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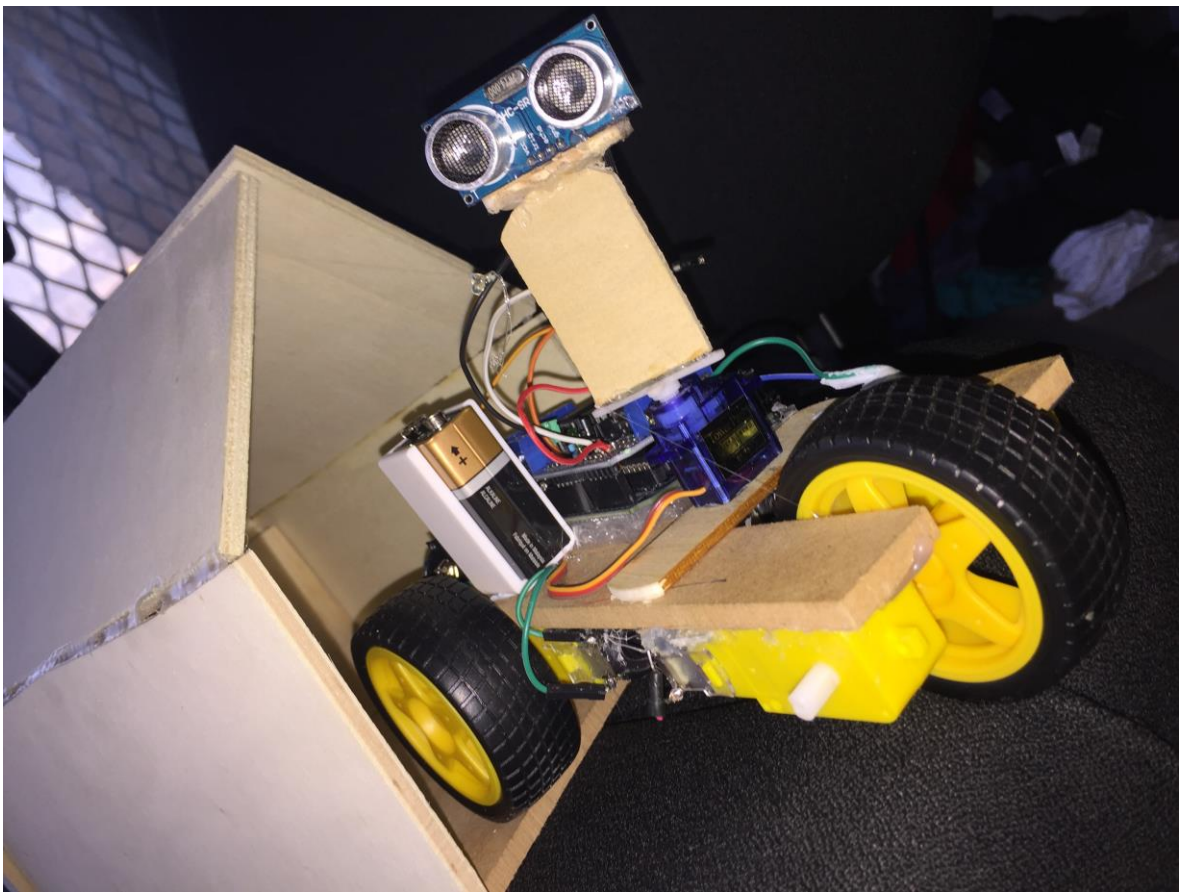
Robots to Rescue

Design Report – Chinmay Manchanda (z5216191)



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Introduction

Design Challenge

Design and construct an autonomous rescue robot that can effectively complete a series of challenges. The total cost of manufacturing the robot must stay under 120 AUD. The robot must be able to maintain a straight path whilst avoiding any presented obstacles. It should be able to maneuver in both rough, and smooth inclined planes without losing balance.

