© IJEDR 2018 | Volume 6, Issue 2 | ISSN: 2321-9939

Assembling And Stimulation Of Arduino Programed And Hand Gesticulation Governed Robot

[1]Akshay Agrawal, [2]Deepanshu Prasad, [3]Akash Agrawal, [4]Rahul Kumar Arya
[1-4]B.E mechanical
[1]Mechanical Engineering Department, Chhattisgarh Swami Vivekanand Technical University C.G-India 491001

Abstract— Influential applications have been taken out to manifest intelligent and compatible interfaces connecting users and computer-based systems based on human movements. Gestures implement an instinctive interface to both human and computer. Hence, before-mentioned gesture-based interfaces can not only supplant the conventional interface agents but can also be utilized to stretch their functionality. Gesture identification technologies are much blooming in present time. At this point, there is an ongoing study in this discipline and limited way of openly accessible implementations. Numerous methods have been discovered for sensing movements and commanding robots. A glove-based system is an innovative tool for understanding hand gestures. It employs a sensor associated to a glove that directly measures hand gestures. A Gesture Guided robot is a sort of robot which can be guided by hand gestures and not the aboriginal method by using keys. The user simply requires to wear a small transmitting device on his hand which incorporates a sensor which is an accelerometer in this case.

IndexTerms- Aurdino Nano, Sensor, Frame, MPU6050,Hand gesture.

I. INTRODUCTION

A robot is accustomed to an electro-mechanical machine that can perform tasks automatically. Some robots need some order of guidance, which may be accomplished by exercising a remote controller or with a computer interface. Robots can be self-governing, semi-autonomous or remotely controlled. Robots have improved so much and are proficient at imitating people that they seem to have an intention of their personal.

A significant feature of a flourishing robotic system is the Human-Machine communication. In the preceding years, the solely way to interact with a robot was to program which demanded high cognitive approach. By the progress in science and robotics, gesture-based recognition came to life. Gestures arise from any bodily action or state but ordinarily arise from the face or hand. Gesture identification can be regarded as a method for the computer to learn human body language. This has depreciated the demand for text interfaces and GUIs (Graphical User Interface).

Gesture identification technologies are much blooming in present time. At this point, there is an ongoing study in this discipline and limited way of openly accessible implementations. Numerous methods have been discovered for sensing movements and commanding robots. A glove-based system is an innovative tool for understanding hand gestures. It employs a sensor associated to a glove that directly measures hand gestures. A Gesture Guided robot is a sort of robot which can be guided by hand gestures and not the aboriginal method by using keys. The user simply requires to wear a small transmitting device on his hand which incorporates a sensor which is an accelerometer in this case. An action of the hand in a particular direction will send the command to the robot which will then proceed in a particular direction. At the drawing end, an RF Receiver module will obtain the encoded data and decode it by employing a decoder IC.

Literatures below give the idea for GESTURE CONTROLLED ROBOT

J. Davis et.al [1] in his research of Visual Gesture Recognition exhibits a technique for realizing human-hand gestures using a model-based path. A limited state machine is employed to form four qualitatively discrete aspects of a general gesture. Fingertips are traced in many frames to compute translating trajectories. The trajectories are then practiced for getting the start and stop position of the gesture. Gestures are interpreted as a file of vectors and are then matched to saved gesture vector models utilizing table lookup based on vector displacements. outcomes are presented showing identification of seven gestures using pictures examined at 4 Hz on a SPARC-1 without any specific hardware. The seven gestures are agents for actions of left, right, up, down, grab, rotate, and stop.

O. Rogalla et.al [2] in his paper Using gesture and speech control for commanding a robot assistant, giving advice to a mobile robot assistant still requires classical user interfaces. A more intuitive way of commanding is achieved by verbal or gesture commands. In this article, we present new approaches and enhancements to established methods that are in use in our laboratory. Our aim is to interact with a robot using natural and direct communication techniques to facilitate robust performance of simple tasks. Within this paper, we describe the robot's vision and speech recognition system. Then, we display robot control for selecting the appropriate robot reaction for solving basic manipulation tasks.

Jesus Suarez et.al [4] in his paper Hand gesture recognition with depth images: A review, presents a literature review on the use of depth for hand tracking and gesture recognition.

