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Gesture controlled vehicle for military purpose

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ABSTRACT

In this paper, we introduce a hand-gesture-based control interface for navigating a vehicle. It is also a semi-autonomous vehicle as we connected the vehicle and gesture device wirelessly by the help of Radio waves. Generally, robots are programmed to perform a specific task which human can't perform, or where conditions are not certain to work for a human. The complete setup and working process are being described in this paper.

Keywords— *Arduino Lilypad- ATMEGA328P, Gesture, Accelerometer ADXL335, RF Module*

I. INTRODUCTION

As we have seen since past years that the criminal cases are increasing day by day and the demand for military robots are increasing in a huge amount. These conditions have created a situation for the researchers to develop the most efficient robots which can help in resolving these issues. Many investments are made by the nation towards the research of most efficient and effective defence vehicles that are capable of safeguarding our citizens as well as Indian army soldiers from the terrorist threats and the environmental conditions around the border. One of the efficient ways is the gesture-controlled surveillance vehicle which actively aims at border patrolling and surveillance. A gesture-controlled vehicle is a type of vehicle which can be controlled by our hand gesture rather than old buttons.

Previously, most of the systems use bulky transmitter part which is not an easy task to carry, thus it is difficult to make use of it. In this project, we have used Arduino Lilypad. It is specially designed for the purpose of e-textile. Thus it is suitable for wearable technologies which make the transmitter part very light in weight and is easy to carry from one place to another. Another reason for using Arduino Lilypad is its size, which is approximately the size of a silver dollar. We can use the Lilypad with a piece of cloth and wear it to use it as gesture control. It is economical in nature and its total cost is very low. Altogether it can be concluded that it makes the transmitter part light in weight which is easy to carry, easy to use, thinner and cheaper than the other proposed systems.

In this project a gesture-controlled system is used along with an accelerometer, Arduino Lilypad, encoder, decoder, motor driver, four dc motors are used and an RF module is also used to make the system wireless.

An accelerometer is used to detect the gesture in the X, Y and Z direction through their coordinates which are fed to the microcontroller and Arduino Lilypad. According to the programming, the encoder sends the command signal to the transmitter module. The receiver module receives this signal in the receiving circuit and sends it to the decoder. After decoding the Analog signal it sends the digital data to the motor driver which controls the motor movement.

2. WORKING

The working principle of the work is presented with the various block diagram. There are two parts in which one is transmitter section and another one is the receiver section. In the transmitter section, an accelerometer is connected to the Arduino Lilypad. The value of accelerometer output connected to the Arduino Lilypad changes with the gestures. The transmitted values are then encoded using the encoder and transmitted using the RF transmission modules connected to it.

The receiver section consists of various parts such as RF receiver module, decoder, motor driver and motors. The decoder is used to decode the received values at the receiving end. The movement of the wheels are controlled by the use of motor driver IC and connected DC motors.

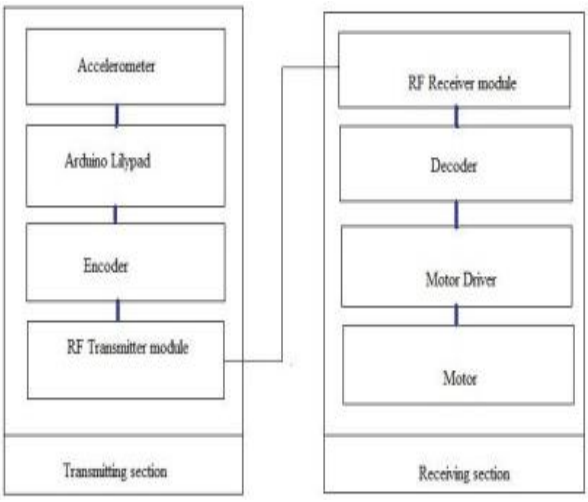

Fig. 1: Schematic block diagram

2.1 Transmitter section

The transmitting section of this project consists of four parts such as Accelerometer, Microcontroller, Encoder and Transmitter Module.

