GESTURE BASED WIRELESS MOBILE ROBOTIC ARM USING FLUX SENSOR

Shifas P S[1], Sharmishta P K[2], Sravan sankar P P[3], Shereena E R[4] ,Binish M C[5]

[1,2,3,4] *BE Student, Electronics and Communication Engineering, KMEA Engineering College, Kerala, India*

[5] *Professor Electronics and Communication Engineering, KMEA Engineering College, Kerala, India*

ABSTRACT

Robotics is the current emerging technology in the field of science. These days a number of wireless robots are being developed for performing variety of operations. Demands for creating artificial arms for different inhuman situations, where human interaction is difficult or impossible is increasing day by day. The technology of controlling through gesture have become very popular in the interest of people. When the robot is in dangerous environment, robot human controlling may also become necessary. There for direct use of hand as an input to device is an attractive way for providing communication between humans and computer this demonstrate a robotic arm which works by 'shadow mode' features. Shadow mode is a feature in which the robot mimics the action of the user. Since we are proposing a robotic arm, it will mimics the movement of the arm of the user. The robotic arm can be controlled by a glove worn on our hand which has flex sensor in it. The robotic arm placed on a vehicle which can be controlled by a smart phone through Wi-Fi connection. This project mainly focus on military and medical field. In military it can be used for bomb diffusion applications. In medical field, contagious diseases like COVID 19 needs social distancing to avoid spread of diseases. As our project is gesture mimicing and even it is free to move, it can be used to assist patients.

Keyword : - *shadow mode, flex sensor, Wi-Fi module*

1. INTRODUCTION

Robotic arm is a programmable manipulator. We use robotics in our day to day life. The emerging world is now in the stage of artificial intelligence. The robotic arm is a non replicable material in the field of industries, military, medical etc. Due to its high repeatability ,accuracy, and efficiency. It has become an important part in the above field. We have seen robotic arm which are programmed and controlled through remote etc. The technology of controlling through gesture have become popular recently. When the robot is in a dangerous environment human controlling may also become necessary. These fore direct use of hand as input to the device is an attractive way for providing communication. Even through many projects where mode aiming gesture controlling most of them are wired and stable. Our project is based on wireless control and motion. The shadow mode feature, which mimics the movement of the arm is featured with wireless connection. The whole robotic arm can be moved to certain distance through a robotic vehicle. Which can be controlled through a smart phone.

Recently the number of terrorist attacks are increasing to disable the explosive materials like bomb, a remote control bomb disposal robot will do the job. But this robot is controlled by using joystick controller with button and some with computer based controlled or gamming console. The bomb experts using this need to have the ability to use this controller since its difficult to be used. The bomb disposed operations it not at all fast since the control is not intuitive. In our analyses this problem can be solved through our project. Since the robot are is gesture controlled it is user friendly. Skills for operating through button not required.

The main objective of our project is that;

- Sensor based robotic arm which mimics the movement of an actual human arm with various degree of freedom.

- Robotic arm that can be used in dangerous areas like mining areas, military and medicals

