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Robot Controlled Using Hand Motion Recognition

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Abstract - In recent years, robotics is a booming technology in the field of science. The purpose of our project is to provide a hand motion controlled robot which is easy to use and handle. The hand motion controlled robotic arm, which is mounted on a robotic car, can lift a required object from a safe distance. The accelerometer controls the movement of the car and the motion of the arm. The development of accelerometer based wireless robotic arm is based on wearable accelerometers. The accelerometer is a three axis accelerometer. Accelerometers are used to measure the angular displacement of human hand motion. When it is mounted on hand glove and linked with the ARM controller, the signal transmitted by the acceleration force is sent to the ARM controller which after processing it sends to the ZigBee transmitter module through UART. The claw of the arm is operated with flex sensors. Wireless communication is obtained by ZigBee modules which are linked by ARM controller on both transmitter and receiver.

***Key Words*: Accelerometer, ARM, ZigBee, Flex sensor**

1. Introduction

Robotics is a new emerging technology in the field of science. Many universities across the world are trying hard to come up with new products in this field to help mankind. Robots can be controlled wirelessly or by using wired controller. In many of the fields robots have replaced humans but still they need to be controlled by them only. Earlier robot were controlled using physical devices but now a days they can be controlled using hand gestures. Hand gestures is the simplest and the natural way to control robots. Hand gesture controlled robots were developed in order to help mankind to they are reach places which are out of reach and hazardous to them. These robots have a transmitting side and a receiving side. The transmitter is mounted on the hand, while the receiver is mounted on the robot itself. The transmitter consists of accelerometer, flex sensor, ZigBee module and the ARM microcontroller and the receiver consists of Arm controller ,robotic arm ,motor driver ,a robotic car and ZigBee module. The accelerometer motion is used to control the robotic car while the flex sensors mounted on the fingers are used to control the claw of the robotic arm. The values of the flex sensors and the accelerometer are given to the Arm controller which processes it and is sent to the ZigBee module for transmission . The receiver receives these signals wirelessly via the ZigBee module and then sent to ARM controller for processing through the UART. These processed signals from the controller are used to drive the robotic car and for controlling the robotic arm. Receiver is mounted on the robot itself. The transmitter prototype consists of accelerometer, flex sensor, ZigBee module and the ARM microcontroller and the receiver prototype consists of ARM controller, robotic arm ,motor driver ,a robotic car and ZigBee module. The accelerometer motion is used to control the robotic car while the flex sensors mounted on the fingers are used to control the claw of the robotic arm. The values of the flex sensors and the accelerometer are given to the ARM controller which processes it and then are sent to the ZigBee module for transmission. The receiver receives these signals wirelessly via the ZigBee module and then sent to ARM controller for processing through the UART. These processed signals from the controller are used to drive the robotic car and for controlling the robotic arm.

1.1 Literature Survey

In the robotics field, several research efforts have been made to create user-friendly robots, implementing user interfaces such as colour touch screens, a 3D joystick. But, these techniques are not efficient to control the robot as they do not give accurate results and provide slow response time. In the past years the manufacturers of robot have made efforts for creating "Human Machine Interfacing Device" using gesture recognition concept. Various technologies like light based recognition, vision-based gesture recognition, finger gesture recognition and accelerometer based gesture recognition have been evolved for controlling the robots.

Light-based Gesture Recognition: Controlling robots with light sensors is being implemented in many cases. The sensors send some rays of light and track them as they gets absorbed in the surface or reflected back to it [5]. According to this, the robot can be line-sensing robots where it is made to follow a black or a white path.

Finger gesture recognition: It aims to make it feasible to interact with a portable device or a computer through the recognition of finger gestures.

Sixth Sense Technology: The Sixth sense technology began in 1990 by Steve Mann who implemented a wearable computing device via neck projector or head-mounted projector coupled with a camera. This technology uses designing applications that give an intuitive output with the connection of internet.

