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ANIMATRONIC HAND SYSTEM CONTROLLED BY HAND GESTURES

G Mayukha[1], Mrs.N.MenakaDevi[2]

[1]UG Scholar, [2]Assistant Professor

[1,2]Department of Electronics and Communication Engineering,

Hindusthan College of Engineering and Technology, Otthakalmandapam, Coimbatore, India.

Abstract: Animatronics is the use of mechatronics to create machines which seem animated rather than robotics. The figures are precisely customized with the exact dimensions and proportions of living creatures. Each joint of this hand has a movement range again the same as or very close to that of a human hand, including the thumb. Motion actuators are often used to imitate the movement of hand but here servo motors are used. Flex sensors are used to measure the defection or bending of the fingers. In this system we are using PWM(pulse width modulator) is used to convert message signals to electrical signals for transmission. The material used here for construction of Animatronic hand is chloroplast. This Animatronic Hand system imitates the gestures of the user's hand.

1. INTRODUCTION

Animatronics is an electro-mechanically animated puppet. It is a modern variant the automation and is often used for the portrayal of characters in films and in theme adventure park attractions. Before the term "animatronics" became common, they were usually referred to as robots. Since then, robots have become known as more practical programmable machines that do not necessarily resemble living creatures. Robots (or other artificial beings) designed to convincingly resemble humans are known as androids. Animation figures can be implemented using both computer control and human control. Motion actuators are often used to imitate muscle movements and create realistic motions in limbs. Figures are usually covered with body shells and flexible skins made of hard and soft plastic materials and finished with details like colors, hair and feathers and other components to make the figure morelike.

LITERATURE REVIEW

"Animatronic Hand Using Arduino" in this reference paper, the authors aim of designing this hand is to reduce human efforts and do the same task with less time using arduino-UNO and XBee technology. There are two main parts of this project i.e. transmitter (Control glove) and receiver (mechanical-electronic robotic hand). Control glove consists of flex sensors. There are five flex sensors arranged separately on each finger on the glove. Human hand give instruction to the another robotic hand; so that it is called as a control glove. This hand can make them independent movements. In industries many chemicals are used now a days especially in pharmaceutical companies and Research labs every day they have to deal with many chemicals in which some are harmless but some chemicals are really hazardous to human being for their skin like methyl isocyanate and Uranium for skin , so to deal with these kinds of chemicals the animatronic hand is veryuseful.

Keywords – ***Arduino-UNO, XBee technology, Flex sensor***

"Robotic Hand Controlling Based on Flexible Sensor" in this study authors construct a robotic hand designed to repeat finger movements depending upon flexible sensors. This flexible sensors are mounted on any wearable glove. In this paper, various sensors that detect the finger positions are used. The sensor that detects the angle of the fingers has been shown to provide high accuracy although cheap sensor is used in research. Moreover, by entering the sensor data into the open source interface program called Blender 3D, it can be seen on the program that how the hand of the animatronic hand moves. Thanks to the prototype of robotic hand in this study it is developed with different materials and mechanisms, it is possible to carry out experimental studies at low cost in places where it is dangerous for human health and safety. The angle data on the sensors and servo motor position information are transmitted through the RF 433 MHz wireless module in the transmitter side. The determinations related to Animatronic hand control are performed with Arduino card.

"Animatronic Rescue Module" in this reference paper the author's aim is to design hand from scratch using 3D designing tool using Google Sketchup, maintaining the proportions. The schematic was cut onto an acrylic sheet using laser to get the micrometer level precision accurately as we wanted. As the strings, we have chosen is badminton strings which can withstand high tension than others.

Widely popular development board Arduino UNO has been used as the platform, which has an ATMEL ATMega 328p as the processing chip. To sense the bending of the fingers, we have opted for Infrared sensor instead of flex sensors to keep the cost minimal. To get rid of the interference due to sunlight's infrared ray, we have built a cleverly designed device, which acts as a black box. To replicate the 6DOF movement of human arm, we have used MEMS (Micro Electro- Mechanical System) Gyroscope and Acceleration sensor. 5 servos control the fingers and arms from instructions by the Arduino.

"Wireless Animatronic Hand using Control Glove" in this research paper authors construct a wireless animatronic hand. The Wireless animatronic hand is basically a robotic hand which is operated by using a latest wireless technology. Intension of this product is to help in many of the industries where human hand is in the need to complete the required task; but it may harm human physically. Here, instead of using actual human hand, we can replace it by this wireless animatronic hand. We may allow this animatronic hand to complete the same task so that the risk of humans will be avoided and we can achieve the required task. A robotic hand is there, so here they are using a control glove, which can easily monitor the action of the human hand. This paper intends to implement an affordable and effective electronic product known as wireless animatronic hand based on wireless technology based on XBee-S2 as well as Arduino-UNO board.

2. SOFTWARE DESCRIPTION

The Arduino integrated development environment (IDE) is a cross-platform application for Windows, macOS, Linux that is written in the programming language C. It is used to write and upload programs to Arduino compatible boards.