2. LITERATURE SURVEY

[1]Pushkar shukla, Bhumik gupta, Shailesh Bilsht, proposed MIMIC. The project is basically a robotic arm. They have attempted to propose an algorithm to control the mimicing action of the robotic arm that copy's the human arm movement. Algorithm as two steps, first is reading from the sensor and converted into mechanical movement into robotic arm using an estimation algorithm. Second step is an algorithm to eliminate the noise. One of the main advantage of this robotic arm is that it can completely replace human operations like bomb diffusion etc. Arm is constructed using acrylic glass. Arm have 5 degree of freedom. It uses six servomotors to control movement. This Arm can mimic flexion and extension. Mimic is done in 2 ways, either by using camera and other visual sensors like "kinetic", or by attaching colour bands to human arms for better recognition of different parts of human arm. Accelerometer , flux sensor, potentiometer are used for tracking movements of robotic arm.
[2] Gargi Saha, Jit Rakshit, Srijita Das proposed MIMICING ROBOTIC ARM. This robotic arm can copy the human arm movement with certain accuracy where human intervention is not possible. This paper shows the design and execution of a mechanical robotic arm using Arduino UNO which mimic the of human arm gesture. Here human machine interface is used for robots by using a DIY bend sensor, which works on basics of actual muscular movement. The Arduino UNO uses atmega 328 microcontroller. The working principle involves interfacing potentiometer and motors achieved by using Arduino board the bend sensor converts mechanical movement into electrical output. The microcontroller convert the signal from the potentiometer and generate digital pulses for activing the servo motors. The motor rotate as per the pulses and thus movement of the arm is achieved.
[3] Edwin Basil Mathew, Dushyant Khanduja, Bhavya Sapra, Bharat Bushan proposed ROBOTIC ARM CONTROL THROUGH HUMAN ARM MOVEMENT DETECTION USING POTENTIOMETERS. In this projects a number of situations exist where it is not possible for a human operations to do an activity on his /her own, due to level of danger of difficulty involved. The danger involves taking reading from active volcano entering buildings on fire, diffusion of a bomb or collecting a radio active sensor. The robotic are can be autonomous and controlled manually which adds up the characteristics to be used to perform various task with great accuracy the robotic arm can be fused on a mobile (wheeled) and can be designed for industrial or home application. There are so many ways in which a robotic arm cab be controlled and manipulated. Apart from this many researches have worked to operates robotic arm through computer terminals, joystick even interfacing them with internet so that they can be controlled and operated from any. A robotic arm by definition is a robot manipulator, usually programmed with function similar to a human arm. This project requires potentiometer, servomotor, Arduino Uno, power supply, frame. The robot require no training since robotic arm is controlled by user. This robotic arm can be provided with a camera so that the user controlled the robotic arm doesn't have to be in direct line of sight of the robot to be able to control it.
[4] Ahasan Ulla Rahul,M Tanseer Ali and Rakibull Ahasan proposed GESTURE BASED WIRELESS SHADOW ROBOT. In this project they presented an application of gesture mimic human robot interaction which has developed using kinetic sensors. The project contains a robotic body that mimics the hand gesture of the user body using kinetic sensor. The project mainly focusses on human hand gesture mimicing by a 17 degree of freedom humanoid. The project includes implementation and evaluation and simply joints angle calculation, utilizing wireless control for robot movements. Developing training mode to store and utilize repetitive robot movements, development of basic non-feedback static walking sequence for the forward walking of the shadow robot etc.
[5] Rahul sekhar, Rakesh Kiran Musalay, Yashwanth Krishnamurthy and shreenivas B, Proposed INERTIAL SENSOR BASED WIRELESS CONTROL OF A ROBOTIC ARM. The project involves the development of a wireless motion sensing control unit, the operation of which is based on inertial sensors, and extends its application to the control of an anthropomorphic robotic arm. MEMS inertial sensors are used in the system and accelerometer and gyroscope are used in the control unit. An additional accelerometer is strapped to the users arm. An accelerometer is used for measuring acceleration through an inertial frame of reference. This can be used to measure its orientation. Thus the orientation of the lower arm of the user is measured and this data is transmitted wirelessly to a receiver where processing is carried out. The robotic arm is programmed in such a way that it mimic the hand gesture of the users. Data processing is carried out on a low-cost microcontroller. The filters are used to smoothen the operation. The data transmitted from the controller has been analyzed in a real time using MAT lab.

The orientation of the control unit is then tracked and displayed. Low-cost components were used where possible, and hence microcontroller that are easily available in the market were used rather than digital signal processor. The system is intended to be modular, in that the measurement made by the control unit can be received on a computer and can be used.

