Hand Gesture Controlled Vehicle

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Abstract- *Robotic Vehicle movement is with the hand movement gesture is difficult task in implementation. Monitoring of robotic system with human interaction is done by many researchers. However, the system does not performed well compare with other hand gesture systems. In this paper, an advanced robotic hand gesture system which is implemented with integrated system with advanced components. The design of the system is based on a simple, flexible and minimal control strategy. With the different types of gestures the system is developed to make easy use by the physically challenged people. In many of the applications this becomes the part.The objective is to portray the control of the robot using the accelerometer with the help of human hand tilting. Accelerometer signals are received and assisted with wired correspondence. The robot moves depends upon the signal made by your hand and from a separation. In this paper we describe approximately the gesture manage robot which may be managed through your everyday hand gesture.*

I. INTRODUCTION

Robots are used to do the work, that human can't perform. To raise the usage of robotics where restrictions that are not mandatory, for example, fire handling task or protection task.

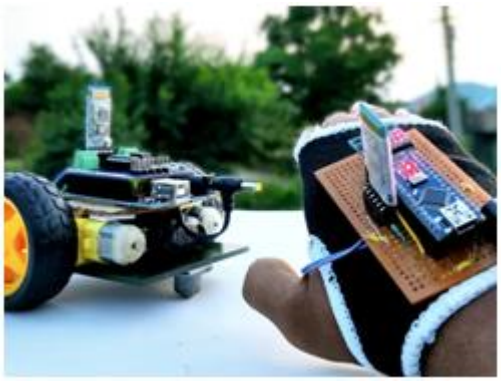

Fig1.1: Hand gesture controlled vehicle

The device as shown in the fig 1.1 receives the input from the user and work out according to the received input. Human hand motions are received by the wire connected to the accelerometer. The robots travel by motion made by the user hand tilting. The objective of this wired control device is achieved using NodeMCU, accelerometer. Here the most significant device is accelerometer. The accelerometer is the 3 axis estimation gadget with +-3g range. This gadget is made by utilizing polysilicon surface sensor and signal controlling circuit to quantify acceleration. The outcome of the accelerometer is analog in nature and corresponding to the acceleration. This gadget measures the static acceleration of gravity when we tilt it and gives an outcome in type of movement or vibration.

The NodeMCU microcontroller receives the analog input values (x axis, y axis) from the accelerometer and converts that analog value to digital value. The input is received by the NodeMCU microcontroller after titling. The robot turns left and right when we tilt our palm to left and right respectively .It moves forward when the palm tilted forward and backward if the palm is tilted backwards. The device halts while it is corresponding to the surface. In this manner, we are able to Use the device to work out those tasks that will be useful for human beings. In the venture we portray regarding the signal to manage robot that can be manage by your typical hand motion.

II. LITERATURE SURVEY

RiyazMansuri, SandeshVakale, AshishShinde, Tanveer Patel, "Hand Gesture Control Robot Vehicle", IJECT, Vol-4, Issue SPL-2, PP:77- 80, 2013 [1]: In this paper, approach is integrated with security surveillance has been described. The user can observe the real time images or live video footages around this designed system continuously. By using various integrated advanced components are utilized to improve the performanceof the hand gesture controlled robot.

Design of IOT Based and Hand Gesture Controlled Robot using MpU-6050 and NODEMCU N.Trinadh Kumar1, N.Neeraja2, Amar Kumar Sharma3 , Dr.Suman Maloji [3]:The author explains about the "Improvement of hand motion acknowledgment sensor hooked in to quickening agent and spinner for controlling arm of submerged remotely worked robots". The hand signal sensor relies upon accelerometer and whirligig. The author also described about the basic wearable hand motion gadget utilizing establishment of clinical and early current examinations. Cooperating with frameworks is finished with the help contact screen, wired or remote mouse and with the console.

