



Hexapod Robot

Amir Khalifeh

School of Computing and Digital Media, Communications Technology London Metropolitan University

Introduction

This project's subject is the design and implementation of a Sensory Crawling Robot. The Sensory Crawling Robot performs different mechanical movements and uses a mobile application for control by the user. This poster covers design, 3d printing and programming. This project is based around the construction of a multifunctional robot toy. The primary objective of this project is to introduce an innovative toy to the market that is facilitate the users' attitude, skill and knowledge development. The robot body is supported by six legs composed of three motor joints (controlled by a microcontroller), ultrasonic sensor, Bluetooth and colour recognition.

In addition, an adjustable power supply is designed and built to monitor and display battery levels, voltage and current.

This project's principal concept could also be adapted to produce a surveillance robot with a camera (e.g., humanoid robots used for space exploration). It could also be used in military operations to collect data in regions dangerous for humans to enter such as mining areas, and in the construction industry where vertically climbing robots can be used to repair pipes or ducts.

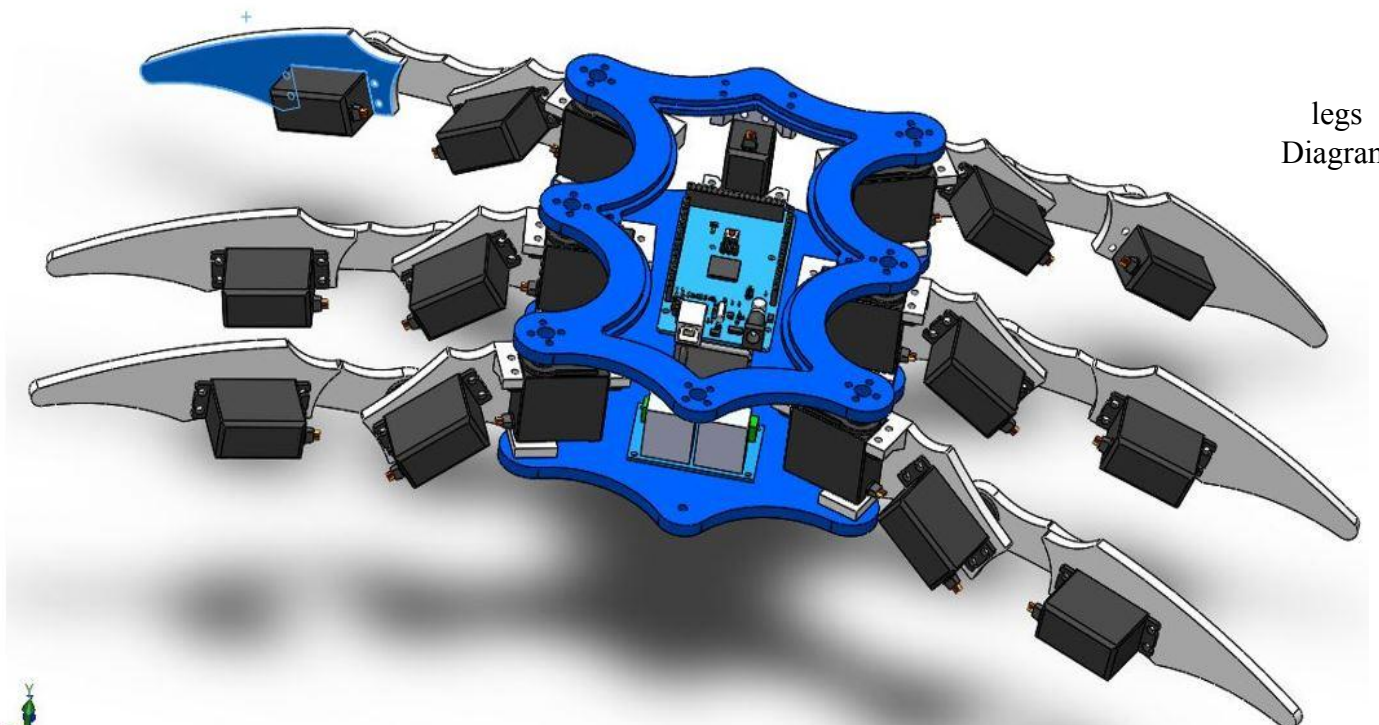
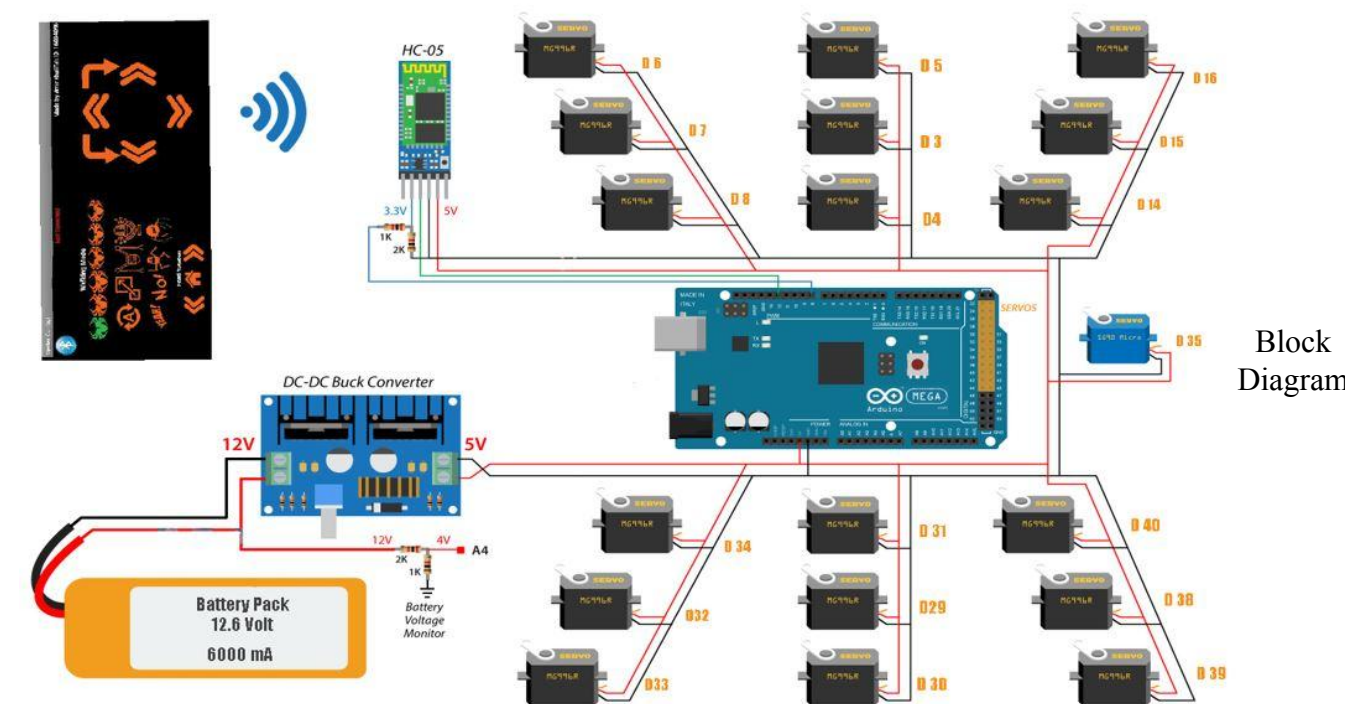
Aim & Objectives

