



Mechatronics Workshop

Building a Soccer Kicking-Line Follower Robot

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INTRODUCTION

Line follower is an autonomous machine that can follow a path. The path can be visible like a black line on a white surface. Sensing a line and manoeuvring the robot to stay on course, while constantly correcting wrong moves using feedback from the sensor forms a simple yet effective system. It is designed to move automatically and follow the line. The robot uses arrays of optical sensors to identify the line, thus assisting the robot to stay on the track. The array of five sensor makes the movement precise and flexible. The robot is driven by direct current (DC) gear motors to control the movement of the wheels. The Arduino Uno interface is used to perform and implement algorithms to control the speed of the motors, navigating the robot to travel along the line smoothly. This project aims to expose students to hardware and software integration for mechatronics systems development and enable students to have basic skills in handling mechatronics components.

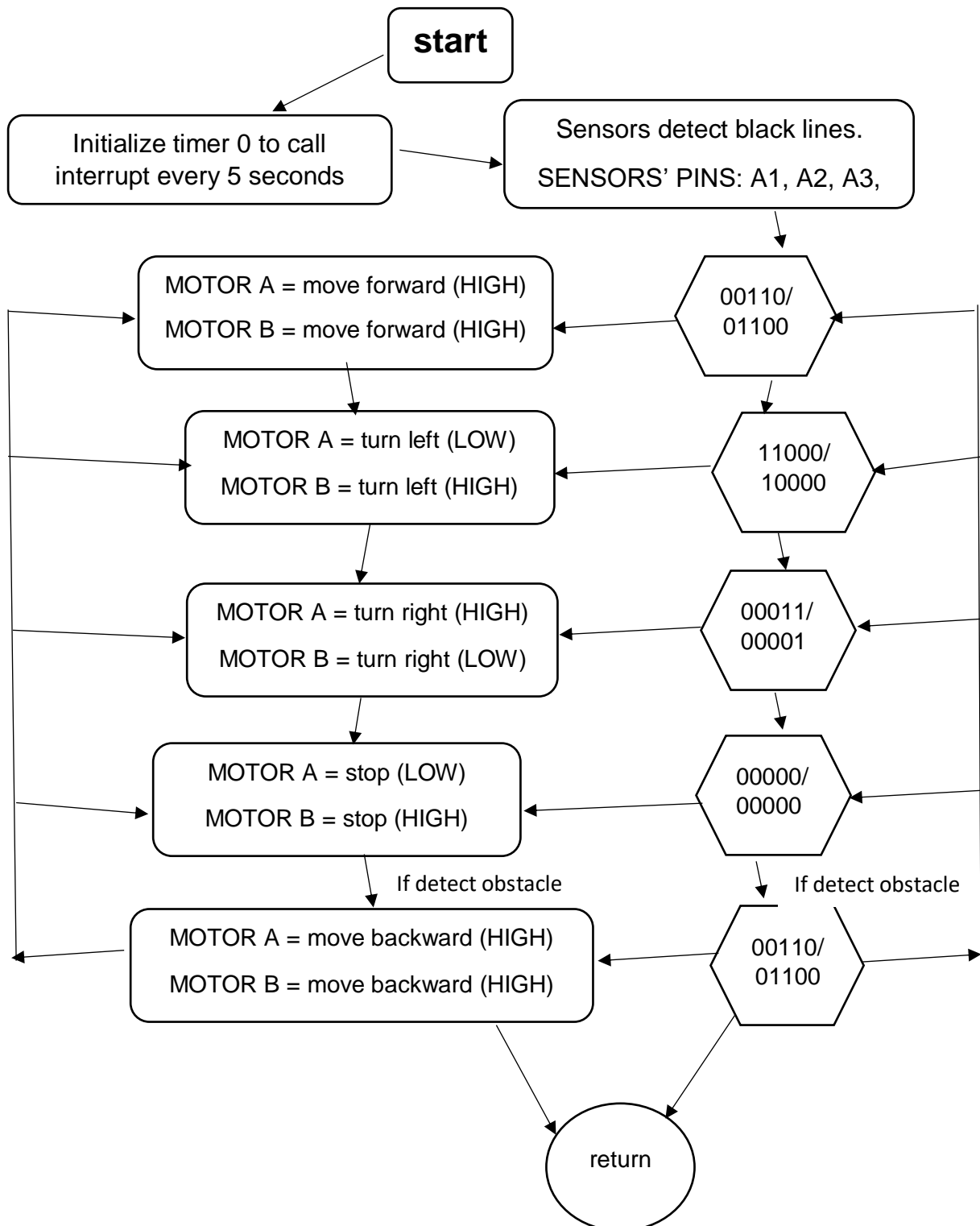
OBJECTIVES

The objectives of this project are:

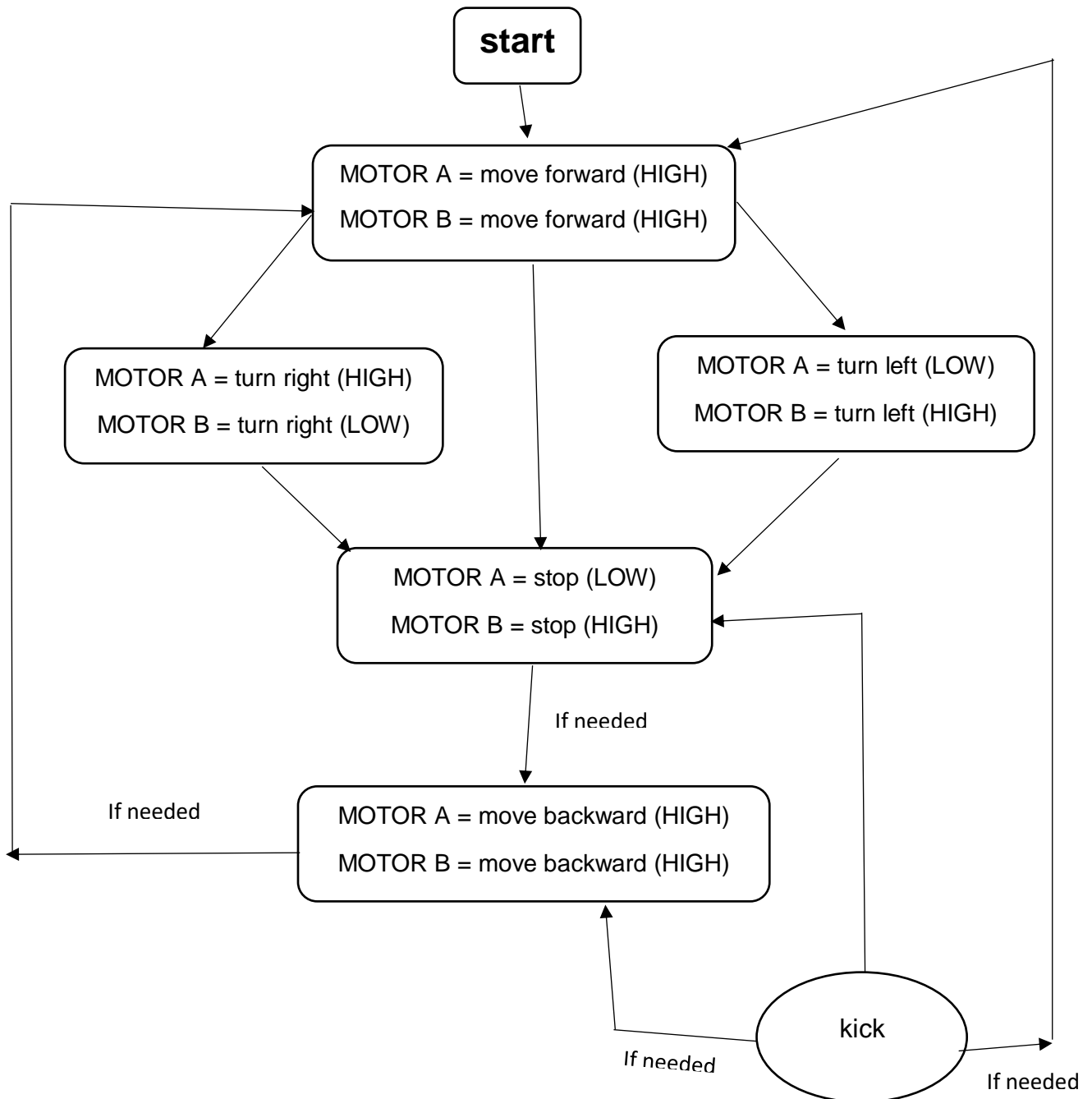
- To understand the basics of mechatronics such as the principle of physics, usage of sensors and programming.
- Design and implement simple mechatronics systems in groups and demonstrate the work with the report.
- The robot is capable of following the line.
- It should be capable in taking various degrees of turns.
- It must allow calibration of the line's darkness threshold.
- It must be able to detect obstacles.

