be allocated as follows:

- Task 1: **5 marks**. This task will be assessed by a demo of your robot during your tutorial in Week 6. You will lose points for any 'hands of God' (human intervention while the robot is running). You will be awarded points based on how well it performs on the two stages of its journey; the first stage is more important than the second. During the demo, each member of the group should be prepared to answer questions about the ROBOTC code the robot is running.
- Task 2: **4 marks**. Marks will be awarded for clarity of the report, and for addressing the topics you need to discuss.
- Task 3: **1 mark**. You'll get full marks if you make it clear how the work was divided up, and what contribution you made.

Naturally, if you didn't make a contribution to your group, you won't share the marks.

Submission

The assignment is due at **4pm on Tuesday of Week 6** (**12 April**). Each group should submit their code for Task 1 electronically, using the `submit343` script, by 4pm that day. Each group should also submit their report for Task 2 on paper, to the assignments box near the office in the Owheo building, by the same deadline. For Task 3, each individual should *fill in the attached marking sheet*, and submit it with their individual report, by the same deadline.

The demo for Task 1 will be done in your tutorial in Owheo later that week.

For each task, you will lose 10% of available marks for each day late.

Borrowing robots

Robots can be borrowed from Kaye Saunders at the CS department office. A team can check out a robot for the day (9am to 3:30pm) or for the night/weekend (4pm to 9am the next morning, or to 9am Monday for weekend borrowing). See Kaye to book in times to borrow your robot. **If you return your robot late, there is a penalty in the assignment:** you will lose 10% of available marks for each session (day/night) you are late.

There's a lot of demand for robots leading up to the assignment deadline. If you're smart, you will plan on getting the assignment done well before the deadline.

COSC343 Assignment 1

Robots on a chessboard

Weight:14% Lecturer: Alistair Knott

Student name:

Other group members:

Total mark (out of 10):
Task 1: testing of the robot (5 marks)
Task 2: group report (4 marks)
Task 3: individual report (1 mark)