'A study on gesture control ardiuno robot'Ashutosh zagade1 , Vishakha Jamkhedkar2 , Shraddha Dhakane3 , Vrushali Patankar4 Prof. Dr.Amol Kasture5 , Prof.Vijay Gaike [4]**:** The purpose of project is to control a toy car using accelerometer sensors attached to a hand glove. The sensors are intended to replace the remote control that is generally used to run the car. It will allow us to control the forward and backward, and left and right movements, while using the same accelerometer sensor to control the throttle of the car. based on the hand movements. By using the above mentioned components the hardware was setup, thus resulting in the formation of a robot. In order to implement the experiment a Dell laptop was used, whose web camera acted as the input device for capturing the video. The software part was developed in Java for image processing wherein the hand gestures were analyzed to extract the actual direction. Eclipse Ide was used for developing the java code. The direction thus identified was send as characters to the robot with the help of Zigbee. XBee S2 version of Zigbee was used for enabling the communication.

Vicky Somkuwar, RoshanGabhane, Sandeepkakde, "Design and Implementation of Gesture Controlled Robot Using Flex sensor and Accelerometer [5]:In this paper robot has been developed which is according to human hand gesture. The robot is showing proper responses whenever we move our hand. Different Hand gestures to make the robot in specific directions are left, right, forward, backward. In this project the robot senses any obstacle comes in it's path, avoids it and resumes it's running.

Harish Kumar Kaura, VipulHonrao, SayaliPatil, PravishShetty, "Gesture Controlled Robot using Image Processing",International Journal ofAdvancedResearch in Artificial Intelligence (IJARECE), PP.69-77, Vol-2, No.-5[2013] [10]:"A MEMS Sensor based single arm Robotic system" is successfully designed and tested. The Robot works according to a person's hand movements and also does certain pick and place task. A Robotic ARM with Jaws is used for the pick and place purpose. This project if implemented on wheel chair can be helpful for Disabled people and old aged people. It can be useful for moving heavy loads from one place to another. RF Technology is used for longer range communication. This is project is user friendly and gives accurate result.

Gaurav, Gautam, Abhijeet, Ashish, Anil Kumar, Avdesh, "Wirelessly Hand Glove Operated Robot", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Volume-3, Issue-11, PP.-1546-1547, November 2014 [11]: The wireless accelerometer based mouse is designed to make our day to day operations on the PC more convenient and time saving. This introduces entirely different technology in navigation compared to earlier Ball mouse with opt coupler or latest optical image processing based mouse. Simple low cost, low power inertial sensor based mouse with wireless capability will provide ease of use. It can be converted to be useful in 3-d gaming application. It also provides health benefits by preventing a problem of carpel tunnel syndrome caused due to the use of keyboard and mouse.

Aswath S,Chinmaya Krishna Tilak, Amal Suresh and GaneshUdupa, "Human Gesture Recognition for Real – Time Control of Humanoid Robot", International Journal of Advance in Mechanical and Automobile Engineering (IJAMAE), Vol- 1, Issue 1,PP: 96-100,2014 [9]**:** This paper is about how car is controlled by recognizing different gestures of a person's body generally hand movements. This will help a person to easily control the automated car to move in different direction as per requirement of the user. Any robot can be controlled wirelessly by using human gestures. The robot is very easy to control as it is based on human actions. It also can be used for military surveillance activities, in medical applications like surgery and can be used for entertainment purpose as well.

Anup Tiwari, Ghanwar Rohit Kumar, S. Madhava Reddy, "Gesture Controlled Robot with Obstacle Avoidance using Arduino and Android" (IRJET) Volume: 06 Issue: 06 | June 2019 [12]:In this paper, Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested. This kind of robot gives an intelligent approach to help physically challenged people to reach their destination, in military applications, in domestic use, in material handling
Chirag Gupta, Nitin Garg "Gesture Controlled Car" IJEECS, ISSN 2348-117X, Volume 3, Issue 9November 2014 [13]:The purpose of project is to control a toy car using accelerometer sensors attached to a hand glove. The sensors are intended to replace the remote control that is generally used to run the car. It will allow us to control the forward and backward, and left and right movements, while using the same accelerometer sensor to control the throttle of the car.