Some papers focus on the development of the robotic Arm by using Flex Sensor, ZigBee and 3 Servo motor connected to the Aurdino Uno which is controlled by processing software and a computer mouse. These robotic arms are cheap and easily available which makes it free from unnecessary wire connection, reducing its complexity. But still there is a requirement of adding new ideas and functionality [5]. The central goal of the paper is to implement a system through which the user can give commands to wireless Robot using gesture [5]. The user control or navigate the robot by using gesture of palm. Thus the robot is developed to reduce the man power in various fields like military, industry, construction sites, medical, etc.

2. Block Diagram

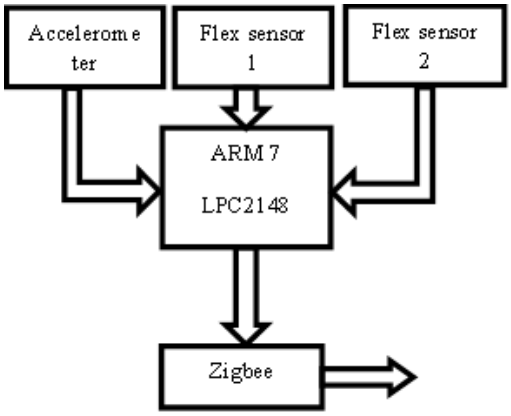


Figure 1. Transmitter

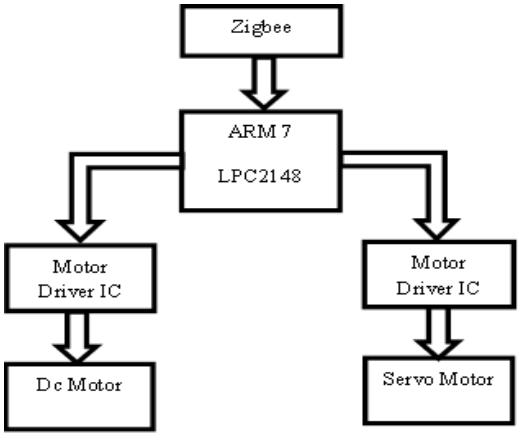


Figure 2. Receiver

3. Components

a) Accelerometer

The adxl335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. An accelerometer is an electromechanical device that measures acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic –caused by moving or vibrating the accelerometer. It is a kind of sensor which record acceleration and gives an analog data while moving in x, y, z directions or may be x and y directions only depending on the type of the sensor. In our project we have used two axes. Accelerometer is used to move the robotic car in forward, backward, left and right direction.

b) ZigBee Module

It is a high-level communication device which is used to create personal and low power digital network. It is based upon standard IEEE 802.15.4 and due to its low power the transmission distance limits up to 100 meters. It has a defined transmission rate of 256 Kb/sec. The purpose of ZigBee is to transmit signal wirelessly from transmitter to receiver. The output data from accelerometer will be sent to ARM controller which will then transmit this data to receiver through ZigBee module. At the receiver end the ZigBee will receive the data and send it to the ARM controller for further processing.

c) ARM7

We are using 32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package. ARM controller will be programmed to differentiate the different command coming from the transmitter to perform a particular task. At the receiver, ARM controller would receive the particular command and after processing it will perform the movement of vehicle and arm.

d) Flex Sensor

The flex sensor technology is based on the resistive carbon element. It requires an input of 5V, and the output varies from 0V to 5V according to the degree of bending in the flex sensor. 2 flex sensors attached to two fingers are used in the project to control the motion of the robotic arm as well as the movement of the claw. This helps us to move the arm in up and down direction as well as to hold the object using claw and to place it to the desired place.

e) Motor Driver

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to flow in either direction. As voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction. Therefore H-bridge IC is ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due to its size it is very much used in robotic application for controlling DC motors.

f) DC Motor

DC motor is used for the conversion of direct current into mechanical motion. The mechanical motion could be rotary or linear. The operation of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. DC motors can be used for the movement of the robotic car.