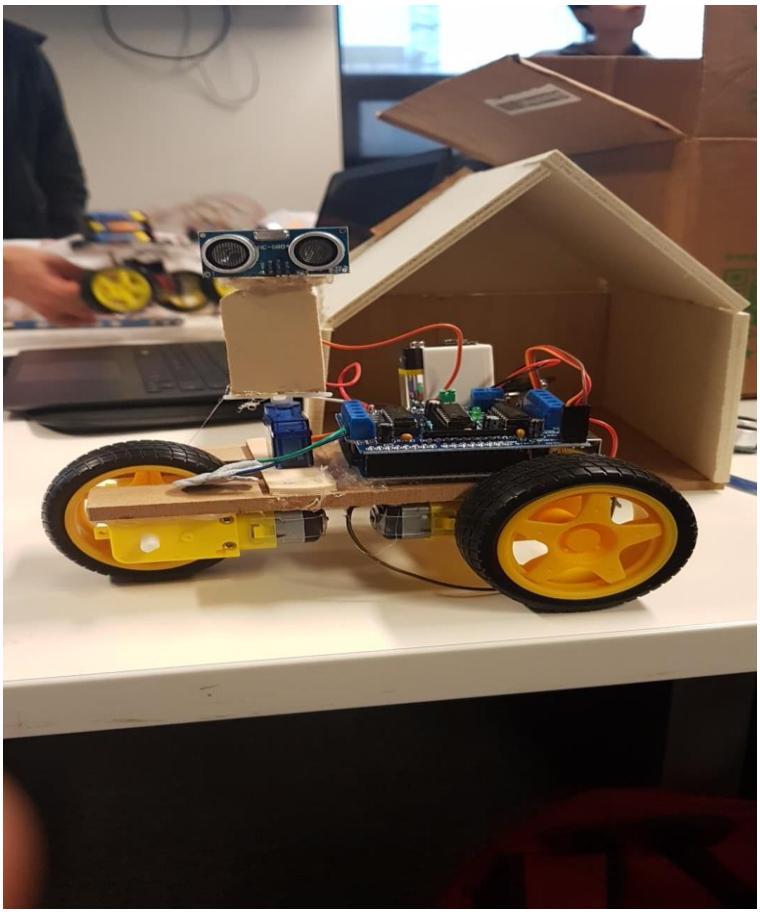
Executive Summary

This report presents a design for an autonomous robot that is to be constructed which will be able to maintain a straight path whilst avoiding obstacles. The combination of three wheels and extremely powered motor's enables it to maneuverer in both rough and smooth inclined planes without losing balance. The design presented in this report uses Medium Density Fibre board for the body. Using an ultrasonic distance sensor, the robot can avoid obstacles. An Arduino along with a 9V battery is used to power the motors. An L239D motor shield will be used in order to keep the motor control separate and well managed.

Prototype Design

Final Design Solution

The final design will look exactly as it is in the picture. It will have 3 wheels with DC motors , an L239D motor shield , an Arduino microcontroller , an ultrasonic distance sensor , one servo motor and one rechargeable 9V battery. The base is to be constructed from an MDF (Medium Density Fibre) Board which will showcase tremendous durability.



Test No 4 – Avoiding Obstacles

Test 4 is all about the testing of the programming or the computing stream. There are various methods a prototype can suceed in this test. It may be smart coding , small size , big size or who knows maybe a jump. As we can see in the picture there are various possibilities for the robot to get out of this situation. Well the best example for this would be that even an Horse can get stuck in situations where an ant would'nt be .

