Hand Gesture Control Car

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***Abstract*— Traditionally, any object can be moved by some external force which is generally human efforts. Moving distant physical objects just by little movements of hands can be achieved by our project. A small amount of motion is amplified on a larger scale. This concept can bring much comfort, convenience and physical cost reduction in daily life as well as industries. We developed an IoT based gesture-controlled car that takes readings from an accelerometer which is placed on a human hand. The direction of the car can be changed by moving the hand in a particular direction, each movement generates the values in its corresponding axis. Generated values by accelerometer are sent to the Arduino UNO, HT12E encoder which is connected to Arduino will encode the values and send it to a receiver through RF433 transmitter. HT12D placed on the car will decode the values and give it to the L298 motor driver, which will instruct the motors to move the vehicle accordingly. This project can be very helpful for physically challenged people as they can move certain objects with less physical movement. The further addition to this project is that the control of the car can be done by an analog stick or joystick.**

Keywords*— *IoT, Gesture Controller, Accelerometer, Arduino

I. INTRODUCTION

The term IoT i.e. Internet of Things extends capabilities of real world objects. The objects are connected to Internet so as to make them capable of sensing the environment around them with least human intervention. These devices collect, share and use the data to give suitable output using wireless networks. The Internet of Things is making the world around us more smarter and more responsive, merging the digital and physical universes.

Gesture means the movement of hand and face of humans. The main objective of this project is to control the car using human hand gestures. The human hand gestures are sensed with the help of an accelerometer. It is coded in such a way that the required actions for the human gesture are done. These sensed signals are processed and then transmitted to the robotic arm at the receiver section using RF transceiver module. Thus the car performs the required movement. This system is also uses an RF transceiver module for the wireless communication. The model can be constructed and the required work can be done. Thus, this proposed model will be helpful and avoid danger for the people working in hazardous areas.

Robots are increasing being installed and used into industries to replace humans especially to perform dangerous and hazardous tasks. A hand gestured control car is a kind of robot which is capable of carrying complex actions automatically or under human supervision. These can be used in various fields such as industries, research, military and healthcare.

It might be dangerous for human to carry out tasks like working with concentrated hazardous chemicals, treating patients with fatal diseases like ebola and corona, defusing bombs, carrying heavy objects in factories etc. So at such places humans are replaced with such hand gestured cars to perform the tasks. This technology is used to move a large movement by just making small hand gestures .

II. OBJECTIVES

1. Connect and Communicate with physical devices: IoT facilitates the communication between human and machine.

2. Faster and Smart innovation: Speed is very crucial aspect of any tool. Because of use of sensors in IoT devices the required output is given in a good speed with great accuracy.

3. Smart sensing capabilities: Sensors such as accelerometer can sense very minute movement ,for instance a little vibration , which humans cannot even recognize. It has tolerance just about 5 -10%. So the device works very precisely and can be used for such works where errors must be minimized.

4. Convenience : We can manifest very little movement on very large scale. In this way, we can do maximum work which requires minimum human energy.

This will bring efficiency along with comfort and convenience.

Limitation

In this scenario, a lot of power is consumed so it has a great power consumption. Moreover it can't detect any object. If a object comes in front of the car it doesn't stop or change its direction. So addition of ultrasonic sensors can overcome the limitation.

III. SYSTEM ARCHITECTURE

A. Arduino UNO:

This is the brain of the car and is installed with some code. The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ,206 quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Arduino consists of both a physical programmable circuit board and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. Arduino Uno can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators.

B. Accelerometer (ADXL335):

An accelerometer is a one type of sensor and it gives an analog data while moving in the direction of X, Y and Z. These directions depend on the type of sensor. This sensor consists of arrow directions, if we tilt the sensor in one direction, then the data at the particular pin will change in the form of analog.

C. HT12E Encoder :

The HT12E encoder are 12 bit encoders that is they have 8 address bits and 4 data bits. It encodes the 12-bit parallel data into serial for transmission through an RF transmitter.

D. HT12D Decoder :

HT12D converts the serial input into parallel outputs. It decodes the serial addresses and data received by RF receiver into parallel data and sends them to output data pins. The serial input data is compared with the local addresses three times continuously and is only decoded when no error or unmatched codes are found. A valid transmission in indicated by a high signal at VT pin.

E. RF Module:

An RF Transmitter and Receiver pair is used for wireless communication. The wireless data transmission is done using

434 MHz Radio Frequency signals that are modulated using Amplitude Shift Keying (ASK) Modulation technique. .

F. L298 Driver:

L 298 is a dual full bridge driver that has a capability to bear high voltage as well as high current.

G. 150 RPM Motors:

These are attached to the wheels of the car to give them power to move.

IV. IMPLEMENTATION

A. Circuit Connections.

- The readings (movement of the hand) are taken from the accelerometer attach on the hand. These readings are sent to Arduino uno.

- Through Arduino the readings are encoded by HT12E. The Encoder sends these readings through RF transmitter to the receiver attached on the car.

