Hand Gesture Controlled Robot

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Abstract: **This paper describe that In today's world there is an increasing need to create artificial arms for different inhuman situations where human interaction is difficult or impossible. They may involve taking readings from an active volcano to diffusing a bomb. Here we propose to build a robotic arm controlled by natural human arm movements whose data is acquired through the use of accelerometers. For proper control mechanism and to reduce the amount of noise coming in from the sensors, proper averaging algorithm is used for smoothening the output of the accelerometer. The development of this arm is based on ATmega32 and ATmega640 platform along with a personal computer for signal processing, which will all be interfaced with each other using serial communication. Finally, this prototype of the arm may be expected to overcome the problem such as placing or picking hazardous objects or non-hazardous objects that are far away from the user.**

Keywords: **Accelerometer, ASK, CMOS, KEIL, Gesture, ATmega32.**

1. INTRODUCTION

Finalizing the decision of making a gesture controlled robot that will be manoeuvred by a hand gloved mounted with the transmission circuit assembly. The circuit assembly will consist of accelerometer & Arduino board along with an RF transmitter, which together function as a input device to the bot We decided on this project because we wanted to do a basic application of controlling a vehicle with your hand. The controls of our robot are based on gesture of hand, which becomes simple for any person to handle it. The basic working principle for our robot is passage of the data signals of accelerometer readings to the Arduino board fitted on the bot.

The program compiled in that arduino runs according to that value, which make the bot function accordingly .While we have used two-axis accelerometer. In which, one axis will control the speed in forward or backward direction and other axis will control the turning mechanism.
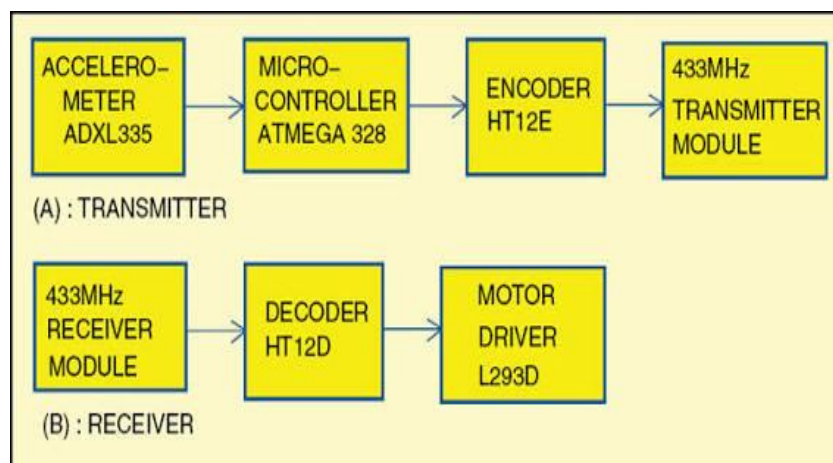

FIG1. BLOCK DIAGRAM TRANMITTER & RECEIVER

2. LITERATURE REVIEW

Hand gestures are a collection of movements or a pose or configurations of hand and arm performed by one or two hands, used to signify a certain meaning or used to communicate with others. Since the ability of the human hand to acquire a huge number of clearly observable configurations, hand gestures become the largest category of gestures among all gesture classes. Based on different application scenarios, hand gesture can be categorized into several classes like conversational gestures, communicative gestures, controlling gestures and manipulative gestures [10]. In general, people often make hand movement that is synchronized with their speech. Traditionally, these movements are called conversational hand gestures which convey semantic information in addition with speech [11]. Sign language is an important example of communicative gestures.

Sign language is highly structural and it can help a deaf one to interact with ordinary people or computers [12]. Controlling gestures are used in remote control applications such as consumer electronic control system [13, 14] and robot control [15]. Manipulative gestures assist as a natural way to interact with virtual objects. Teleoperation and virtual assembly are good examples for the applications of manipulative gestures [10].

3. METHODOLOGY

1. SOFTWARE MODULE:

For the operation purpose, the user application instructions are written programming code by using embedded c. The application program is compiled by using KEIL-C compiler and converts the source file into. hex file. For the dumping purpose, we use micro flash programmer. Here the program is dumped in the microcontroller ROM memory location. The µVision3 screen provides us with a menu bar for command entry, a tool bar where we can rapidly select command buttons, and windows for source files, dialog boxes, and information displays. µVision3 lets us simultaneously open and view multiple source files.

A project contains enough information to take a set of source files and generate exactly the binary code required for the application. Because of the high degree of flexibility required from the tools, there are many options that can be set to configure the tools to operate in a specific manner. It would be tedious to have to set these options up every time the application is being built; therefore they are stored in a project file. Loading the project file into KEIL informs KEIL which source files are required, where they are, and how to configure the tools in the correct way. The user of KEIL centers on "projects". A project is a list of all the source files required to build a single application, all the tool options which specify exactly how to build the application, and –if required – how the application should be simulated. The project can then be saved to preserve the settings. The project is reloaded and the simulator or debugger started, all the desired windows are opened. KEIL project files have the extension. Output to the output pins after processing the data. The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high current/high-voltage loads in positive-supply applications.

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

Transmitting section: The above transmitting diagram indicates the transmitting section which includes an accelerometer whose output is in continuous form as the encoder can only understands the digital data we are using the comparator for converting the analogy data to digital data and this data is to be transmitted so we are using radio transmitter which transmits the serial data converted by the encoder from parallel data.