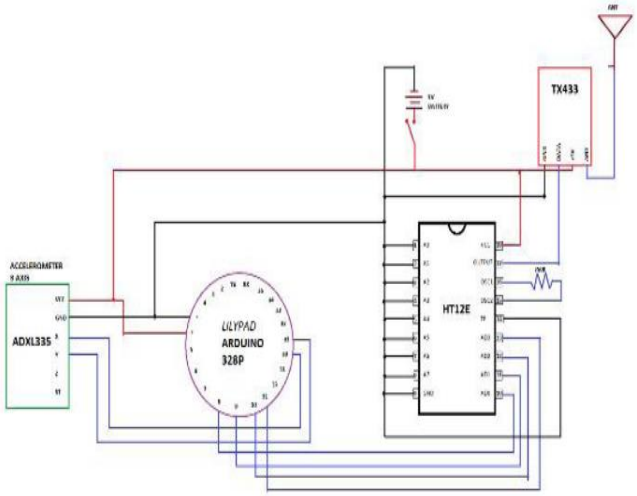

Fig. 2: Transmitter section

An accelerometer is a device that measures the proper acceleration of an object across 3-axis it means across X, Y, Z axis. It also helps in detecting the position, velocity, vibration and orientation of an object. In this project we have used ADXL335, which provides coordinates in all the 3 axis X, Y, Z in respect of the associated object X and Y coordinates are used to detect the gesture which is then fed to the microcontroller. X and Y pin of the accelerometer is connected to the power supply or VCC. Zero volts is applied to pin a0, a1 along with '+' and '-' pin of Lilypad.

In this Arduino, Lilypad is used in which ATMEGA 328P is used as a microcontroller. Arduino IDE is used to write the gesture controlling algorithm and then send it to the microcontroller. After receiving X and Y coordinates from the accelerometer, the microcontroller sends the digital output to the encoder.

The encoder used HT12E is an integrated circuit of 212 series of the encoder in which 12 bits are split into 8 address bits and 4 data bits. Address bits are used from Pin 1- Pin 8.

By the analysis of the algorithm, 'HIGH' and 'LOW' data signals are sent to the pins which are described as AD0, AD1, AD2, AD3(i.e. from Pin 10- Pin 13). The output of the encoder is received at 'Data' pin of the receiver circuit. As this pin works as transmission enable pin (i.e. Pin -14, TE) which is active low, this pin is always connected to ground to repeat the data transmission cycle. The transmitter-receiver module frequency which is used in this project is 433MHZ.

2.2 Receiver section

The receiver part is divided mainly into five parts which are described as Receiver module, Motor driver IC, Decoder, Voltage regulator and DC motor. The Analog signal from the transmitter is received by the receiver module and then send it to the decoder by the help of 'DATA' pin. The address bits of the encoder are kept at a low state and the address pins i.e. Pin 1- Pin 8 is connected to the ground. Firstly, we compare the received serial data with local address bits and if both the data gets matched to each other, then the received data is sent to the decoder. The decoder converts the Analog signal into the digital signal and then send it to the motor driver IC. We have used L293D motor driver IC which has two H-bridge driver circuit which helps in moving two motors in a clockwise and anticlockwise direction. Movement of the motor is decided according to the inputs which are provided in the input table. The receiver section input is connected to a 9-volt source and make 5-volt stable at the output terminal by the use of the 7805 voltage regulator. We have used four DC motors which involved two L293D, motor driver ICs.

