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HAPTIC ARM ROBOT

Aishwarya Dhawale,Mayuresh Multani,Vrushali Deshpande
U. G. Scholars, P.E.S Modern College of Engineering
Mrs. S.V.Thuse
Professor, E&Tc,P.E.S Modern College of Engineering

***Abstract*–In today's world where scientific advancements are at a whole new level, the field of robotics have experienced a great leap. Automation and robotics have replaced "human touch" in many areas. For scientific explorations such as volcanic activity monitoring, Robots can be used instead of humans to avoid casualty. Robotics can also be used for Bomb identification and diffusion.**

This paper aims to contribute towards the above applications. In this we are going present a model to control a robotic arm through simple human gestures using Haptic Sensors. By mounting a three axis accelerometer on our arm, we can manipulate the Robotic Arm arrangement. The arrangement consists of a robotic arm, which is controlled by one accelerometer. This arm is placed on a base platform with four wheels, which is controlled by another accelerometer. Analog readings from accelerometer are transmitted by using zigbee to receiver unit. Received signals are processed by microcontroller and given to respective driving motors. A camera is mounted on this arrangement for controlling and monitoring purposes.

***Index Terms*- Accelerometer,ADC, PWM, Gesture, Robot, Wireless.**

I. INTRODUCTION

Gesture control is becoming a popular technique in many applications and various works has been implemented in this field. Researchers also worked on an Integrated Vision-based robotic arm interface for operators with upper limb mobility impairments which was developed to operate a commercial wheel chair-mounted robotic manipulator (WMRM).[7]

There are various ways in which a robotic arm may be controlled. In the past there have been many researchers working to control robotic arm through computer terminals, Joysticks [2], even interfacing them with the internet so they can be controlled from anywhere in the world. Usually most of the robotic arms are controlled by a central controller which makes uses of values taken in from the terminal that areentered by the user at the terminal to move the arm to a particular co-ordinate in space.

This makes the control very difficult as the control values of the motors are very difficult to predict to achieve a particular movement.

This is easily achieved byour project.The model is able to recognize our hand gestures and process them to control the robot accordingly [1]. Atmega powered controller is the core of this robot. This arrangement is placed on wheels to facilitate mobility. The controlling of robot is done wirelessly which makes it flexible giving it an advantage over existing implementations.

The process flow of our project is:

- Hand Gesture sensing
- Transmission of signal wirelessly
- Processing the signals (ADC)
- Driving Servo motors using PWM signals
- Delivering DC motor driving signals

II. METHODOLOGY

A BLOCK DIAGRAM

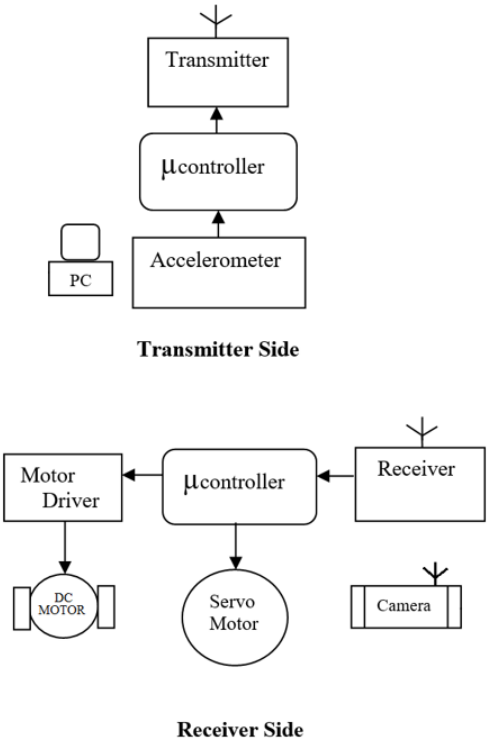

Fig.1 Block Diagram

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Transmitter: This device fits over the users hand like a glove. It consist of an accelerometer sensor, which detects users Hand movements. This detected analog output is sent wirelessly through Zigbee to Receiver.

Receiver Robotic Arm: Received analog output is converted to digital using AVR controller and used to manipulate the Arm. This is achieved by using servo motors in the joints of the arm. This arrangement is placed on a moving base, which will help us controlling the robot from a remote location.

Accelerometer: Sensor used for measuring acceleration of a moving or vibrating body.

LCD:LCD is 16×2 display, it displays the accelerometer output.

AVR Atmega 16 Controller:Itperforms analog to digital conversion of data. Processes the data and provides the corresponding PWM (Pulse Width Modulated) signals to servo motors and DC motor driver signals.

Zig-Bee: Used for wireless transmission and reception of data.

DC Motor: Used for driving Base wheel arrangement

Servo Motor: Used for Robotic Arm movements.

Camera: Mounted on the Robot for controlling and observing purposes.