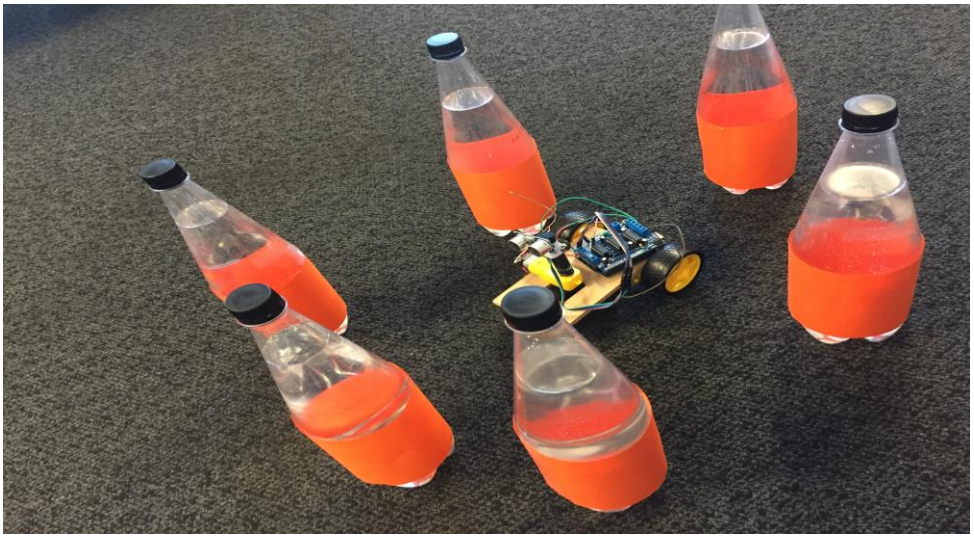
Client Specification

The client has a demand to for a robot which can avoid any obstacle which comes in its way during it's rescue course whether it's a bottle, rock or even a human being. Main aim to achieve is to get a prototype working in all situation in the best budget possible.

Test Procedure

The test will have the following characteristics:

- The robot will be surrounded by 6 bottles (1.25l soft drink) of water to form a hexagon shaped cell
- One bottle will be removed at random, so the robot may escape
- The robot must manoeuvre out of the cell without knocking over the bottles.

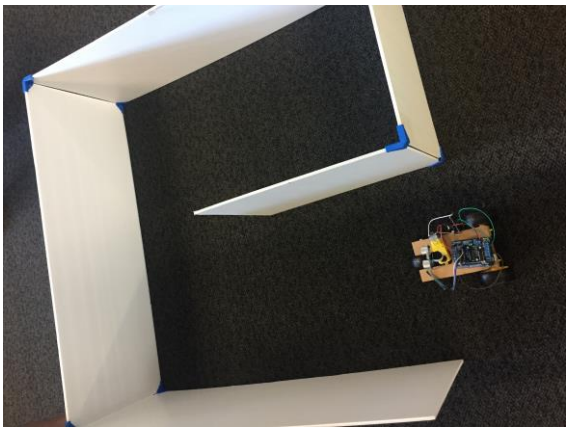


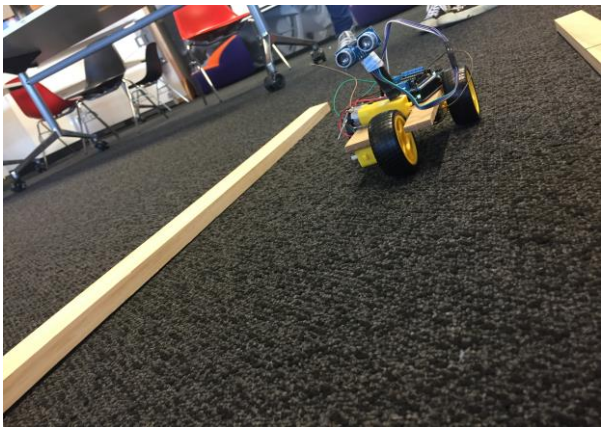
Testing Results

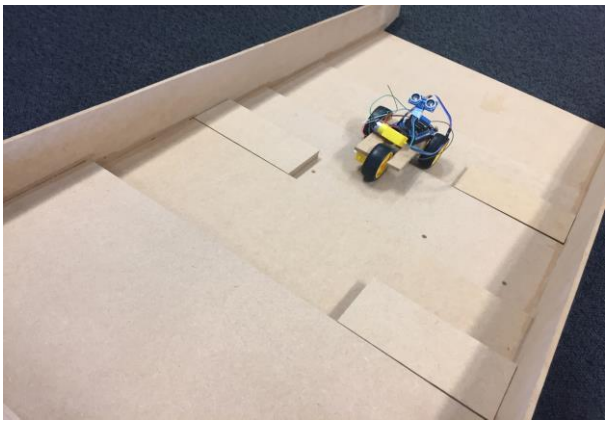
Our prototype's performance was exceptional in this test., whereas we didn't choose to display the specifications of this test because of that reason. Our protype was exceptional in each and every test but our main aim behind showcasing this test was that the result we got was not what we were expecting. Our robot passed the obstacle test in almost no time. The recorded time was 15 seconds including a delay of 5 seconds in the code itself.