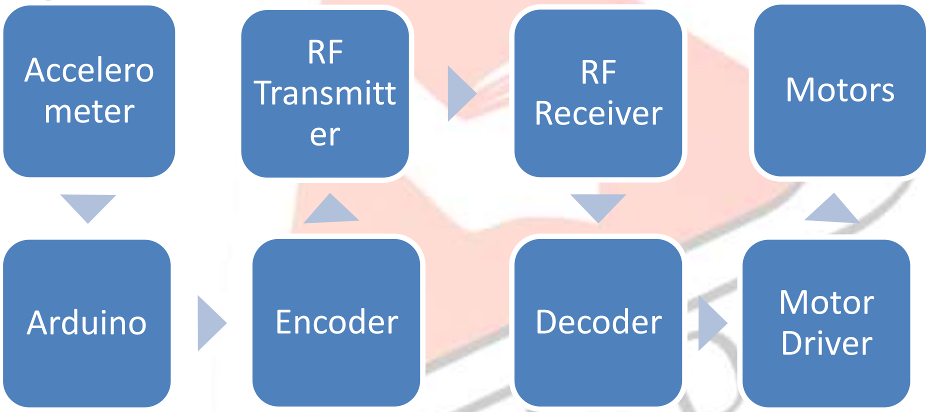
M.P. Singh et.al [8] in his paper, GESTURE CONTROL ROBOT, presumes that today human-machine intercommunication is moving away from mouse and pen and is converting pervasive and much more cooperative with the mechanical world. With each passing day, the passage between machines and humans is being decreased with the introduction of new technologies to alleviate the norm of living. Gestures have executed a vital role in depreciating this chasm. In this paper, a dogmatic analysis of "Human-Machine Interaction" using gestures has9 been acted. The system layout is partitioned into two parts namely: Accelerometer part and robot part.
Rahul Ranjan Singh [10] on his paper, Wireless Controlled Robot Movement System Designed preparing Microcontroller, presents a wirelessly controlled robot which can be controlled by simple human gestures. The robot can move forward, backward leftward & rightward within the transmitter device. The sensor will admit the movement of the hand in a specific direction which will result in the motion of the robot in the particular direction. Accelerometer part and robot part. The wireless receiver module assumes the wave signal transmitted by the wireless joystick transmitter module. Then the module decodes the wave signal and sends to the ATmega328P microcontroller through UART. UART attains for Universal Asynchronous Receiver Transmitter. It is generally used as a protocol for interacting with the microcontroller. Next, the microcontroller transmits the motor controlling signal to the L298 motor driver IC according to accepted wireless signal.

OBJECTIVE

Our objective is to make this device manageable as well as cheap so that it could be mass produced and can be used for a number of objects.
Our motivation to work on this project came from a useless person who was driving his wheelchair by hand with actually a lot of difficulty. So we wanted to make a device which would help such people force their chairs without even having the requirement to affect the wheels of their chairs.

LIST OF COMPONENTS USED

Our gesture controlled robot functioning on the principle of the accelerometer which records hand moves. That information is then transferred to an Arduino which takes various judgments based on the logic written on the Arduino and then signals are assigned to an encoder which makes it fit for RF communication. The information is obtained wirelessly via RF, and then passed onto the decoder is for decoding the erudition. These judgments are transferred to the motor driver IC which triggers the motors in different arrangements to make the robot move in a specific region. The following block diagram helps to explain the working of the robot:



We split our responsibility into two parts to make the job easy and simple and to bypass complexity and execute it error free. The first is the transmitting segment which involves the following elements: Accelerometer

- Ardiuno Nano
- RF Transmitter Module
- Encoder IC

The second is the receiving end which consist of following components:

- RF Receiver Module
- DC Geared Motors
- Motor Driver IC
- Decoder IC

Mpu-6050 Accelerometer + Gyro

MPU6050 entailed with 3-axis MEMS gyroscope, a 3-axis MEMS accelerometer. It is quite useful for some action detecting. This small module combines the logic level converter circuit（makes it congenial with 3.3V-5V voltage level) together with the MPU6050 sensor.

ENCODER IC (HT12E)

The encoder for controls the objective is (HT12E) is a (212) sequence encoder IC Integrated Circuit to remote control objectives. It is commonly used for radio frequency (RF) reinforcements. By using the matched HT12E encoder and HT12D decoder we can easily convey and obtain 12 bits of parallel data serially. HT12E simply converts 12 bit parallel data into serial output which can be forwarded through an RF transmitter. These 12 bit parallel data is classified into 8 address bits and 4 data bits.

