ELEC 334 - Homework #1

Reminders:

- Please read carefully, and answer accordingly.
- Submit your solutions in a PDF file and any additional files asked from you.

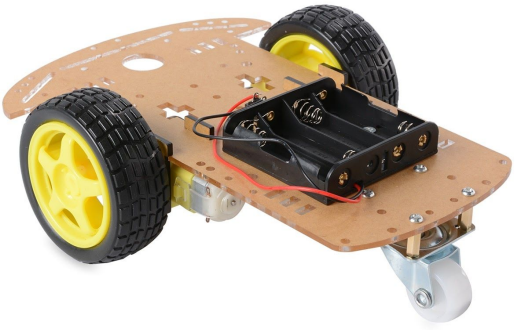

Figure 1. 2-motor 3-wheel robot skeleton.

Problem 1 `[20 pts]`**.** Our senior design students proposed to build **a remote-controlled 2-motor 3-wheel robot** that will find its way in both of the randomly generated 8x8 mazes given in **Figure 2.** They will use a microcontroller board and control the robot using a wireless controller. Please design its **block diagram** for the hardware (as best as you can without searching online, Figure 1 above should give you at least some ideas), and a **detailed flowchart of the software design**.

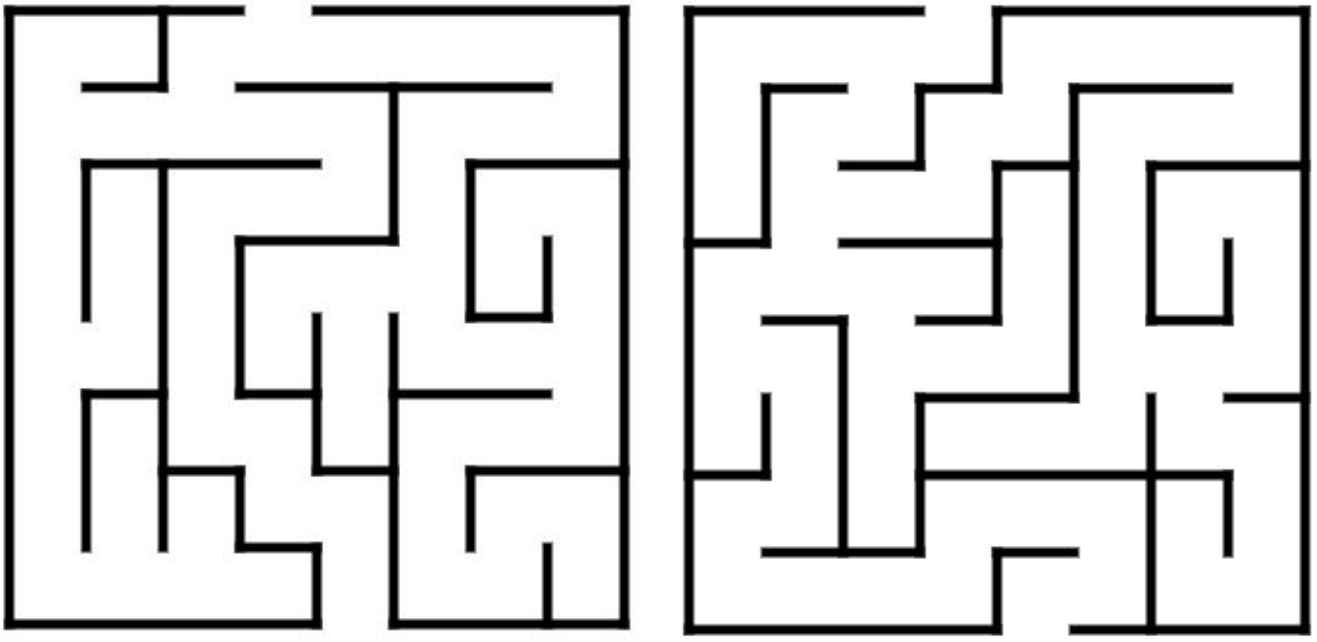

Figure 2. 2 8x8 Mazes. Start from top and finish at the bottom.

Problem 2 `[40 pts]`**.** As their adviser, *-and this being a senior design project-* I decided to make it a little more challenging, and asked them to make it **an autonomous robot** in addition to having remote-control capabilities. This autonomous / remote-control functionality that can be selected *anytime* using a switch on the remote, and the autonomous software is expected to complete the maze and any (or most) other possible maze combinations. Please design its **block diagram for the hardware** (as best as you can without searching online, what kind of sensors you would use and add), and a **detailed flowchart of the software design**.

Problem 3 `[40 pts]`**.** After carefully planning their hardware and software design, they decided to first build a C implementation of their designed algorithm, and want to write a function that will hold all the previously visited locations. Can you help them write a **logger function in C** that will remember all the locations the robot traveled and count the number of steps until the robot finishes its move?

Example: Assume the robot solved the second maze from top to bottom using the path in Figure 3. Your logger should keep and print the following info upon completion.

```
Path followed:
D8, C8, C7, B7, B6, B5, A5, A4, B4, B3, B2, A2, A1, B1, C1, D1, D2, E2, F2, F1, E1
Total moves: 21
```

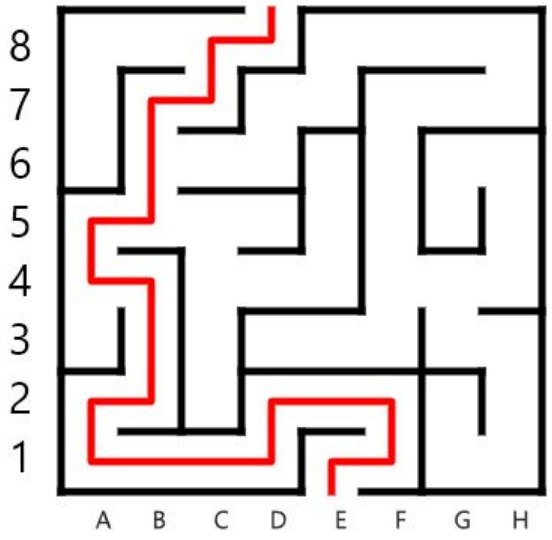

Figure 3. Robot following the shown path in the second 8x8 Maze from top to bottom.

Requirements for the logger function:

- Should implement a **queue** data structure.
- Should keep **all the previous** moves in the queue.
- Write the **push** function for the queue that will add the current move to the end of the queue.
- Write the **print_moves** function that will go through that queue and print all the traveled locations in order.
    - This also should print the number of moves.
- Write a simple test function that will demonstrate the functionality.
- Include comments for your design decisions in your code.
- Attach it in the PDF and as a separate .c file.