

# MCEN90028 Robotics Systems

## Group Project 2021

### 1 Overview

In this project, you will be required to design, build and program a robotic manipulator to move chess pieces on a chess board. The robot is required to realise the typical moves required by a player when playing chess. No prior knowledge of chess is required.

A chessboard is shown (on top view) in Figure 1. The typical movements required are: to move a piece from one square to another, over other pieces that may be on the board, as well as moving the captured pieces out of the board (and occasionally, to move pieces from outside the board back onto the board from the captured pool). While it is not the player's turn, the robot should remain idle outside the board.

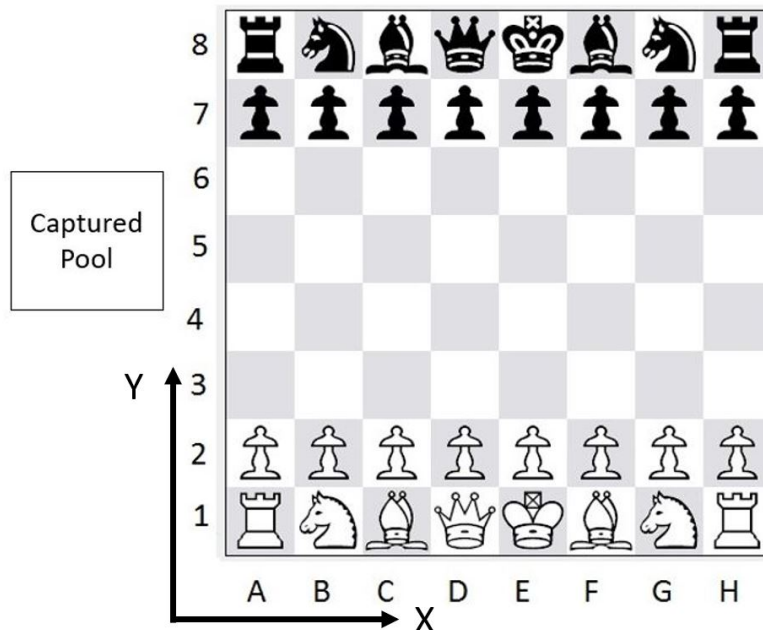


Figure 1: A chessboard

It is important to note that there is no unique robot design to solve the problem, and you are encouraged to explore and consider different robot configurations before deciding on your design. Given that robots are flexible and reprogrammable tools, your robot will require a user interface that allows users or operators to easily modify loading bay and tower positions. In this subject, the instructions on where to move

the pieces will be given as the coordinate of the pieces (using chess notation - often referred to as the chess algebraic notation).

## 2 Expectations

The expectations for this project is clearly described in Assignment 4. The description of the tasks that your robot needs to carry out for the final demonstration of the project as well as the marks associated with each task are described in Assignment 4, which is available now. The format of the instructions (of the moves that your robot needs to carry out) is also provided there. Please refer to the Assignment 4 document early in this subject – and early in your robot design process, to understand exactly what you are designing.

Other additional notes that need to be mentioned:

- You are to carry out your project in a group of 3 students, the same grouping as the those for the other assignments in this subject. In other words, you will be in the same group for all assignments in this subject. All the other assignments will be geared towards the project. For example, the forward kinematics assignment will require you to derive the forward kinematics for your robot, as well as to derive the appropriate link lengths for your robot, in view of the chessboard size you chose.
- In order to manage the uncertainties associated with COVID restrictions, we would form the student groups such that every student who is not able to be on campus physically would be in a group with 2 other students who are attending on-campus.
- You are to choose the chessboard to be used in your group. It can be an existing chessboard you already have or you can buy a cheap (or expensive, if you are happy with the cost) chessboard. It is recommended to go with a rigid board (I mean, not a flimsy plastic sheet or cardboard). The size is up to you. Please do not intentionally purchase the same board as another group.
- In this project, you are NOT required to construct any chess playing algorithm. The focus on this subject is Robotic Manipulation, where we get robots to perform movements and manipulate objects.

## 3 Useful Resources

The following websites could be useful if you plan to look for your components online.

<https://www.littlebirdelectronics.com.au/>  
<https://au.rs-online.com/>  
<https://www.digikey.com.au>

<http://au.element14.com>  
<https://www.pololu.com>  
<https://www.auselectronicsdirect.com.au>