The aim of this project is to design and construct a sensory crawling robot that uses a microcontroller, sensors, and Bluetooth.

- To meet the aim, the project will explore following objectives:
- Gain a better understanding of the role of robotic toys in education. Also, their evolving future purpose in correlation with evolving technology.
 - Utilise hardware knowledge and skills in designing an interface between sensors and the microcontroller, and utilise my software knowledge and skills in developing/using a mobile app.
 - Showcase a portfolio of knowledge in utilising a variety of different motors to construct crawling robotic toy.
 - Implement effective wireless communication (Bluetooth) between the robotic toy and user by mobile app.
 - Demonstrate soft and transferable skills, through thorough and coherent documentation, time management and communication/presentation.

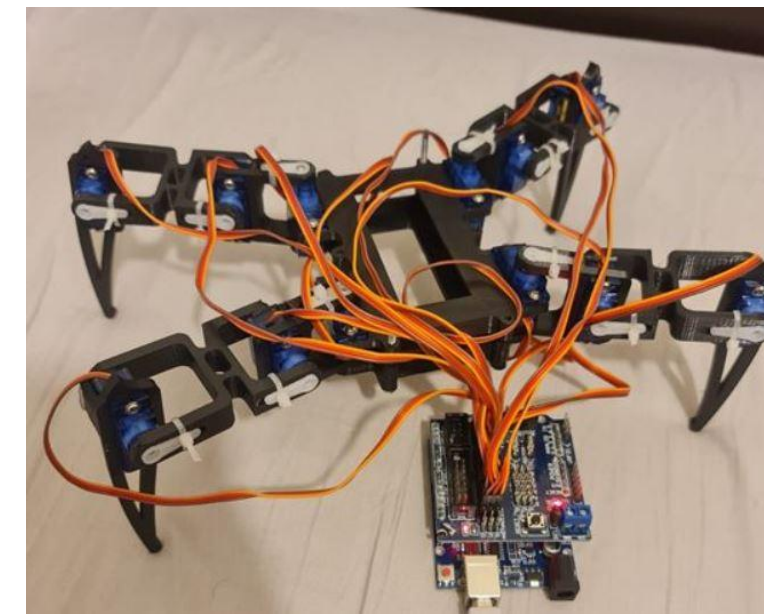
Method

It was important to come up with a capable mechanical design for the robot, enabling it to move around freely and perform the movements needed. The design required a dependable leg design, which will enable the robot to move in all directions. The electrical parts used such as servos and the microcontroller are reusable, and thus this minimises the environmental effect this robot may have. A simple control system is needed to make it easy for the user to steer and control the robot. An android app will be good enough to do that since everybody has a smartphone nowadays. Bluetooth controlled movements (via a phone application) will include forwards, backwards, sideways motions, and elevation of arms (to say "hello"/greeting). With regards to a particular colour recognition, The Sensory Crawling Robot will be programmed to respond exclusively to objects of colour, and reject all other colours. An ultrasonic sensor will aid the spider with depth perception and recognition of oncoming objects