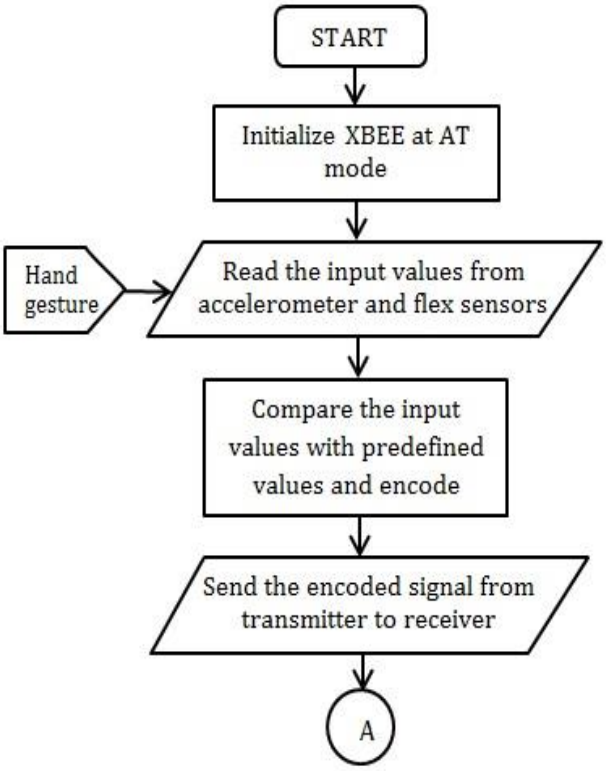
g) Servo Motor

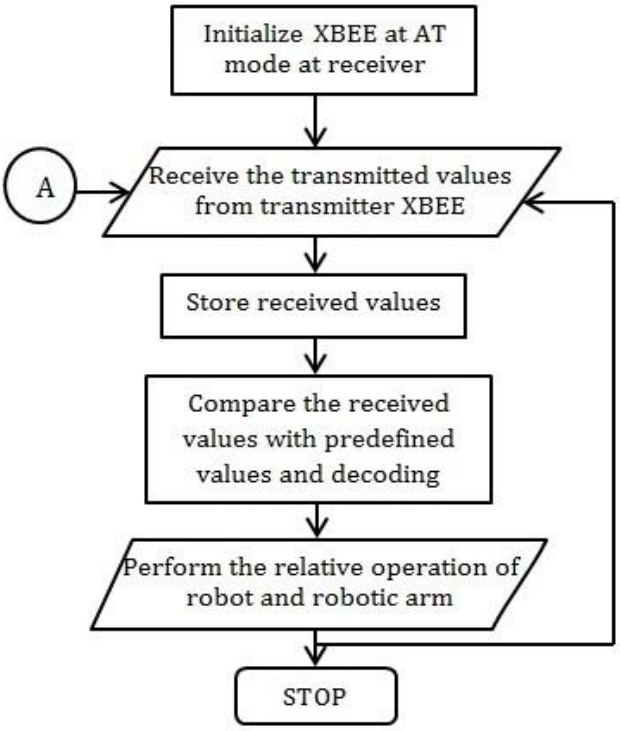
Once the servo is powered, the signal wire is ready to receive signal in the form of pulse width modulation (PWM) from an external source. The signal expects to be updated every 20 ms with a pulse between 0.5ms and 2.5ms. Servo motors can be used for specific movement of robotic arm. One servo motor is used in robotic arm for its up and down movement while the other is used for movement of claw.

h) Battery

A battery is device consisting of one or more electrochemical cells. A battery is device that directly converts chemical energy to the electrical energy. The purpose of battery is that ARM controller requires 3.3 volts, ZigBee requires 3.3 volts and servo motors require 12 volts to operate. High power battery is required to control the dc and servo motors.

