FSU PANAMA CITY

EEL 3705L Digital Logic Laboratory

Performed by:

Obadah Kabuka

Kevin Flores

Instructor: Dr. Manzak

11/02/2021

Robodog Project Lab

Table of Contents

List of Illustrations

1 Abstract

For this experiment, the student will be building a robodog using motors for the dog's movement, an Arduino board to store the code for the dog's movements, a power source, and a body using any material that he or she wishes to use. The goal of this project is to test the robodog and make sure that it is able to move six feet in a straight line. Therefore, the student must keep testing the code and the structure of the dog until he or she is able to achieve this.

2 Introduction and Background Theory

The idea of making a robot dog is surrounded around learning some basics that all engineers need. This project combines the concepts of design, physics, coding, failure, and the use of the Arduino software. From the Arduino website, they state that they are "the world's leading open-source hardware and software ecosystem." This allows specifically students to be put into a hands-on environment to begin learning the basics of coding and robotics. This is important because that is the beginning of features found in fields such as product development of all departments. The background of robotics is to facilitate everyday life such as minimizing the dangers certain jobs can hold, items used in homes, and departments important as the transportation system. The whole idea of artificial intelligence is complex but as stated by Diva-Portal, "Thinking – or reasoning – is a loaded term when applied to machines, dating back to the "debate" between Alan Turing, asking the question "Can Machines Think?" This is when the beginning of machine learning began and it has brought the world to where researchers can implement their ideas into products of the future as the researchers for this project were able to do.

3 Procedure and Apparatus

- Arduino board
- Laptop or Computer (for Arduino code)
- Robodog's legs and body (whatever material the student wants to use)
- Wires
- Breadboard (optional)
- Servo Motors
- Power source
- Cable (for connecting power to the Arduino board)

Procedure:

To start off the experiment, the student must assemble the Arduino board with the wires and hook it up with the servo motors. After, the student finishes assembling the pieces, he or she must hook up the Arduino board to his or her computer and begin testing the code on the Arduino program. The goal is to have the motors sync in a walking motion. In order to do that, the student must adjust the angles on each servo motor on the code in order to make it turn in his or her desired fashion.

Figure 2

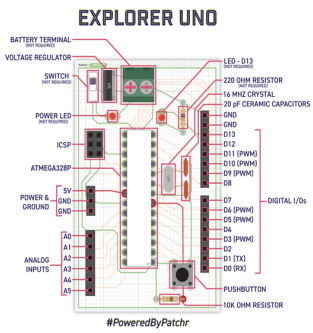


Figure 1

In order to connect the 4 servo motors to the Arduino board, the student must find a way to connect all of the red wires to ground, the orange wires to the 5v gate, and the yellow wires to gates 3, 5, 6, and 9. Once the code has been set, the student must begin building the body of the dog using whatever material he or she wants as long as it's not too heavy and weighs down the dog. Once the body has been built, the student must find a way to connect the legs to the motor and position them correctly on the body with the leg having a proper structure that allows it to move across a slippery floor. Then, the student will connect a portable power source to the battery terminal of the Arduino board to allow the motors to work without the need of being connected to the computer. Afterwards, the student must adjust the code or the leg structure to make sure the dog is able to move 6 ft in a straight line. Lastly, the student will have to structure the dog's body to allow both the Arduino board and the power source to sit on it without affecting its movement. For this experiment, all the students will participate in a race to see which dog is the fastest and most durable. There are 3 main rules for the race. The first rule is that there will be no direct connection from the dog to a computer. It needs to be powered by a power supply. The second rule is that there will be no wheels allowed. The dog must be able to walk. The third and final rule is that the dog needs a nametag with his or her name on it.

4 Results and Analysis

The purpose of this experiment was for the researchers to use their knowledge of using the Arduino software, building circuits, and using engineering skills to design the perfect robot dog. For the

researchers the code to allow the robot dog to walk was straight forward. The true difficulties arose from the design aspect as it was crucial to the success of the project. From the test of multiple designs, failure upon failure occurred due weight issues, not enough friction to walk, and even lack of good structure for ideal straight movement. Although there were challenges, the perfect design was able to be done with the laser wood cutter provided by the University that really allowed the design to be perfect for the presented circumstances of weight, structure, and overall a good-looking design as shown in figure 3. Also, the code made by researchers is shown in figure 4.