- These readings are sent to the receiver and are decoded by HT12D . After the readings are decoded they are send to L298N motor driver due to which the motors are moved. Thus the movement of car is achieved.

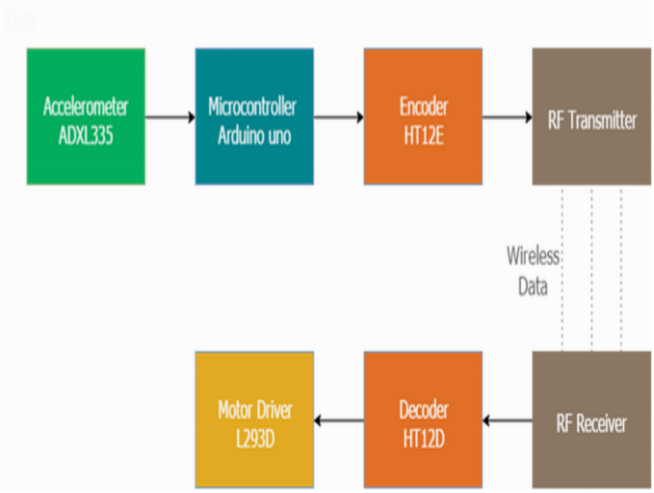

Figure 1 Hand Gestured Controlled Car circuit layout

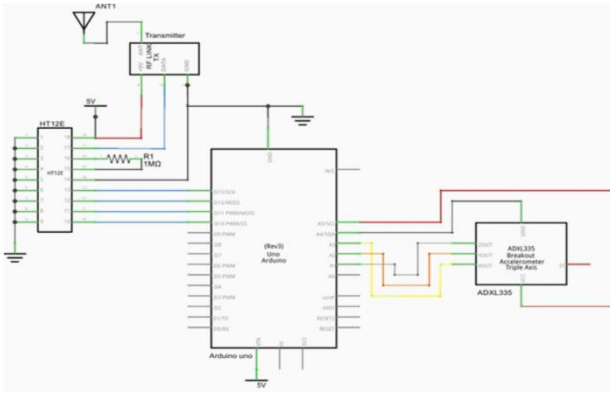

Figure 2 Circuit Diagram of Transmitter

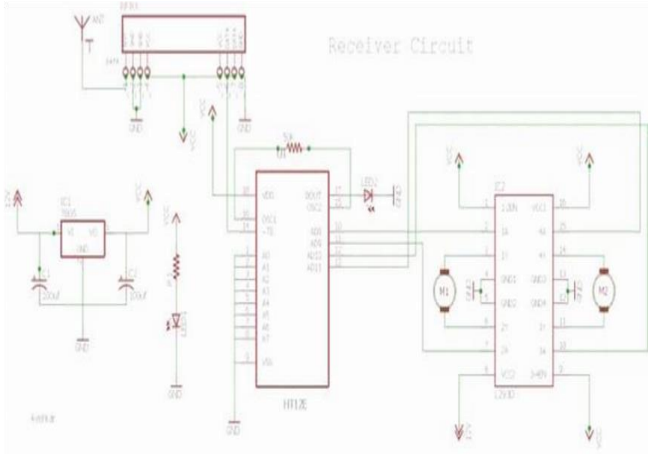

Figure 3 Circuit Diagram of Receiver

B. Working

- There are five hand gestures which can be recognized by the car. They are STOP, RIGHT,LEFT,BACKWARD, , FORWARD.
- The following are the hand gestures used in controlling the car.

Figure 4 (a) Gesture to move left

Figure 4 (b) Gesture to move right

Figure 4 (c) Gesture to stop

Figure 4(d) Gesture to move forward

Figure 4(e) Gesture to move backward

V. CONCLUSION

The introduction of IoT and combination of IoT and physical devices makes life easier. The tasks which are dangerous and hazardous can be done very easily. The introduction of IoT also completes the tasks in a very short duration of time. Moreover the human errors are reduced on a great scale and results are achieved with great accuracy.

The limitations such as great power consumptions can be overcomed by use of strong batterys and low power consumption sensors. Human hand can move in various directions however only five of them are recognized by the car. So further addition to the project is detecting other hand gestures and getting the output from the car accordingly.

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[6] Image 1: Hand Gestured Controlled Car circuit layout Ref: https://create.arduino.cc/projecthub/mayooghgirish/hand-gesture-controlled-robot-4d7587
[7] Image 2: Circuit Diagram of Transmitter Ref: https://create.arduino.cc/projecthub/mayooghgirish/hand-gesture-controlled-robot-4d7587
[8] Image 3: Circuit Diagram of Receiver Ref: https://create.arduino.cc/projecthub/mayooghgirish/hand-gesture-controlled-robot-4d7587 Receiver Circuit
[9] Image 4(a)Gesture to move left , 4(b) Gesture to move right ,4(c) Gesture to stop,4(d) Gesture to move forward,4(e) Gesture to move backward Ref: https://create.arduino.cc/projecthub/mayooghgirish/hand-gesture-controlled-robot-4d7587 left_flat , right_flat ,Stop_flat, , ,forward_flat,backward_flat