Evaluation of Performance

In our case size played it's own role getting our robot to the places we didn't expect it would go through. Our robot was the tiniest of all the competing robot's and completed all the evaluation task's it was asked to go through with grace. Well going straight isn't a tough task for any prototype but climbing an incline surface and dodging it's way through walls is quite a hectic task. Well , our prototype exceeds it's capability in every task but there are places where there is scope for improvement. Our prototype lacks a bit of climbing power because of being small . Even then it completed 80% of the required assessment. Our prototype is a complete success in these kind of situation as it can find it's way on it's own and avoid obstacles even while going up rough surfaces. It is small in size , roughly 8 cm's in length and 5 cm's by breadth . The idea behind keeping it tiny is to get it into spaces where some big prototypes might fail. Here are the test's our prototype went through and completed.







Design Process Analysis

Summary

The Design process involves various steps that are needed to be completed in order to get the best solution for our client. We started with defining the problem by preparing our individual problem statements. We then performed background research in our streams and started collecting ideas. After finding the best solution we presented it to you through our design proposal and started working on that prototype. This process divided in parts helped us create the best working solution for our client.

Recommendations

There is scope of improvement in almost everything in this world. Even the process of designing an Arduino tech with a team requires a few advancements. For the start we know that there's an assessment known as Teamwork survey , the person who did the work will eventually get the marks of everyone else but what if no other person is working in that team. It's difficult for a single person to complete a team project and get his marks. Recommendations are to check if all the team members are working after the first survey and if not some plausible action should be taken. The knowledge given to us by the faculty was more than enough according to my opinion. The assessments and the sources provided were genuine and are appreciated.

Two information charts giving a SWOT analysis are shown on the next page →→→→

Strengths

- Various Problem Statements to identify the problems from each and every perspective.
- No cluttering of ideas because of low participation by team members.
- Teamwork survey in Project assessment helped in providing motivation to the people who actually worked hard.
- Knowledge provided by the faculty helped in making things possible in our project.
- No Funding issues.

Weaknesses

- Low man power.
- Loss of time and energy due to less participation of other members.
- No research done by most of the team members.
- Difficult for a person from one stream to understand the working of the process of another stream.
- Difficult to gather all the team members due to different courses and preference of each team member.

Opportunities

- Better research could have been done if people were active.
- Better ideas could've been put forward if the ideas were given by appropriate people from respective streams.
- A lot of time could've been utilised for innovative ideas if equal participation or timely check's would've been conducted.

Threats

- Working of project faces a huge threat if a single person has to study the parts of every stream involved.
- Damage of devices and goods or complete failure if not properly worked up.
- Threat to completion of the project if the only working people give up.
- Lack of will and interest to work.

Appendices

Appendix A : Manufacturing Cost

Serial Number	Type	Cost
1.	**Body (MDF Board)**	**2 AUD**
2.	**Electrical Components**	**22 AUD**
3.	**Wheels and motors**	**6 AUD**

Appendix B : L239D Motor Shield

This L293D motor driver is a motor controller which has the ability to control 4 DC motors or 2 Stepper motors at the same time. This is a dual full-bridge driver designed to drive all the motors independently giving them different instructions such as different speeds and directions at the same time. It also has a external terminal power access which allows us to use two 9V batteries that'll be directly attached to the circuit (One with the Arduino and one to the motor driver). It also has pull down resistors which help us to keep the motors off while powering up. It also has a reset button

Appendix C : References

The information about the motor shield was taken form

https://playground.arduino.cc/Main/AdafruitMotorShield.

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