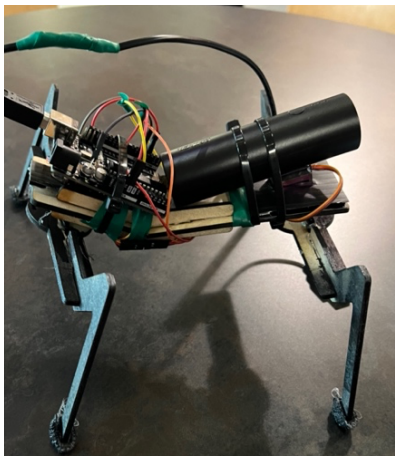


Figure 3

```
#include <Servo.h>

//constants
Servo FRServo,BKServo;
char forward[]={15,25,25,25,25,15,15,15};
void setup()
{
  FRServo.attach(3);
  BKServo.attach(5);

}

void loop ()
{
  for(int n = 0;n<4;n++)
  {
    FRServo.write(forward[2*n]);
    BKServo.write(forward[(2*n)+1]);
    delay(100);
    }
}
```

Figure 4

5 Conclusion

Given the outcome of the race and experiment, the student was able to accomplish the goal of this project which is being able to make the dog walk 6 feet in a straight line if possible. The student's robodog got 3rd place in the competition which shows that it had a very durable structure and design which allowed it to accomplish this. For this specific dog, the student created a spider-like model with only 2 motors which was an efficient and effective design. However, if the student decreased the delay time for the leg's movement, he would have very possibly won the race which was the only minor discrepancy.

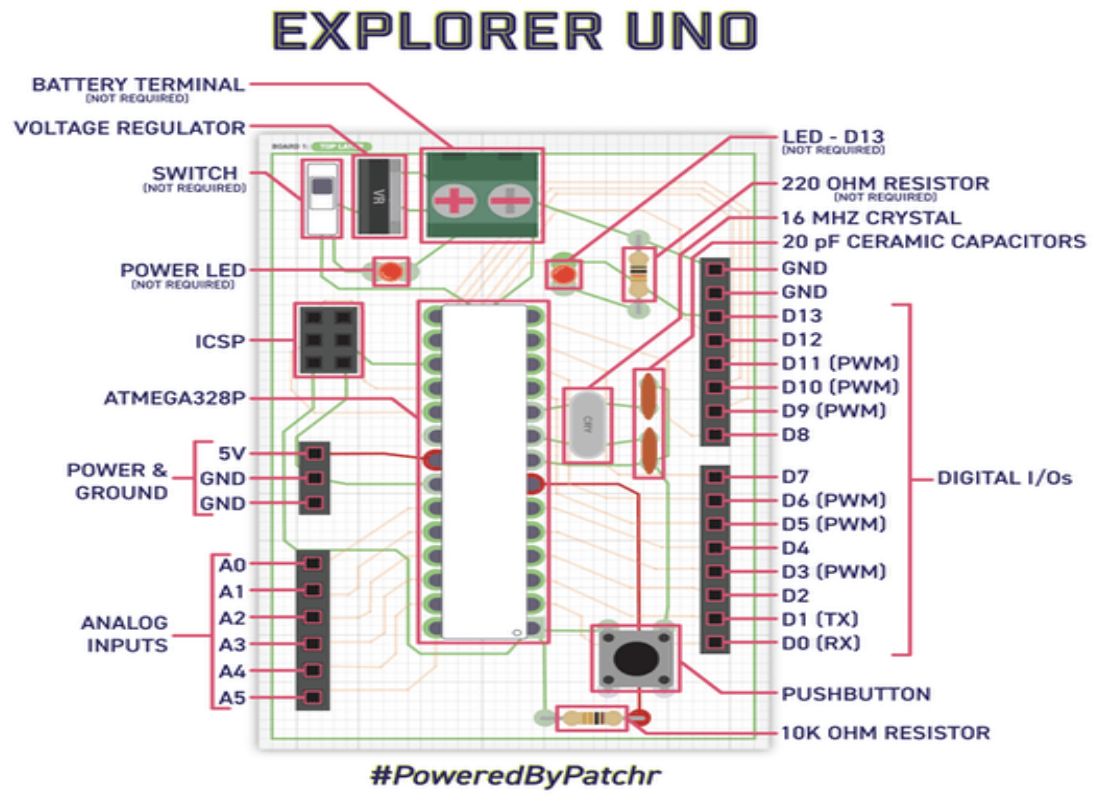
6 References

https://www.arduino.cc/en/Main/AboutUs

https://www.diva-portal.org/smash/get/diva2:646174/FULLTEXT01.pdf

7 Appendix


TOWER PRO
Micro Servo
9g
SG90


EXPLORER UNO
BATTERY TERMINAL
(NOT REQUIRED)
VOLTAGE REGULATOR
SWITCH
(NOT REQUIRED)
POWER LED
(NOT REQUIRED)
ICSP
ATMEGA328P
POWER & GROUND
5V
GND
GND
ANALOG INPUTS
A0
A1
A2
A3
A4
A5
LED - D13
(NOT REQUIRED)
220 OHM RESISTOR
(NOT REQUIRED)
16 MHZ CRYSTAL
20 pF CERAMIC CAPACITORS
GND
GND
D13
D12
D11 (PWM)
D10 (PWM)
D9 (PWM)
D8
D7
D6 (PWM)
D5 (PWM)
D4
D3 (PWM)
D2
D1 (TX)
D0 (RX)
DIGITAL I/Os
PUSHBUTTON
10K OHM RESISTOR
#PoweredByPatchr