3. PROPOSED SYSTEM

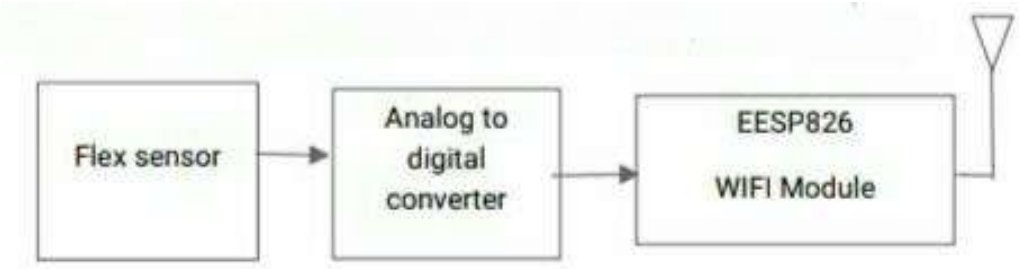

Fig -1: Block diagram transmitted section

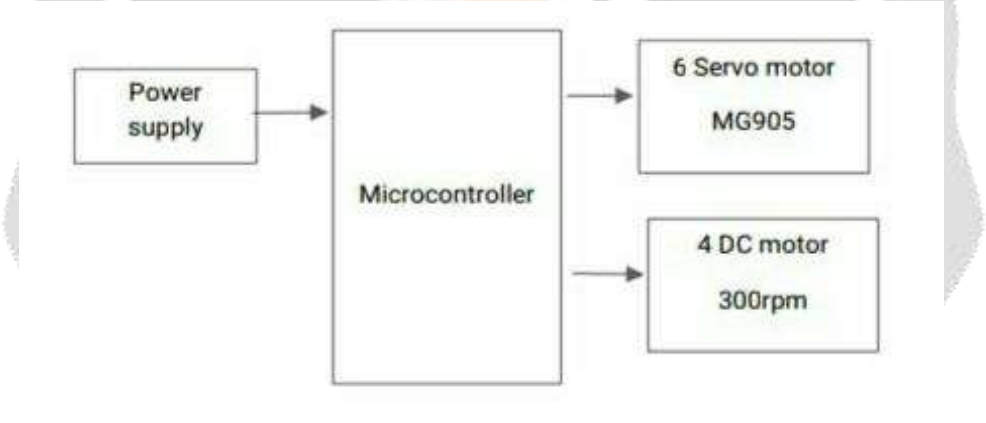

Fig -2: Block diagram of receiver section

The figure 1 shows the transmitter section of the shadow arm. The transmitter section contains the glove containing flex sensor. The flex sensor captures the movement and sent the readings using Wi-Fi to the receiver section. Receiver section fig 2 shows the receiver section. Receiver section includes robotic arm. The robotic arm mimics the movement by processing the data which it has received. The mimicing is the output of servomotor which has programmed using the received details from microcontroller. The robotic vehicle for the motion of the robotic arm is also embedded in the receiver section. The operation of the robotic vehicle is connected to the same microcontroller. which works by connecting Wi-Fi where controlled through a smart phone.

The robotic arm works on the principle's of "shadow mode" where the robot imitates the exact movement of the arm. The movement of each finger is sensed by flux sensor which fitted on a glove which is being worn by the person and the servo motors acts as actuators for the moving part of the robotic arm.

The flux sensor convert the physical movement into electrical signal which energize the actuated to produce mechanical movement. Analog to digital converter is used to convert analog signal from the flux sensor to digital signal and is passed to Arduino Wi-Fi module. Arduino Wi-Fi module is programmed to transmit the digital message from the ADC. This completes the transmitter section of the shadow arm.

The Arduino Uno is programmed to receive the transmitted signal from ESP8266. The microcontroller then process the received signal and convert them into requires pulse which are the input to the servo motors. As programmed the required movement is generated which is a replication of person's actual arm movement. The robotic vehicle is moved by programming micro controller for four wheel movements. According to the program DC motors are rotated and wheels are moved. This movement is controlled using smart phone which is connected to the same modem

4. RESULT

A complete mechanical design of a prosthetic hand was developed with the help of additive manufacturing technology. It is a multi-disciplinary project, a unique combination of medical science and computer aid designing and manufacturing. It is a bridge between the both discipline and future technology of manufacturing process. More than all this it is cheaper in cost compare to existing available prosthetic hands. Our project makes it unique, most favorable and user appropriate product

.

Fig -3: glove containing flux sensor

fig -4: Robotic arm

5. CONCLUSIONS AND FUTURE SCOPE

The ever improving field of Engineering and Robotics will continue to grow on and on because of the desire of us and the intriguing prospects it bring to its inventors and makers. It is a dream of any human to make a machine that does what he can do, or even more. Our project is a robotic arm that mimics the hand gesture.

Mimicing robotic arm is a common project. The improvement that we had done to it is the freedom of motion. The shadow arm not only mimics the movements but also moves to certain distance. The major advantage is that it is wireless. Our unique project can be very helpful in industrial robotic systems. We mainly focous on military and medical fields.

In medical fields, contagious diseases like COVID 19 is a nightmare. The disease rapidly spread through contacts. Since our project is gesture mimicing and even it is free to move, it can be used to assist patients. Our project doesn't have camera application. If we overcome this by modifying it with camera application, then it can be easier for the user to operate it with maintaining distances.

Same opinion comes in military field also. If camera is embedded in the robotic arm the soldiers can ensure more safety from explosion and bomb diffusion.

6. REFERENCES

[1]. Waseem Afzal, shamas Iqbal, “Gesture control Robotic arm using flex sensor”.
[2]. Pushkar shukla, Bhumika Gupta,”mimics”.
[3]. Gargi saha , Jit Rakshit, ”mimicking Robotic Arm”.
[4]. Rahul Shekar, Rakesh Kiran,”Inertial sensor based wireless control of a robotic arm”.
[5]. Edwin Basil Mathew,Dushyant Khanduja, ”Robotic arm control through Human Arm movement detection using potentiometer”.
[6]. Ahasan Ulla Ratul,M Ton seer Ali, “Gesture based wireless shadow robot”.
[7]. Rajesh kanan megaliangam,Nihil Saboo, ”Kinetic based gesture controlled robotic arm”.