Xing-Han Wu, Mu-Chun Su and Pa-Chun Wang, "A hand-gesture based control interface for a car robot," 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems, Taipei, 2010,4644-4648 [14]:In this paper, a hand-gesture-based control interface is introduced for navigating a

car-robot. A 3-axis accelerometer is adopted to record a user's hand trajectories. The trajectory data is transmitted wirelessly via an RF module to a computer. The received trajectories are then classified to one of six control commands for navigating a car-robot. The classifier adopts the dynamic time warping (DTW) algorithm to classify hand trajectories. Simulation results show that the classifier could achieve 92.2% correct rate.

III. METHODOLOGY

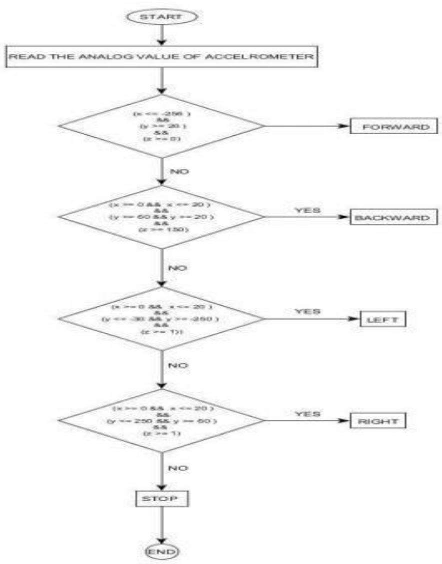

Fig 3.1: Methodology

The accelerometer is kept on the palm of the user and the robot moves in steps with the palm movement. In this paper we explained about 5 distinctive gestures role of the person's hand i.e halt condition, front moving, backward moving and turns towards right and left. Conditions are set for x axis and y axis and the robot changes its direction according to the specified range. Here we use accelerometer to transmit the axis value to the NodeMCU. The axis is changed according to the Hand tilt of the user and the axis value is sent to the NodeMCU repeatedly. If the user turns the accelerometer towards front simultaneously the robot moves forward. If the user turns the accelerometer towards backward, simultaneously the robot moves backward. If the user turns the accelerometer toward left, simultaneously the robot turns left. If the user turns the accelerometer towards right, simultaneously the robot turns right. If the user keeps the accelerometer parallel to the ground, simultaneously the robot stops moving.

IV. SYSTEM COMPONENTS AND SPECIFICATIONS

ACCELEROMETER- MPU6050

Fig 4.1: Accelerometer- MPU6050

MPU6050 sensor module as shown in fig 4.1 is complete 6-axis Motion Tracking Device. It combines 3-axis Gyroscope, 3-axis Accelerometer and Digital Motion Processor all in small package. Also, it has additional feature of on-chip Temperature sensor. It has I2C bus interface to communicate with the microcontrollers. It has Auxiliary I2C bus to communicate with other sensor devices like 3-axis Magnetometer, Pressure sensor etc. If 3-axis Magnetometer is connected to auxiliary I2C bus, then MPU6050 can provide complete 9-axis Motion Fusion output.

The MPU-6050 module has 8 pins:

INT: Interrupt digital output pin.

AD0: I2C Slave Address LSB pin. This is 0th bit in 7-bit slave address of device. If connected to VCC then it is read as logic one and slave address changes.
XCL: Auxiliary Serial Clock pin. This pin is used to connect other I2C interface enabled sensors SCL pin to MPU-6050.
XDA: Auxiliary Serial Data pin. This pin is used to connect other I2C interface enabled sensors SDA pin to MPU-6050.
SCL: Serial Clock pin. Connect this pin to microcontrollers SCL pin.
SDA: Serial Data pin. Connect this pin to microcontrollers SDA pin.
GND: Ground pin. Connect this pin to ground connection.
VCC: Power supply pin. Connect this pin to +5V DC supply.

1111111111111111111111111111111111111111111111111 1111111111111111111111111111111111111111111111111 1111111111111111111111111111111111111111111111111 11111111114NodeMCU (ESP8266).