B. SYSTEM OVERVIEW

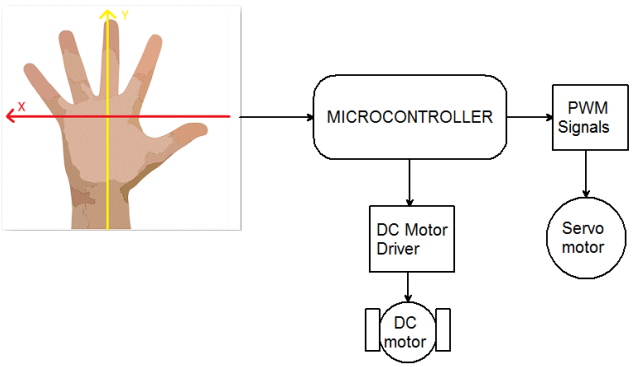

Fig.2System Overview

Overview of system is shown in above figure, simple hand gestures in a particular direction causes accelerometer to respond. This analog output is sent to microcontroller wirelessly. Zig-bee is used for wireless transmission which has a range up to 50 meters. Microcontroller is programmed to provide control signals for dc motor and servo motor.

Dc motor is used for driving Base wheel arrangement and Servo motor is used for robotic arm movements.
Three servo motors are used, one for shoulder to elbow movement, one for elbow to wrist movement and one jaw movement on wrist. A camera is placed on the system for monitoring the system, which transmits us a live feed on the monitor.

III. RESULTS

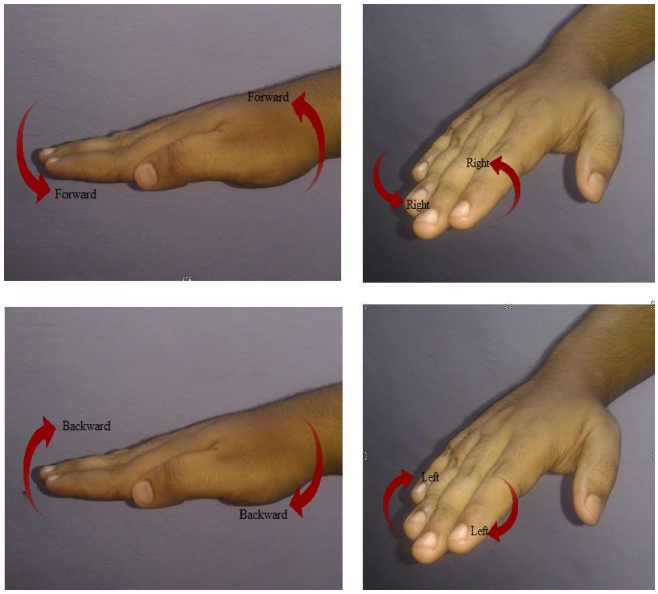

Fig.3Accelerometer gestures for Base-wheel arrangement control

First Accelerometer captures x, y axis movements successfully and moves the base robot in front, back, left and right directions accordingly. Second Accelerometer is placed in other hand and is used for manipulating the robotic arm.

IV. CONCLUSION

Human Machine Interface and Robotics platform can be utilized to avoid human casualties during bomb diffusion. In this paper we put forward an approach to control a robotic arm using Haptic technology. Accelerometer is used to sense simple hand gestures and manipulate the robot to perform any task. Two 3 axis analog accelerometers are used as input for capturing human arm movements. Using accelerometer for controlling the robot is more intuitive than programming a robot, since we can control it instantly in real time. It give us a natural feel of maneuvering and controlling. One of the advantages is that the overall system setup is simple and easy to understand. The arrangement is not bulky and has a low cost. Future scope includes increasing the range of the system by using alternatives to zigbee technology. As well as increasing the accuracy and throughput of the system by placing more accelerometers on human arm. Flex sensors is

also a possibility which can be used to replicate finger movements.

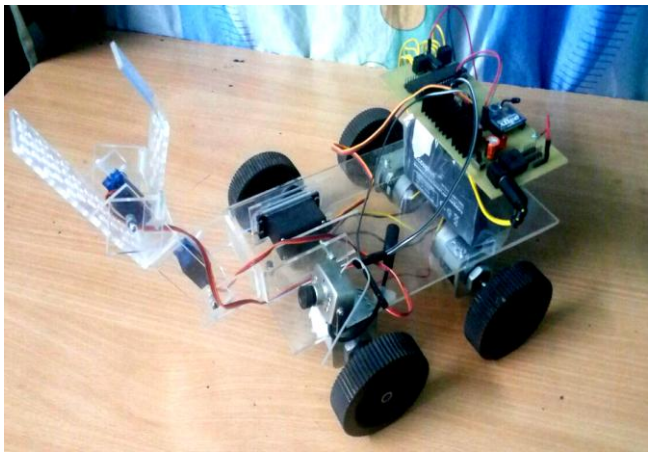

Fig.4 Final Setup

V. ACKNOWLEDGMENT

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First Author: Aishwarya Dhawale, B.E. E&Tc, P.E.S Modern College of Engineering, Pune.

Second Author: Mayuresh Multani, B.E. E&Tc, P.E.S Modern College of Engineering, Pune.

Third Author: Vrushali Deshpande, B.E. E&Tc, P.E.S Modern College of Engineering, Pune.

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