RF MODULE (Rx/Tx)

This RF module holds an RF Transmitter and an RF Transceiver. An RF transmitter accepts serial data and dispatches it wirelessly through RF within its antenna connected at 4pin. The synchromesh befalls at the rate of (1Kbps - 10Kbps). The transmitted data is obtained by an RF receiver performing at the same rate as that of the communications.

DECODER IC (HT12D)

(HT12D) is a (212) series decoder IC (Integrated Circuit) for remote control purposes. It is generally applied for radio frequency (RF) wireless purposes. By working the paired (HT12E) encoder and HT12D decoder we can forward 12 bits of coextending data serially. HT12D just converts serial data to its input (may be received through RF receiver) to 12 bit parallel data. These 12 bit parallel data is divided into 8 address bits and 4 data bits. Utilizing 8 address bits we can afford 8-bit security cipher for 4-bit and can be utilized to direct multiple receivers by using the related transmitter.

MOTOR DRIVER IC (L293D)

Actuators are the devices which really gives the drive to do a job similar to that of a motor. In the present realm, there are several kinds of motors available which operate on various voltages. This needs a motor driver for driving them by the controller. The output from the microcontroller is a weak current signal. The motor driver augments that current which can control and drive a motor. In most cases, a transistor can act as a switch and execute this task which actuates the motor in a particular direction.

- Toggling a motor ON and OFF demands only one switch to regulate a single motor in a particular direction. We can invert the direction of the motor by only reversing its polarity. This can be accomplished by utilizing four switches that are organized in an understanding manner such that the circuit not only runs the motor but also guides its direction. Out of many, one of the most popular and ingenious design is an H-bridge circuit where transistors are ordered in a shape that mirrors the English letter H.
- As observed in the figure, the circuit has switches A, B, C and D. Toggling these switches ON and OFF can drive a motor various ways. When switches A and D area on, motor rotates clockwise.
- When **B** and **C** are working, the motor rotates counter-clockwise.
- When **A** and **B** are working, the motor will stop rotating.
- Turning off all the switches lead the motor to a free wheel drive.
- Turning on **A** & **C** at the same time or **B** & **D** at the same moment shorts the entire circuit.

DC MOTORS (BO MOTORS)

A machine that changes DC power into mechanical energy is known as a DC motor. Its principle is based on current carrying conductor is installed in a magnetic field, the conductor encounters a mechanical energy. Direct current motors have a revolving armature winding but non-revolving armature magnetic field and a stationary field winding or a permanent magnet. Various connections of the field and armature winding give different speed/torque regulation characteristics. The momentum of a DC motor can be regulated by alternating the voltage used to the armature or by alternating the field current.

METHODOLOGY

The accelerometer notes the hand movements in the X and Y paths only and outputs constant analog voltage levels. This output transfers to the Arduino which takes judgment according to the program coded. Arduino accepts the signals in analog form Pin A5 from SCL Pin of the accelerometer and Pin A4 from SDA Pin of the accelerometer, processing the signal converts into digital signals and give four digital signals at Pin D5, D6, D9 and D10.

.

This digital signal from corresponding pins is the input to the encoder IC at pins 13, 12, 11 and 10. The input to the encoder is identical while the output is a serial coded waveform which is proper for RF transmission. Four LEDs is soldered within the Arduino and encoder IC in data transmission line to verify the data transmission.

The RF transmitter modulates the input signal using Amplitude Shift Keying (ASK) intonation. It is the form of modulation that embodies digital data as fluctuations in the amplitude of a carrier wave.

This transferred signal is collected by the RF transceiver, demodulated and later transported over the decoder IC. The decoder IC decodes the coded waveform and the initial data bits are retrieved. Information is a following coded modulated waveform while the output in correspondence. The pin 17 of the decoder IC is the Valid Transmission (VT) pin. A led bulb is attached to this pin

which will show the state of the communication. In the case of a victorious transmission, the led will flash.

The signal is acquired by RF transceiver is fed into the pin 14 of Decoder and output of this information is forwarded to Motor driver IC from pins 10, 11, 12 and 13 to pins 7, 2, 15 & 10 sequentially. Left side motors are attached to pin 11(+ve) and 14(-ve) & the Right side motors are connected to pin 3(-ve) & 6 (+ve). Finally, motors get the motion due to the gesture.

SOFTWARE PROGRAM

The software program is coded in Arduino programming language. A programmed an Arduino Nano which has (ATmega328) microcontroller with the help of Arduino(IDE 1.8.5).