Features

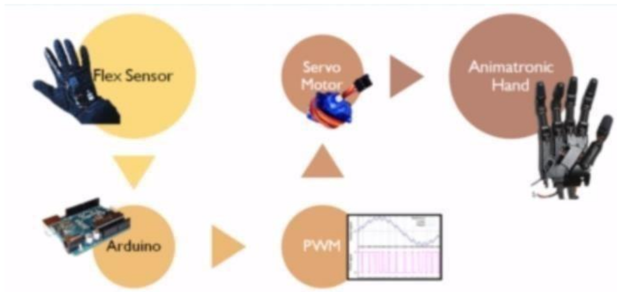
- Works offline (internet connection is not required).
- Open/edit Arduino sketches.
- Example sketches and libraries included.
- Code syntax highlighting.
- Compile sketches (no root required).
- Upload sketch.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

3. HARDWARE AND SOFTWARE USED

- Arduino-UNO
- Flex Sensors
- Servo motor

BLOCK DIAGRAM



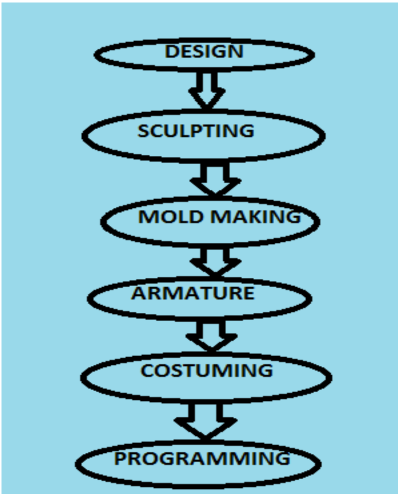
4. WORKING OF ANIMATRONIC HAND

In this model we can capture the movements and actions of the user by using flex sensors. Then we are using transmitting circuit which uses PWM(Pulse Width Modulation) to convert the signal from the observed form to transmitting form. Then there is Receiver circuit which receives the signal and sends to the servo motors for execution of the operation. When each finger bends, the corresponding **flex sensor** bends, thereby varying the resistance. The varying resistance show the value with which the movement and bend of the hand can be detected.

The arduino is programmed according to the need of the application. Similarly in this Animatronic Hand it receives the signal from the Flex sensors. Then according to the value of the sensors the Arduino sends the command to the servo motors connected to it. This performs very simple operation. When the pulse is high it charges the capacitor at constant rate. And when the pulse is low it discharges the capacitor connected to it. In this the standard circuit of Pulse width to Voltage converter is used. Servo motors are devices which are used here to convert the electrical energy into mechanical energy. It is a closed loop which automatically sends negative feedback for the correction of position. It has a rotator actuator which provides precise control over angular and linear position.

FLOW DIAGRAM

As we can see in this Flow Diagram the first step is to design the Animatronic Hand. In this major steps are design, armature and programming.



ADVANTAGES OF THE SYSTEM

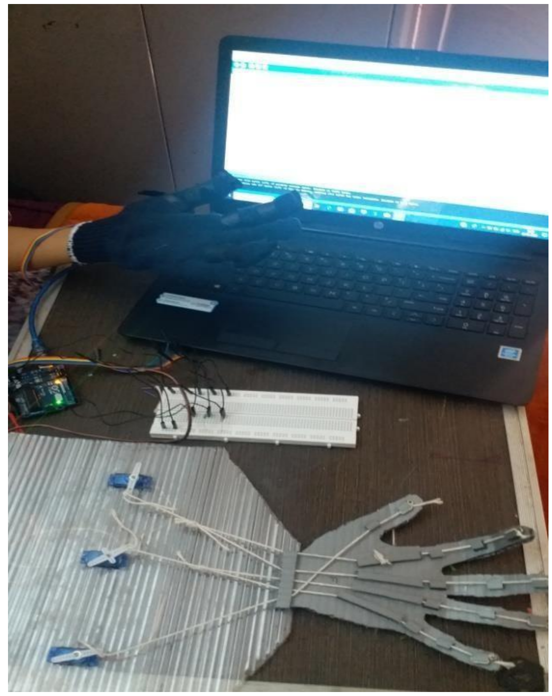
- Affordable
- Easy to use
- Can be used for risky tasks.

APPLICATIONS

- Bomb diffusals
- Chemical industries
- Nuclear Power plants
- Research Laboratories
- A limited amount of weight can be lifted.

5. OUTPUT

In output, the Animatronic hand system is constructed which is controlled by hand gestures is working and mimicking the gestures of the user's hand. As we can see that the gloves attached to the flex sensors is monitoring the gestures of the hand. Then it is connected to the Arduino-UNO which is programmed using Arduino IDE software. The instruction sent from arduino are given to servo motors. The servo motors controls the movement of the Animatronic Hand system.



6. CONCLUSION

The paper presented an Animatronic Hand system which is controlled by Hand Gestures. Hence now we can control this Animatronic Hand system by changing the hand gestures. We can use this Animatronic Hand system for several applications. This system may be very effective in pharmaceutical and medical industries more than others.

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