Roboqueen 3D

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ABSTRACT

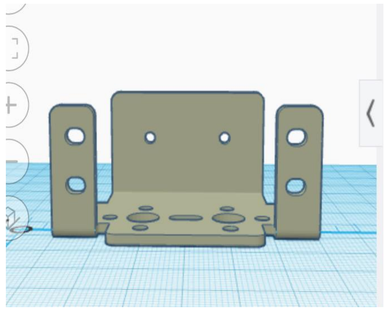
Roboqueen is a persistent research project in the Computer Engineering Technology Department. It is being designed as a full body interactive robotic mannequin in response to the needs of the fashion technology industry. The original prototype built in 2016 was based on the original versions of Arduino and Raspberry Pi computer boards. Throughout this project we have been upgrading the computer hardware boards to the latest versions that are computationally more powerful and faster than the original versions. An upgrade in hardware will allow us to program the mannequin with programs written in C++ and Python. The Roboqueen's hardware circuits and components will be improved and updated with the help of 3D printed electronic, embedded circuits and sensors. These custom 3D printed devices and circuits will be used to add functionality and features to the Roboqueen project. Thus, a challenge is proposed to use MATLAB, to study forward and inverse kinematic equations and their solutions in 3D, to control the body movements. Furthermore with the upgraded hardware the movements of the robot are more fluent compared to the previous version. This project can be utilized in a variety of applications, for example with a finished upgrade of voice recognition, it can assist someone by guiding them and pointing them to the right direction to where they need to go if asked. Another application could be in a classroom, where the robot can be of assistance to students who need help.

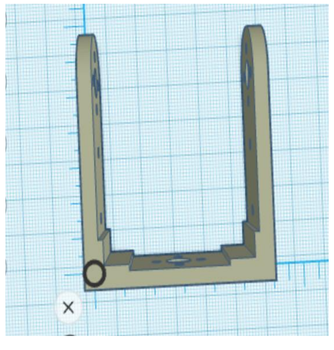
INTRODUCTION

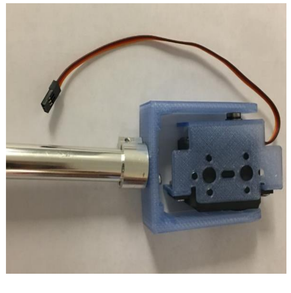
Roboqueen is designed as a robotic mannequin with the purpose of interacting with people with a natural fluidity. Two of its important ideologies are: 1) Being a robot that communicates with customers in a mall to know where is a store or the price of a product. 2) Help the students of the CET department by tutoring those struggling to grasp the Math and Computer Hardware / Software concepts being taught.

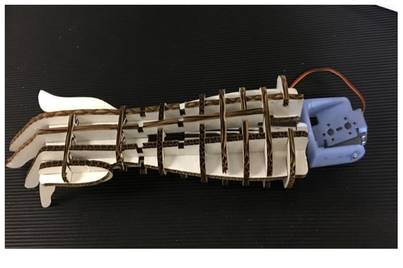
PARTS LIST

- Arduino UNO
- Servo Motor
- Microphone
- Power Supply
- Extruded Aluminum Kit
- Raspberry Pi 3
- Speakers
- LEDs
- Cardboard
- 3D Printed Junctions