MECHANISM OF THE SYSTEM

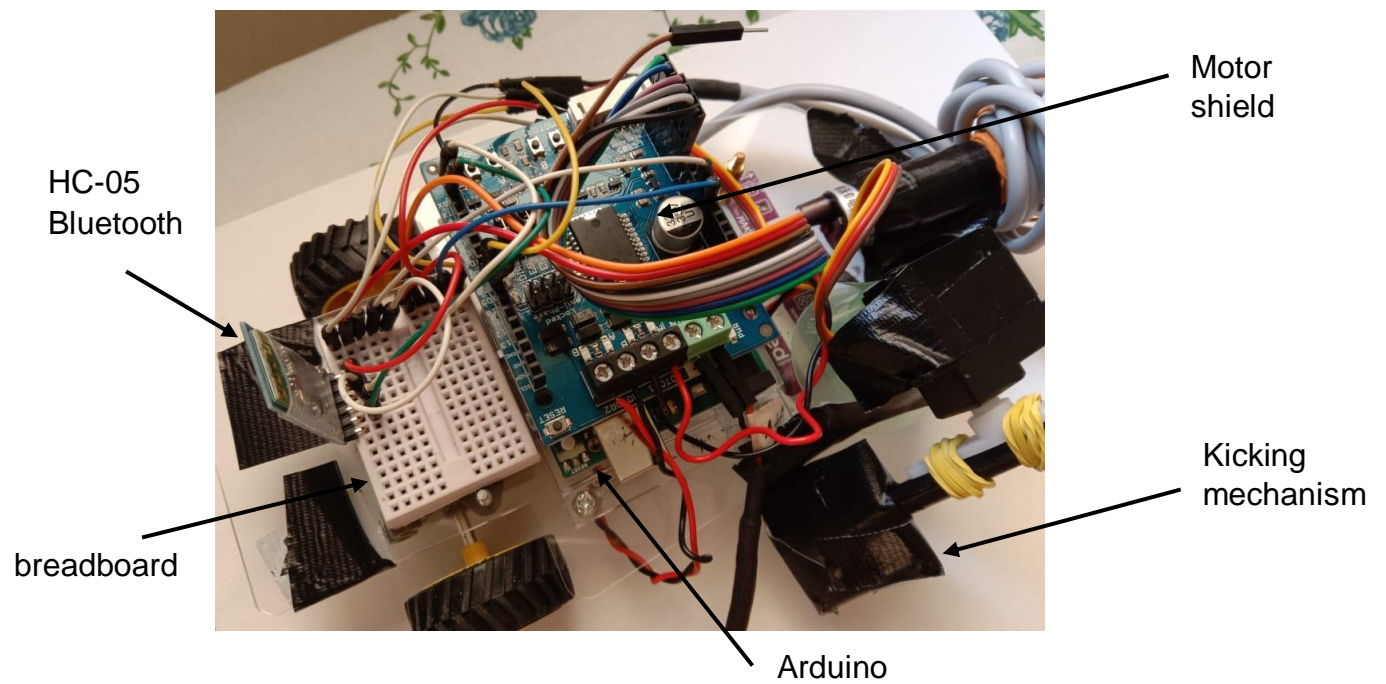