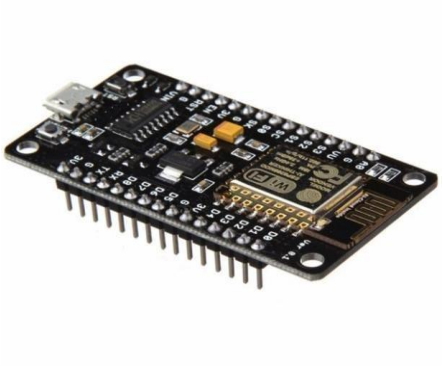

Fig 4.2: NodeMCU (ESP8266)

NodeMCU as shown in fig 4.2 is an open-source Lua based firmware and **development board** specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hardware which is based on the ESP-12 module.

The **NodeMCU ESP8266 development board** comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in- built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface. NodeMCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISCCPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects

MOTOR DRIVER- L298N

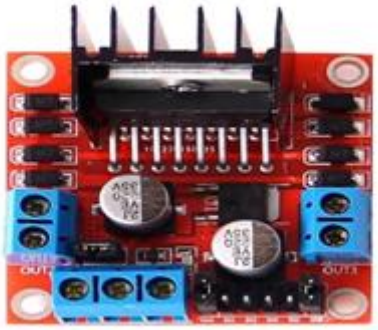

Fig 4.3: Motor Driver- L298N

This **L298N Motor Driver Module** as shown in fig 4.3 is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. **L298N Module** can control up to 4 DC motors, or 2 DC motors with directional and speed control.

78M05 Voltage regulator will be enabled only when the jumper is placed. When the power supply is less than or equal to 12V, then the internal circuitry will be powered by the voltage regulator and the 5V pin can be used as an output pin to power the microcontroller. The jumper should not be placed when the power supply is greater than 12V and separate 5V should be given through 5V terminal to power the internal circuitry. ENA & ENB pins are speed control pins for Motor A and Motor B while IN1& IN2 and IN3 & IN4 are direction control pins for Motor A and Motor B. L298 Module Features & Specifications:

- Driver Model: L298N 2A
- Driver Chip: Double H Bridge L298N
- Motor Supply Voltage (Maximum): 46V
- Motor Supply Current (Maximum): 2A
- Logic Voltage: 5V
- Driver Voltage: 5-35V
- Driver Current:2A
- Logical Current:0-36mA
- Maximum Power (W): 25W
- Current Sense for each motor
- Heatsink for better performance
- Power-On LED indicator

DC MOTORS

Fig 4.4: DC Motor

A **DC motor** as shown in fig 4.4 is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

POWER SUPPLY

We use AC Mains for the power supply.

WIRES AND USB CABLE

Used for making connections.

ROBOT CHASSIS

Fig 4.5: Robot Chassis

Robot Chassis Kit,as shown in fig 4.5 is an easy to assemble and use robot chassis platform. The Chassis kit provides you with everything you need to give your robot a fast four wheel drive platform with plenty of room for expansion to add various sensors and controllers.

ARDUINO IDE

Fig 4.6: Arduino

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

V. TECHNICAL DETAILS

Working process is divided into two main parts, Transmitter Circuit and Receiver Circuit implementation. In transmission circuit, first step is to recognize and detect the movements of hand. This is done by using Accelerometer MPU6050. Position of hand is identified by using X and Y scale. This data is supplied to NodeMCU. The NodeMCU can be programmed using Arduino IDE Software.

This transmitted data in air is captured by receiver circuit. Receiver module also includes NodeMCU and a motor driver module L298N. The received data is sent to Motor Driver Board Module. This board then runs the automated car in desired direction according to the gesture of the User's hand.

VI. APPLICATIONS

- Wireless controlled robots are very useful in many applications like remote surveillance, military etc.
- Hand gesture controlled robot can be used by physically challenged in wheelchairs.
- Hand gesture controlled industrial grade robotic arms can be developed.
- Entertainment applications – Most videogames today are played either on game consoles, arcade units or PCs, and all require a combination of input devices. Gesture recognition can be used to truly immerse a players in the game world like never before.
- Automation systems – In homes, offices, transport vehicles and more, gesture recognition can be incorporated to greatly increase usability and reduce the resources necessary to create primary or secondary input systems like remote controls, car entertainment systems with buttons or similar.