4. Flowchart





5. Result

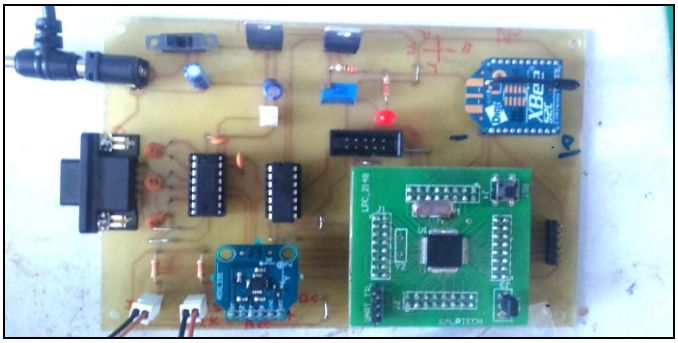


Figure 3. Transmitter Prototype

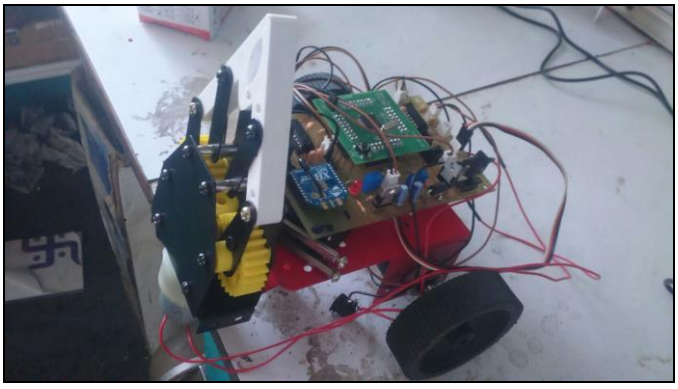


Figure 4. Receiver Prototype

6. Conclusion

The objective of this project has been achieved which was developing the hardware and software for an flex sensor controlled robotic arm and accelerometer controlled robotic car. From observations it is clear that movement of arm and car is precise, accurate, and is easy to control and user friendly to use .This robot control method is expected to overcome the problem such as placing or picking object that is away from the user or picking any hazardous object in a very fast and easy manner.

7. REFERENCES

[1] Premangshu Chanda, PallabKanti Mukherjee, SubrataModak, AsokeNath, "Gesture Controlled Robot using Arduino and Android", IJARCSSE, Volume 6, Issue 6, June 2016

[2] P.V.Patil, M.B.Shete, T.M.Padalkar, "Wireless Hand Gesture Robot using Accelerometer,Volume: 03 Issue: 04 , Apr-2016.

[3] Saurabh A. Khajone, Dr. S. W. Mohod, V.M.Harne "Implementation of a Wireless Gesture Controlled Robotic Arm" in IJIRCCE Vol. 3, Issue 1, January 2015.

[4] Vivek Bhojak, Girish Kumar Solanki, Sonu Daultani "Gesture Controlled Mobile Robotic Arm Using Accelerometer" in IJIRSET Vol. 4, Issue 6, June 2015.

[5] SwarnaPrabha Jena, Sworaj Kumar Nayak, Saroj Kumar Sahoo, Sibu Ranjan Sahoo, Saraswata Dash, Sunil Kumar Sahoo ,"Accelerometer Based Gesture Controlled Robot Using Aurdino" IJESRT.

[6] Archika Setia, Surbhi Mittal, Padmini Nigam,Shalini Singh, Surendra Gangwar "Hand Gesture Recognition Based Robot Using Accelerometer Sensor" in IJAREEIE in Vol. 4, Issue 5, May 2015.

[7] Pedro Neto, J. Norberto Pires, Member, IEEE, and A. Paulo Moreira, Member, IEEE "Accelerometer-Based Control of an Industrial Robotic Arm".

[8] N.V.MaruthiSagar, D.V.R.SaiManikanta Kumar, N.Geethanjali, "MEMS Based Gesture Controlled Robot Using Wireless Communication", IJETT – Volume 14 Number 4 – Aug 2014.

[9] Gaurav Gautam, Abhijeet Ashish, Anil Kumar, Avdesh, "Wirelessly Hand Glove Operated Robot", IJARECE Volume 3, Issue 11, November 2014