For using the (mpu6050) Accelerometer with Gyro, first download the Arduino library for (MPU 6050), produced by Jeff Rowberg. extract library, rename the folder to (MPU6050) and paste it inside the Arduino's "library" folder. for this, open the folder where Arduino is installed (Arduino --> libraries) and paste that in the libraries folder.

CODING PART

```
// MPU-6050 Short Example Sketch
// By Arduino User JohnChi
// August 17, 2014
// Public Domain
#include<Wire.h>
const int MPU_addr=0x68;  // I2C address of the MPU-6050
int16_tAcX,AcY,AcZ,Tmp,GyX,GyY,GyZ; // declare accellerometer and gyro variables
void setup(){
Wire.begin(); // initiate i2c system
Wire.beginTransmission(MPU_addr); // be sure we talk to our MPU vs some other device
Wire.write(0x6B);  // PWR_MGMT_1 register
Wire.write(0);     // set to zero (wakes up the MPU-6050)
Wire.endTransmission(true); // done talking over to MPU device, for the moment
Serial.begin(9600); // initialize serial port to 9600 bps so you can see your debug messages in Arduino IDE via debug channel
pinMode(5, OUTPUT);
pinMode(6, OUTPUT);
pinMode(9, OUTPUT);
pinMode(10, OUTPUT);
}
void loop(){ // main program loop
Wire.beginTransmission(MPU_addr); // get ready to talk to MPU again
Wire.write(0x3B);  // starting with register 0x3B (ACCEL_XOUT_H)
Wire.endTransmission(false); // done talking to MPU for the time being
Wire.requestFrom(MPU_addr,14,true);  // request a total of 14 registers
// all the fancy <<8| stuff is to bit shift the first 8 bits to
// the left & combine it with the next 8 bits to form 16 bits
AcX=Wire.read()<<8|Wire.read();  // 0x3B (ACCEL_XOUT_H) & 0x3C (ACCEL_XOUT_L)
AcY=Wire.read()<<8|Wire.read();  // 0x3D (ACCEL_YOUT_H) & 0x3E (ACCEL_YOUT_L)
AcZ=Wire.read()<<8|Wire.read();  // 0x3F (ACCEL_ZOUT_H) & 0x40 (ACCEL_ZOUT_L)
Tmp=Wire.read()<<8|Wire.read();  // 0x41 (TEMP_OUT_H) & 0x42 (TEMP_OUT_L)
GyX=Wire.read()<<8|Wire.read();  // 0x43 (GYRO_XOUT_H) & 0x44 (GYRO_XOUT_L)
GyY=Wire.read()<<8|Wire.read();  // 0x45 (GYRO_YOUT_H) & 0x46 (GYRO_YOUT_L)
GyZ=Wire.read()<<8|Wire.read();  // 0x47 (GYRO_ZOUT_H) & 0x48 (GYRO_ZOUT_L)
// the above lines have gathered Accellerometer values for X, Y, Z
//  as well as Gyroscope values for X, Y, Z

Serial.print("AcX = "); Serial.print(AcX); // share accellerometer values over debug channel
Serial.print(" | AcY = "); Serial.print(AcY);
Serial.print(" | AcZ = "); Serial.print(AcZ);
Serial.print(" | Tmp = "); Serial.print(Tmp/340.00+36.53);  //equation for temperature in degrees C from datasheet
Serial.print(" | GyX = "); Serial.print(GyX); // share gyroscope values over debug channel
Serial.print(" | GyY = "); Serial.print(GyY);
Serial.print(" | GyZ = "); Serial.println(GyZ);
delay(333 ); // delay a bit to not overwhelm you the user/programmer as you view the results

if (AcY > 10000) //forward
{
digitalWrite(5, LOW);
digitalWrite(9, LOW);
}
else if (AcY < -10000) //backward
{
digitalWrite(6, LOW);
digitalWrite(10, LOW);
}
else if (AcX >10000) //right
{
digitalWrite(5, LOW);
```

```
digitalWrite(10, LOW);
}
else if (AcX < -10000) //left
{
digitalWrite(6, LOW);
digitalWrite(9, LOW);
}
else
{
digitalWrite(5, HIGH);
digitalWrite(6, HIGH);
digitalWrite(9, HIGH);
digitalWrite(10, HIGH);
}
}
```

