

Project Proposal

Animatronic Hand

1. Introduction:

In this project, we will implement an animatronic hand using the Arduino microcontroller and control the animatronic hand using the manual hand movements. This project intends on replication of the manual hand movements as well as recording and re-implementation when triggered. We will be using the servo motors to control the animatronic hand and RF transceivers to communicate between the animatronic hand and microcontroller.

2. Description & Block Diagram of Project:

In this project, we will use fundamental concepts of mechanical design and Arduino architecture to create a robotic or animatronic hand. The hand will use servo motors to move and will communicate with the Arduino via the nRF24L01 module. The robotic hand will be controlled using a wireless glove. In short, this Animatronic hand will tie together seamlessly concepts used in mechanical, mechatronics and electrical engineering.

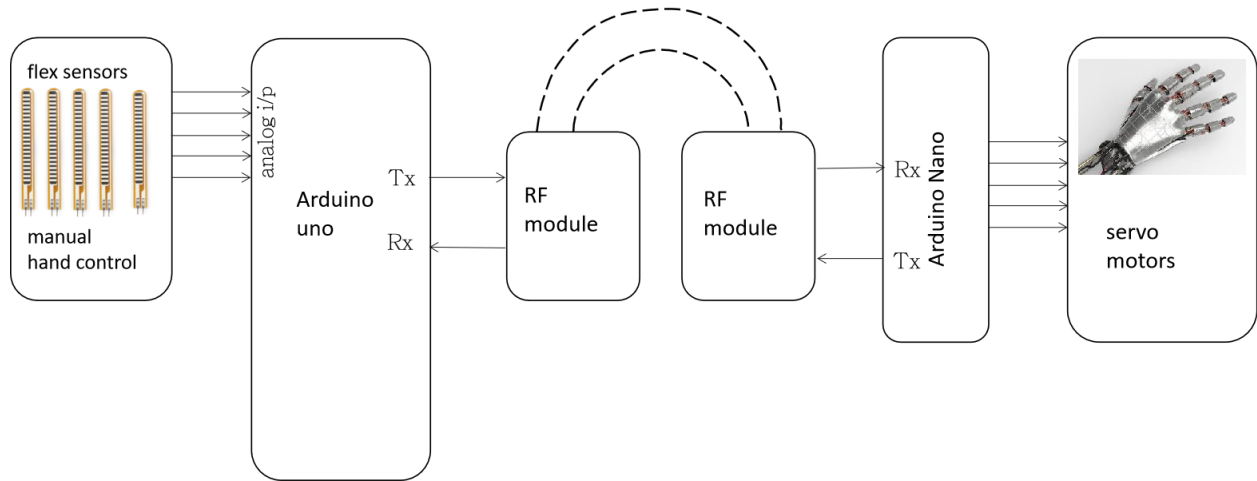
-A word about Animatronics:

Animatronics is the use of cable-pulled devices or actuators to animate a replica of a human or an animal, or bring lifelike characteristics to an otherwise inanimate object. We will be using strings pulled by servo motors to control the finger movements. The inputs can be taken using the sensors like flex sensors, accelerometers, etc.

-Flex sensor:

A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually, the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to the amount of bend it is used as goniometer, and often called flexible potentiometer. Hence these sensors can be used to sense the bending/movement of the fingers.

-Block diagram



-Project Brief:

1. The flex sensors are connected to an arduino which inturn is connected to a RF-module, this acts as a remote for the servos.
2. The servos are connected to another arduino which inturn is connected to another RF-module, acts as a controller for the servos.
3. The flex sensors are bent while the manual hand moves, hence the resistance of the flex sensors change thereby changing the analog voltage across it.
4. These analog inputs are taken to the remote arduino and are processed and transmitted to the controller arduino via the RF-modules.
5. The controller arduino is connected with the servos that pull the strings bidirectionally.
6. The strings are connected to the fingers of the animatronic hand.
7. The structure of the fingers in the animatronic hand are made using the cardboard in a manner that they have all the privileges to move in the required directions(hinging).
8. We will use three buttons which controls the operations like record, animate, replicate respectively.
9. The remote arduino contains the code for receiving the flex inputs and transmit to controller arduino as well as to record the flex inputs when the button is pressed.
10. The controller arduino contains the code for receiving the data via RF-module and controlling the servos as per the received data.

-Concepts required:

1. Basic mechanical engineering
2. Basic drafting and engineering drawing
3. Arduino architecture and Programming
4. Circuit-making and basic electronics

3. Table of Materials Required:

Content	Quantity	Expected price
Arduino Uno	1	400
Arduino Nano	1	300
nRF24L01	2	500
Servo motors	5	525
Flex sensors	5	2000
Buttons	3	80 (available as a pack of 10)
Strings	1 m	50
Resistors	5	20
Batteries	4	80
BreadBoard	1	80
Jumper cables		50
Glue Gun	1	150
Cardboard	-	
Expected total		INR 4235

4. Conclusion:

Thus the animatronic hand using the arduino microcontroller would be implemented. The concepts of basic mechanics, electronics and arduino are used alongside to create this project. In the advanced stages of this project we can use this animatronics for the industrial applications like industrial machinery, minor remote surgeries as well as in toys.

5. References:

1. Skyfilabs website
2. Advanced microcontrollers subject (from V semester)

6. Project Team:

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