# CG1111 Engineering Principles and Practice I

# The A-maze-ing Race Project

Welcome to the grand project of CG1111: The A-maze-ing Race!

Similar to its namesake TV program, you (more specifically your mBot) will be facing certain challenges while attempting to complete the maze. Your mBot must be intelligent enough to navigate the maze, as well as solve the challenges in the maze. The requirements of the A-maze-ing Race are as follows:

1. The mBot needs to detect and avoid bumping into any maze wall in front of it.
   (Hint: Echolocation)

2. The mBot needs to be able to move straight between two parallel maze walls. Ideally, your mBot should maintain equal distance from each side wall.
   (Hint: DIY proximity sensor)

3. The mBot needs to detect a black line at certain locations in the maze, and solve the challenges presented to it at the said locations. These locations are junctions in the maze, and solving these challenges will hint at the correct direction to proceed in the maze.

4. The mBot will have to solve light-based or sound-based challenges at these junctions.

5. Light-based challenges: The mBot shall detect the brightness of the light shining at these junctions, and choose the correct direction hinted accordingly. Three different levels of brightness will denote the three directions, with respect to the mBot, that it needs to take (i.e., Front, Left, or Right)
   (Note: Details about the brightness levels and the corresponding directions they represent will be provided at a later date.)

6. Sound-based challenges: The mBot shall filter out noise from a sound being played at these junctions, identify the amplitude of the sound, and then choose the correct direction hinted accordingly. The different loudness of the filtered sound will denote the directions with respect to the mBot that it needs to take.
   (Note: Details about the sound frequency and loudness threshold will be provided at a later date.)

7. Once the mBot solves the maze, it needs to play a tone to signify the end of the conquest (Yay!).

The race will be conducted during your Week 13 Studio 2 timeslot:

Group 1: 15 Nov, 9am-12pm
Group 2: 15 Nov, 2pm-5pm
Group 3: 16 Nov, 9am-12pm

Figure 1 below shows a sample maze layout.

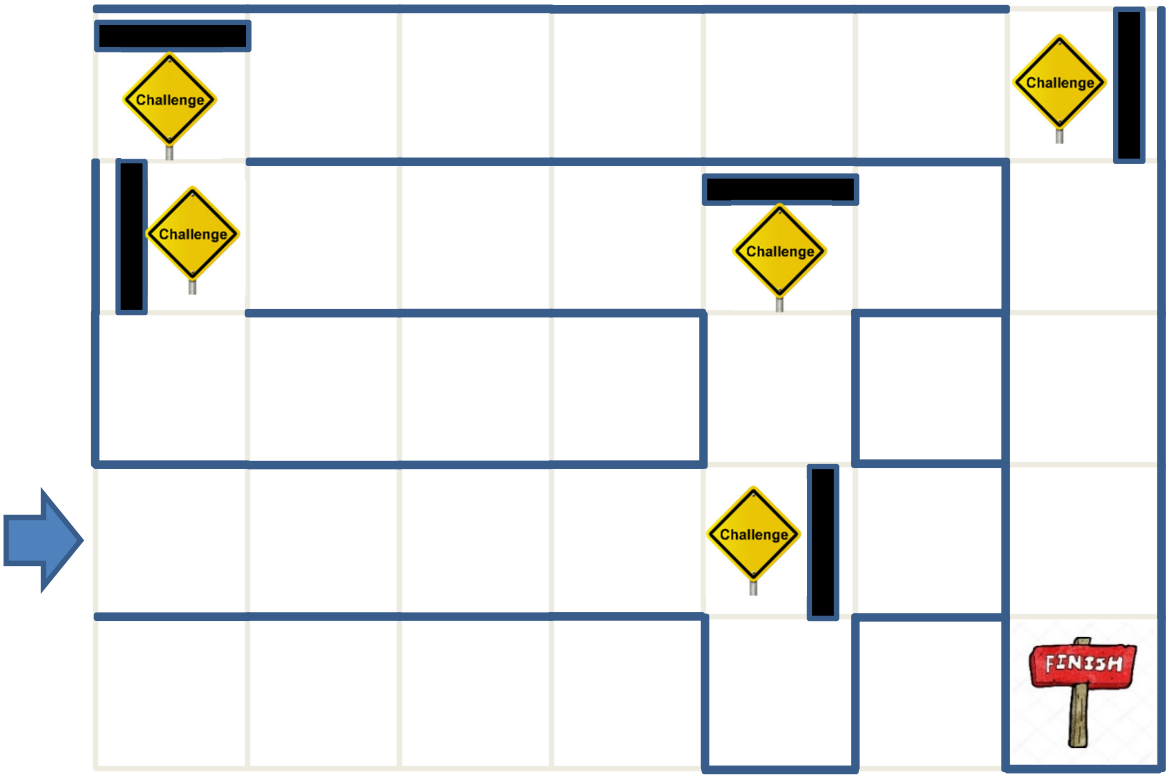


*Figure 1: A Sample Maze Layout*

Rules:

1. At each challenge, if your mBot turns in the wrong direction, it will be teleported to one grid before the challenge to make a second attempt while the clock continues to run. If it fails in its second attempt, it will be manually turned to the correct direction, and an additional penalty time of 30 seconds will be added.

2. You are not allowed to add any commercial-off-the-shelf sensors that are not issued by the DSA Lab.

3. The actual maze layout for the A-maze-ing race will not be revealed until the race.

4. The team that completes the maze in the shortest time wins a delicious prize!

Grading Criteria:

| Criterion | Marks |
|---|---|
| Meeting the required features | 15 |
| Algorithms and coding | 5 |
| Short team report | 5 |
| **Total** | **25** |

Deliverables:

Deadline: **20 Nov 2017 (Monday), 2359 hrs**

(10% will be deducted for every day it is late)

Zip all files into a single file, and name it according to your Group and Team numbers (You can find your group and team number from IVLE), e.g., **Group1_Team 1.zip**, and upload it into IVLE Workbin under the "Project Submission" folder before the deadline. You must include the following:

1. Program source codes. The codes must be well documented by providing appropriate comments.

2. A concise written report, in PDF format. You may use your own discretion for the number of pages. Your report must describe your design in detail, especially about how the required features are met.

Peer Evaluation:

You will submit a confidential peer evaluation form about your teammates' contribution in the project. More details will be announced at a later date.

Academic Integrity:

Plagiarism will not be tolerated. You are **not** supposed to share any code with other teams. You **may** discuss the project requirements or your solution strategies at a high-level, without sharing details at the code level. We do **not** distinguish between those who copy others' work, and those who allow their work to be copied. If you are involved in plagiarism, you will be given 0 mark for the project, and referred to the University for disciplinary action.

Good Luck, Work Hard, and Have Fun! ☺