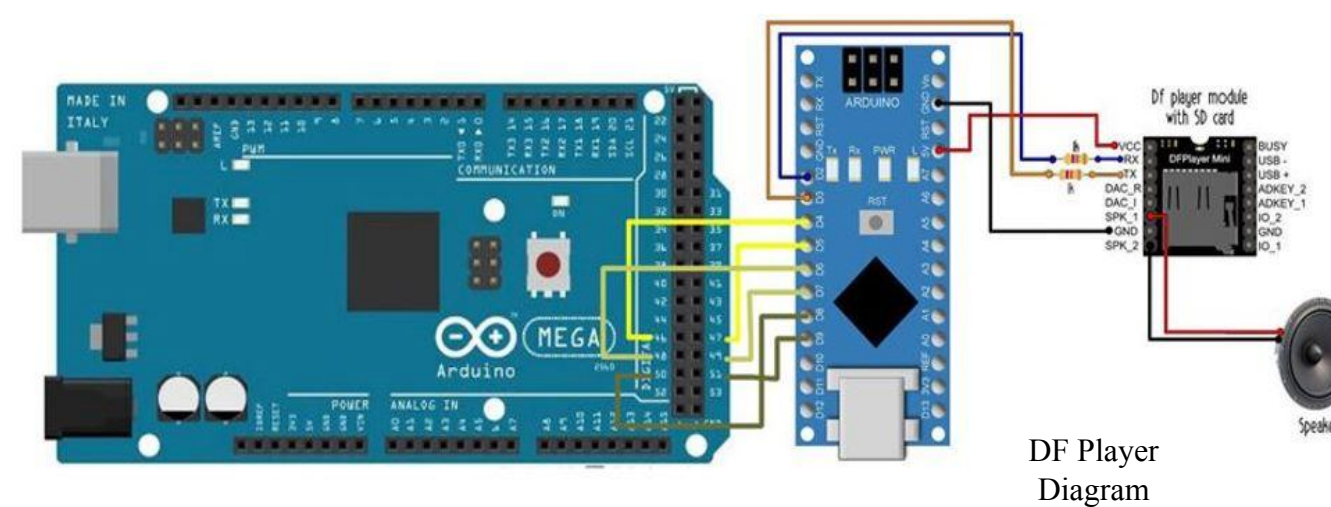
Results

1. The first design (the four leg spider) did not achieve the results that was set out and when the prototype was tested, it did not perform to expectation in many areas and there were many anomalies



2. The DFplayer was not compatible with the Bluetooth module. They both need sender/receiver ports however there was only one per of sender/receiver port.

An additional ARDUINO NANO was introduced to sully deal with DF player however again additional programs were required for the MEGA and NANO to communicate adequately and the MEGA remain as the master.



- 1-The four leg design was indicate for the purpose,
- 2- for the 6 leg design to work with the target specification, more substantial equipment was required.
- 3- The solution to the conflict between the NANO, MEGA & the servo motors is that they cannot be functioning all at the same time,



Project plan

The original plan was to create a spider that could operate in any terrain and whilst I followed my plan from the first semester, I soon realised that the design in mind had many limitations and could not achieve all of the functions listed in the plan. Again whilst my plan and the end project result never changed the design did.

Weeks	October	November	December	January	February	March	April	May
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								

Conclusion

In general Robotics is the future, for better or worse and it is an area that will continue to improve as other sectors of technology improve with it.

I found this subject to be one of my favourites hence I set myself a high target with the initial proposal and even thereafter wanted further improve my own proposal. If such opportunity arises again, a more complex topic will be chosen.

This project has allowed me to test all of my skills and show my strengths whilst improving my weakness. This process has helped me to improve myself in the following areas:

- Improving my programing skills in writing the program for the operation of servomotors and sensors
- Learning how to make an application for an Android mobile phones and the connection of this application to the robot via Bluetooth. This application is also voice activated.
- Improving my understanding of the design process overall, e.g., the appearance of the robot in the form of the casing not only makes the spider look more appealing (which would automatically create more interest from the naked eye) but also protects the more sensitive part (sensors, motors).
- Learning how to manufacture a power supply that supplies the correct specific current and voltage required.
- In conclusion It is fair to state that the initial design was fully accomplished but it did not meet the requirements set out in the original aim and objectives therefore it was changed and upgraded. The upgraded version was produced, tested and enhanced yet again i.e. in addition to the initial intended work, the robot has speech, voice recognition, colour recognition, use of ultrasonic sensor for detecting objects, use of Bluetooth to control the robot with mobile app.

Acknowledgements

I would like to thank my supervisor, Dr Shukla, for all the support and guidance given for this project and other tutors throughout my degree who helped me understand even the most challenging topics.