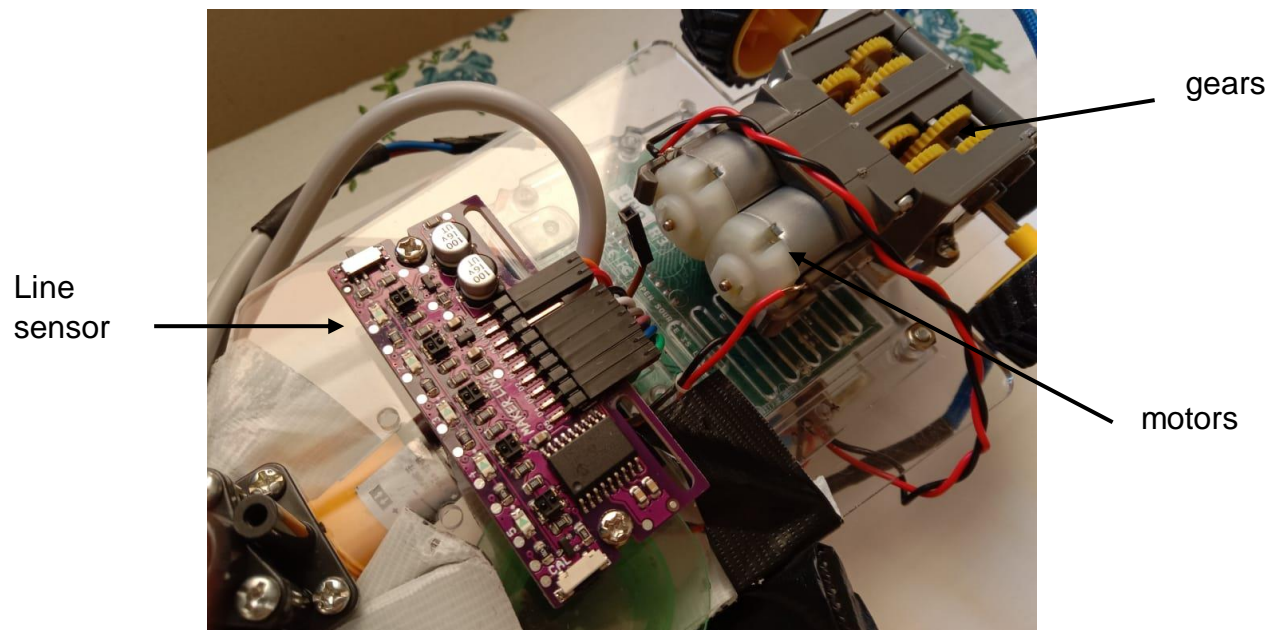
The flow chart shows the simulation of this project.