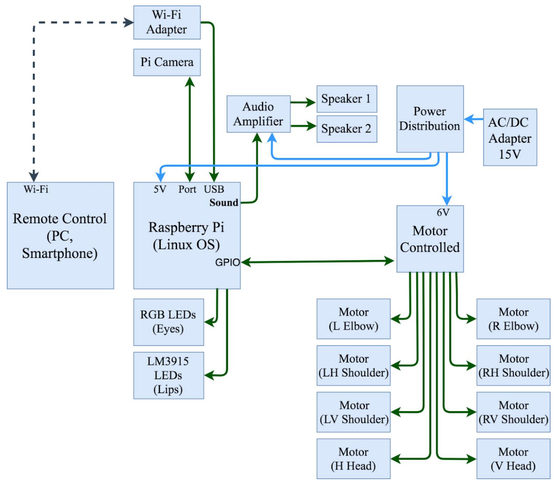






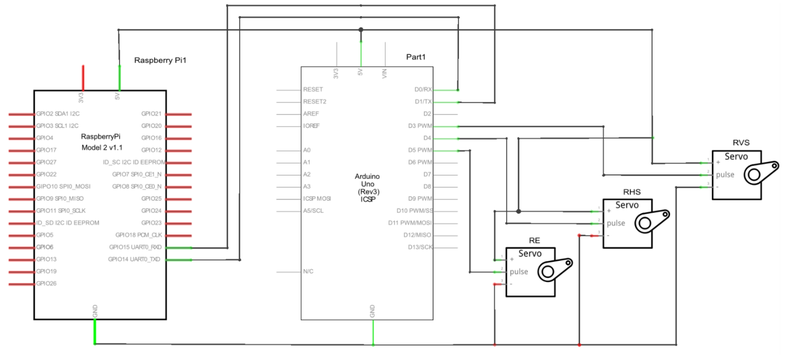
BLOCK DIAGRAM

The diagram below shows how the circuits in the project are connected.



ELECTRICAL CIRCUIT

The servos motors are tested with Arduino and connected to the Raspberry Pi at the same time.



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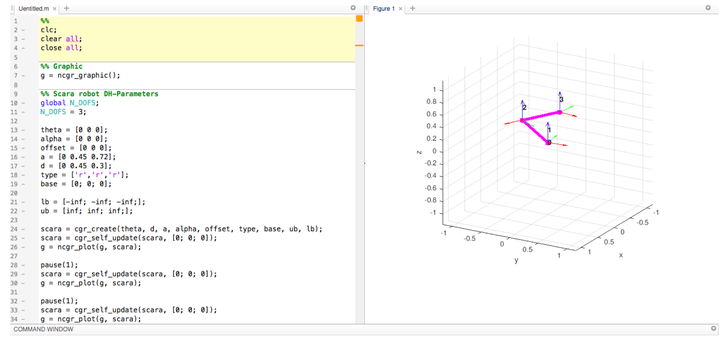
- Special Thanks to Professors Farrukh Zia and Dominica Sim

PROGRAM CODE



```
%%
clc;
clear all;
close all;

%% Graphic
g = ncgr_graphic();

%% Scara robot DH-Parameters
global N_DOFS;
N_DOFS = 3;

theta = [0 0 0];
alpha = [0 0 0];
offset = [0 0 0];
a = [0 0.45 0.72];
d = [0 0.45 0.3];
type = ['r','r','r'];
base = [0; 0; 0];

lb = [-inf; -inf; -inf;];
ub = [inf; inf; inf;];

scara = cgr_create(theta, d, a, alpha, offset, type, base, ub, lb);
scara = cgr_self_update(scara, [0; 0; 0];);
g = ncgr_plot(g, scara);

pause(1);
scara = cgr_self_update(scara, [0; 0; 0];);
g = ncgr_plot(g, scara);

pause(1);
scara = cgr_self_update(scara, [0; 0; 0];);
g = ncgr_plot(g, scara);
```

CONCLUSION

The work done on the casing and mounting frame of the servo motor will open a path for future work to be implemented not only into Roboqueeen, but can be used in any other project that involves servo motors. We also have been able to sync the movement of heads and arms with its speech, and the speech can be implemented in different languages.

FUTURE WORK

Areas of further research in this project are: Testing different 3D print infill percentage for the casing and mounting frame. Implementing Google Voice speech recognition to achieve a more human interaction towards people.

REFERENCES

- Roboqueen Portfolio
  https://openlab.citytech.cuny.edu/roboquin/
- 3D CAD file for the standard Servo Bracket
  https://www.pitsco.com/TETRIX-Single-Standard-Scale-Servo-Motor-Brackets
- HS-311 standard servo specifications and MATLAB program
  https://www.servocity.com/hs-311-servo
  https://matlab.mathworks.com/