RESULT

The necessary motion is obtained. During the hand gesture is in +y direction, the robot drives Forward direction. Similarly, -y-direction gives backward, +x gives right, -x gives left motion. Communication by RF is reliable than IR because of many causes. Firstly, signals through RF can progress over larger ranges getting it proper for long-range applicability. Furthermore, while IR typically works in line of sight RF signals can progress even when there is an interference among transmitter & receiver. RF communication is durable and dependable than IR transmission. RF transmission uses a particular frequency, unlike IR signals which are influenced by other IR emitting sources. The transmitter/receiver combination functions at a frequency of 433(MHz)an RF transmitter collects serial data &transmits it wirelessly by RF through its antenna connected at Ant pin. Through this paper, we are in a status to command a robot wirelessly via gestures We draw conclusions to make favorable interaction with the robots. This is a simple method to interact with robots outwardly any special preparation. By decent implementation, this theory will be a stepping stone in the robotic world.

CONCLUSION AND SCOPE OF FUTURE WORK

We accomplished our goal without any difficulties i.e. the government of a robot practicing gestures. The robot is exhibiting fitting responses whenever we move our hand. Various Hand gestures to
make the robot move in particular ways are as follow:

Figure-3

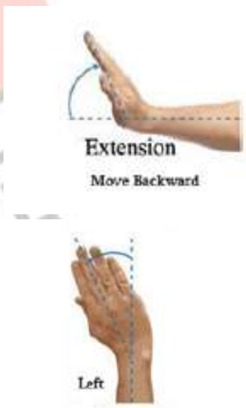


Figure-4

SCOPE OF FUTURE WORK

- As we are employing RF for wireless communication, the range is short(50- 80m).This problem can be resolved by employing a GSM module for wireless communication. The GSM foundation is installed around all over the globe. GSM will not only provide wireless connectivity also also a wide range.
- An onboard camera could be installed to govern the robot from remote places. All we require is a wireless camera which would broadcast and receive module which will provide live telecasting

REFRENCE

[1] J. Davis, M. Shah, "Visual Gesture Recognition", IEEProc.-Vis. Image Signal Process, vol. 141, no. 2, April 1994.
[2] O. Rogalla, M. Ehrenmann, R. Zollner, "Using gesture and speech control for commanding a robot assistant", DOI: 10.1109/ROMAN.2002.1045664, 27-27 Sept. 2002.
[3] Mr.Pravin Vaishnav, Mrs.Shalini Tiwari, "Accelerometer Based Hand Gesture Controlled Robot", Volume 4 Issue 3, March 2015.

[4] Jesus Suarez, Robin R. Murphy, “Hand gesture recognition with depth images: A review”, DOI: 10.1109/ROMAN.2012.6343787, 9-13 Sept. 2012.
[5] S. Mitra and T. Acharya, "Gesture Recognition: A Survey," Systems, Man, and Cybernetics, Part C: Applications and Reviews, vol. 37, pp. 311-324, 2007.
[6] Monika Jain, Aditi, Ashwani Lohiya, Mohammad Fahad Khan, Abhishek Maurya, ”WIRELESS GESTURE CONTROL ROBOT: AN ANALYSIS” International Journal of Advanced Research in Computer and Communication Engineering Vol. 1, Issue 10, December 2012.
[7] Waldherr, S., Thrun, S., and Romero, R., “A Gesture based interface for
a. Human-Robot Interaction”, Kluwer Academic Publishers, Netherland, 2000.
[8] M.P. Singh, Abhinav, Soniya, Sushil, “GESTURE CONTROL ROBOT”, International Journal of Innovative Research in Science and Engineering, Vol. No.1 Issue 06, November 2015.
[9] Das, S., Toya, L., Green, Perez, B., and Murphy, M. M., “Detecting User Activities using the Accelerometer on the Smartphone”, Team for Research in Ubiquitous Secure Technology REU Research Program, July 2010.
[10] Rahul Ranjan Singh, Deepak Rasaily, Rishu Kumar "Wireless Controlled Robot Movement System Desgined using Microcontroller", International Journal of Engineering Trends and Technology (IJETT), V32(5),204-207 February 2016.
[11] “International Journal of Current Trends in Engineering & Research” (IJCTER) e-ISSN 2455–1392 Volume 3 Issue 4, April 2017 pp. 90 – 91 Scientific Journal Impact Factor : 3.468 <http://www.ijcter.com>
[12] “International Journal of Science and Research” (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438 www.ijsr.net
[13] http://www.rroij.com/open-access/hand-talka-sign-language-recognitionbased-on-accelerometer-and-semg-data.php?aid=51400
[14] https://patents.google.com/patent/US9696867