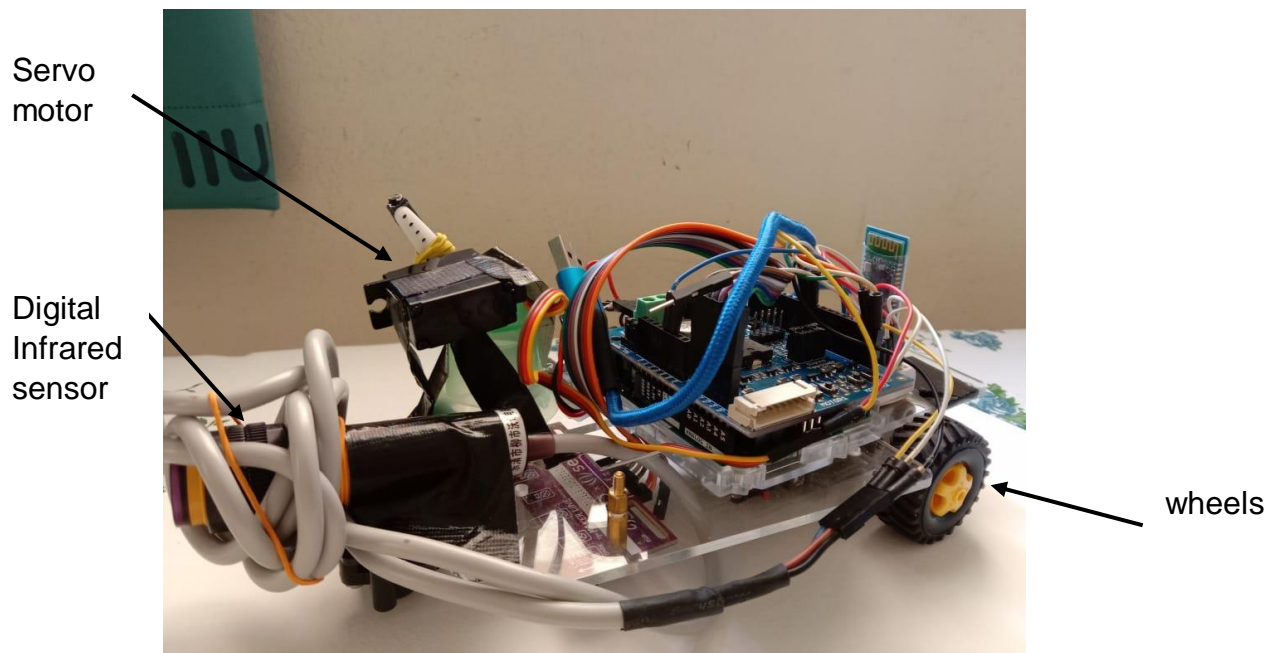


The flow chart shows the simulation of the kicking mechanism which is controlled by phone using Bluetooth.



The labelling of the robot:





DISCUSSION

Islamic perspective

Islam does not prohibit human beings from creating science and technology; in fact, fardhu kifayah requires it. As a result of improvements in science and technology in different disciplines, humans may now enjoy a higher quality of life, which has proven to be beneficial to both plants and animals. Based on the passages of the Quran, Surah Al-Baqarah Verse 30, it is in accordance with Allah's will to make man the caliph of this world. Because we know that the beginning of the assembly for the robot is quite complicated and demands a lot of patience, the Islamic content we have in this project is that we must be patient in confronting the test. This demonstrates that if we are given a difficult or light test, we must be patient since Allah knows whether we are capable of enduring it or not.

Besides, the manner in which we wish to connect Bluetooth to mobile phones also demonstrates that we, as Muslims, must be aware of how to maintain our relationship with Allah as well as with other people. As we all know, there are Muslims today who have no idea how to approach and know Allah better, leading them to drift in their own world and renounce all of Allah's commands.

So, from above we knew that we should learn as much as we can about knowledge because it is important and it also one of fardhu kifayah. Then, we must teach ourselves to have good patience because Allah said in the Quran that patience is one of the Iman characteristics. Lastly, this is one of the basic and very important things that is we need to take care of our relationship with Allah SWT because Allah is our God

and we as Mankind of Allah must follow all Allah rules.

Improvements

On the competition day, our line following robot did not manage to compete and complete a few mechanisms that are required to be evaluated. The probability of what may have caused the robot did not operate properly is the coding of the program. There are maybe hidden errors from the coding that made the robot cannot come out with its output. To prevent this from happening, we should now the foundations in handling the electronic components. And also, to have a strong basic of coding knowledge. Next, there is also a possibility that there are damaged components. In the process of building the line follower robot, most of the useful features are identified and many of them was implemented. But due to our lack of knowledge and other factor, some of these cannot be fully functional. Some improvement that can be made to the robot are:

- Install the wires and components in a tidy and orderly manner so that they cannot be readily pulled out and detached after soldering.
- Make the IR sensor responsive to circuit lines by calibrating it.
- Provide additional room for the robot base to accept the load of components on the robot so that it does not break and is not damaged, as well as enough support for the robot to move easily.
- Use of a CCD camera to improve path identification and precision tracking
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CONCLUSION

This line following robot is automobile system that has the ability to recognize its path, move and change the robot's position toward the line in the best way to remain in track. In the tournament, our robot was not really functioning well as it did not able to detect the obstacle and connect to Bluetooth. An addition, if the Bluetooth was not connected during the semi-autonomous mode, the kicking mechanism will not be functional as we planned.

On the other hand, this line following robot project test our group to cooperate, communicate, and our understanding of electronics, mechanical systems, and codes in programming. The successful completion of every task demonstrated the potential of mechatronic systems and a positive group dynamic.