VII. RESULT

The final image of the vehicle and the results obtained are given below:

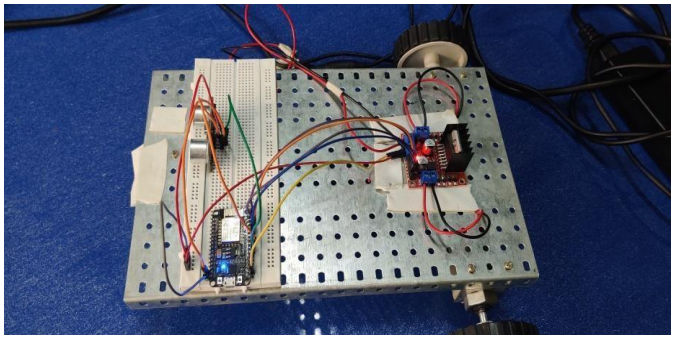

Fig 7.1: Final model of the vehicle

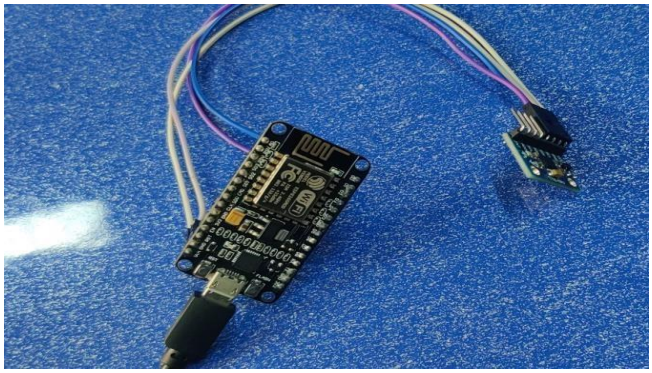

Fig 7.2: Transmitter part with Accelerometer

Fig 7.3: Outputs onserial monitor:

Fig 7.3(a): Stop

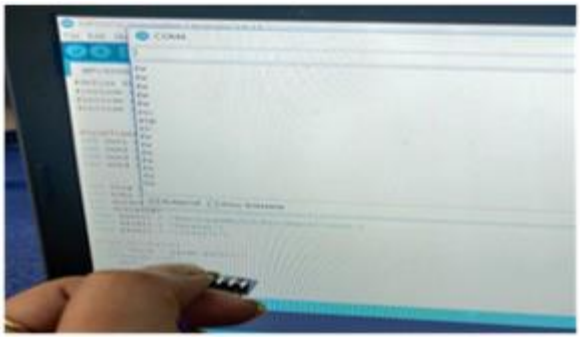

Fig 7.3 (b): Forward

Fig 7.3 (c): Backward

Fig 7.3 (d) : Left

Fig 7.3(e) : Right

VIII. CONCLUSION AND FUTURE SCOPE

CONCLUSION:

The purpose of project is to control a vehicle using accelerometer sensors.The final movement of the robot can be concluded as follows:

As the hand moves from bottom to top, the robot would move in the forward direction. As the hand moves from top to bottom, the robot would move in the backward direction. As the hand would turn towards the left, the robot would move towards the left direction. As the hand would turn towards the right, the robot would move towards the right direction. As the hand is kept stationary with respect to the environment, the robot would be in the stop mode. When an

obstacle is detected the robot would reduce the speed of the vehicle.

IX. FUTURE SCOPE

- The on board batteries occupy a lot of space and are also quite heavy. We can either use some alternate power source for the batteries or replace the current DC Motors with ones which require less power.
- The proposed system is applicable in hazardous environment where a camera can be attached to the robot and can be viewed by the user who is in his station. This system can also be employed inmedical field where miniature robot are created that can help doctors for efficient surgery operations For more efficient response, threshold values can be used to detect gesture and advanced features such as finger counts that provide different functional commands can be used.

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[4] A STUDY ON GESTURE CONTROL ARDIUNO ROBOT Ashutosh zagade1 , Vishakha Jamkhedkar2 , Shraddha Dhakane3 , Vrushali Patankar4 Prof. Dr.Amol Kasture5 , Prof.Vijay Gaike6
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