Receiving section: The above receiving block diagram indicates the receiver section the transmitted data by the transmitter is received by the RF receiver and the serial data is given as input to the decoder which converts the serial data to parallel data and is given as input to the

microcontroller which consists of a pre defined program to fulfil our task, depending upon the data received the controller generates some signals to the motor driver LED's buzzer's etc., here the purpose of the motor driver is to drive the motors and here LED's and buzzer are used for some specific indications Various types of modules like ping module, GSM module are used. The ultrasonic sensor output signal is fed to the microcontroller in which a suitable embedded 'c'

program is written the algorithm here, to indicate the presence of an obstacle. Here the GSM module includes a SIM used for Tran's receiver for the controller to do a task which includes a glowing of bulb that represents a bomb.

2. HARDWARE DESIGN MODULE:

In cases there is a requirement of a mechanism where in the chair should be controlled without any physical contact. Therefore gesture is our choice in order to achieve this primary goal. Gesture is a nonverbal and easier physical action. A sensor that takes gesture as its input can do this job. The Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. The MMA7361L is a low power, low profile capacitive micro machined accelerometer featuring signal conditioning, a 1-pole low pass filter, temperature compensation, self test, 0g-Detect which detects linear freefall, and g-Select which allows for the selection between 2 sensitivities. Zero-g offset and sensitivity are factory set and require no external devices. The MMA7361L includes a Sleep Mode that makes it ideal for handheld battery powered electronics.

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources. The HT 12E Encoder ICs are series of CMOS LSIs for Remote Control system applications. They are capable of Encoding 12 bit of information which consists of N address bits and 12-N data bits. Each address/data input is externally programmable if bonded out. The HT 12D ICs are series of CMOS LSIs for remote control system applications. These ICs are paired with each other. For proper operation a pair of encoder/decoder with the same number of address and data format should be selected. The Decoder receive the serial address and data from its corresponding decoder, transmitted by a carrier using an RF transmission medium and gives

4. EXPERIMENTAL RESULTS

In the area of safety, for example, many machines require operators to place each hand on a control switch before the controller starts any action. Instead of having operators move their hands to special switches, why not simply let them hold up their hands with a gesture sensor? This type of control could improve productivity, reduce the effects of repetitive motions, and improve safety.

Advanced robotic arms that are designed like the human hand itself can easily controlled using hand gestures only. The arm controller wears the sensor gloves and the robotic arm will mimic the movement of the controller. Advanced robotic arms like these can perform complex and hazardous tasks with ease. Proposed utility in fields of construction, hazardous waste disposal, medical sciences.
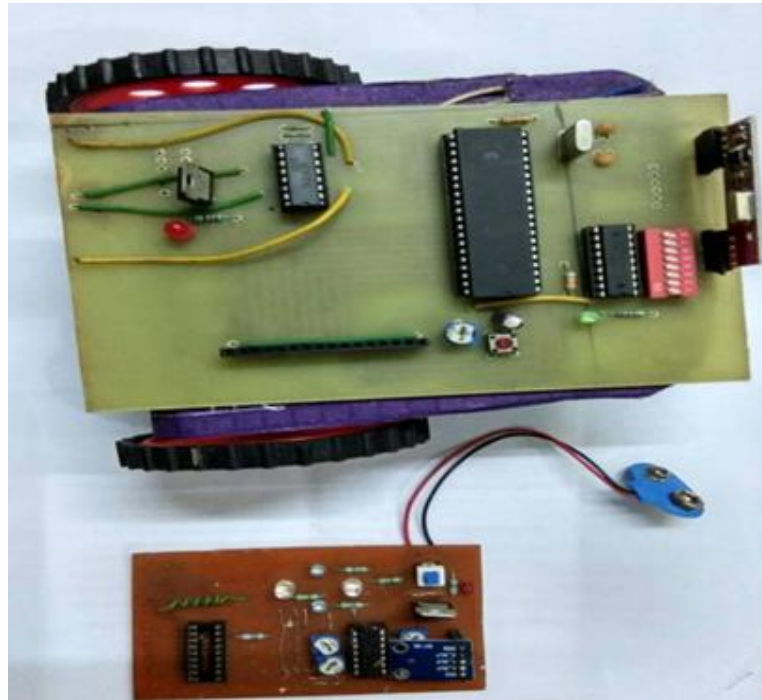

FIG 2. HAND MOVEMENTS

FIG 3. FINAL ROBOT

5. CONCLUSION

In our project we have added special features by which our robot can overcome so many problems in industry. If it is further developed then it can be used for military application. An Accelerometer is a kind of sensor which gives an analog data while moving in X,Y,Z direction or may be X,Y direction only depends on the type of the sensor. Here is a small image of an Accelerometer shown. We can see in the image that there are some arrow showing if we tilt these sensor's in that direction then the data at that corresponding pin will change in the analog form. An Accelerometer Controlled robot is a kind of robot which can be controlled by your hand gestures not by old buttons. You just need to wear a small transmitting device in your hand which included an acceleration meter. This will transmit an appropriate command to the robot so that it can do whatever we want. The transmitting device included a comparator IC for analog to digital conversion and an encoder which is use to encode the four bit data and then it will transmit by an RF Transmitter module. At the receiving end an RF Receiver module receives the encoded data and decode it by an decoder.

6. FUTURE SCOPE

The paper is built on a wired model. It could further be developed to work on wireless communication, thus allowing the user to move in an even easier unrestricted manner. A clamper can be connected on the motor M6 which will allow the movements of the palm and allow picking and placing of objects. Currently the accelerometer signal is being processed via a digital computer; this could be eliminated by using a fast microprocessor such as ARMv7, etc. It could also be possible to eliminate the ATmega32 altogether when ARMv7 is being used. The microprocessor could take the input from the accelerometer and smoothen it and then generate the corresponding PWM signal itself to actuate the servo motors.

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