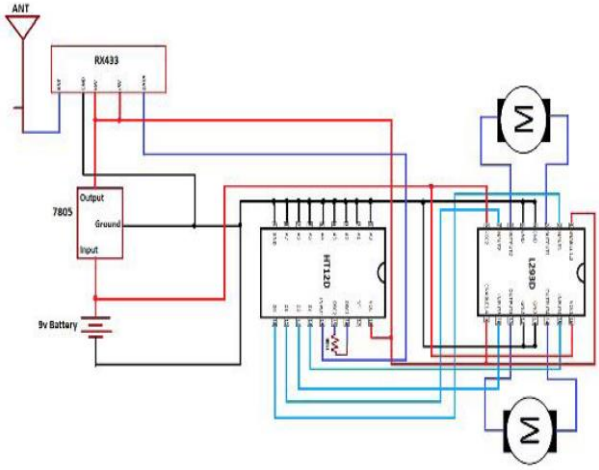

Fig. 3: Receiver Section

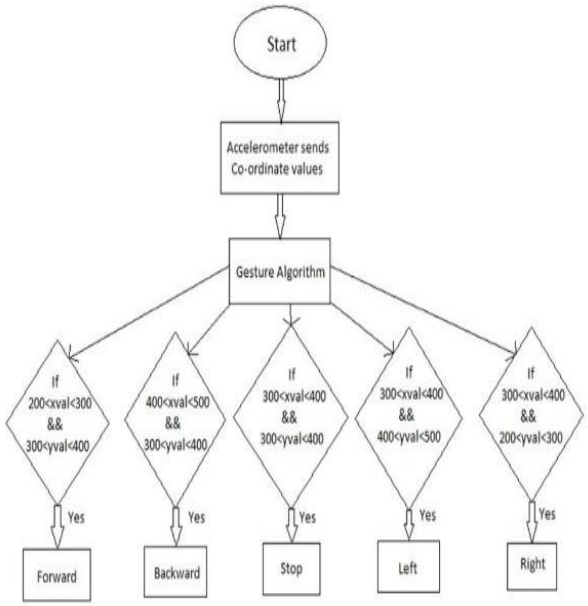

Fig. 4: Flowchart of the whole system

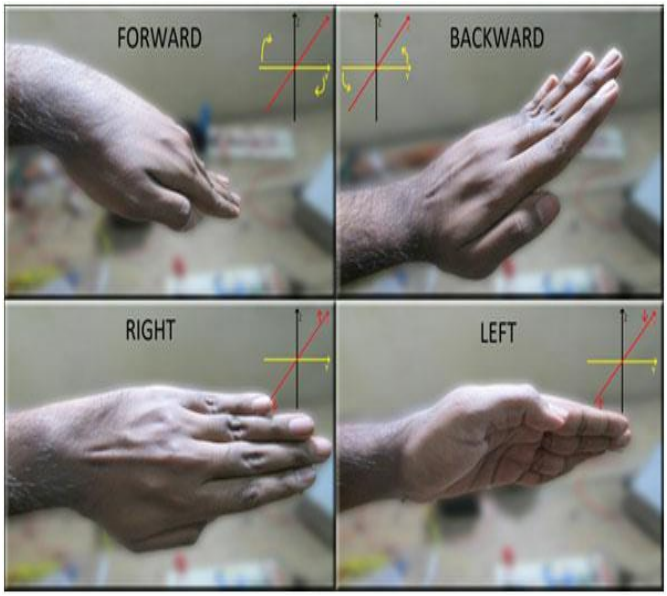

Fig. 5: Hand gestures and their logic

Table 1: Input and movements

Input logic	Movement
00	STOP
01	CLOCKWISE
10	ANTICLOCKWISE
11	STOP

3. RESULT

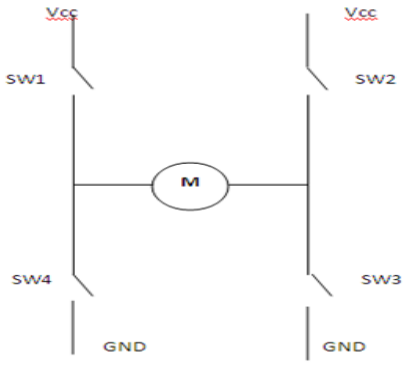

Fig. 6: Switches arrangement

When switches **1**and **4** are on, the motor rotates clockwise.
When **2** and **3** are on, the motor rotates anti-clockwise.
When **1** and **2** are on, the motor will stop.
Turning off all the switches gives the motor a freewheeling drive.
Turning on **1** and **3** at the same time or **2** and **4** at the same time shorts the entire circuit.

4. CONCLUSION

The purpose of the project is to control of vehicle using Accelerometer Sensors attached to hand gloves. The Sensors are intended to replace the remote control that is used to run the vehicle. It will allow as to control the forward, backward, left, right movements while using the same accelerometer Sensor to control the throttle of the vehicle.

5. FUTURE SCOPE

- The onboard 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.
- Secondly, as we are using RF for wireless transmission, the range is quite limited; nearly 50-80m. This problem can be solved by utilizing a GSM module for wireless transmission. The GSM infrastructure is installed almost all over the world. GSM will not only provide wireless connectivity but also quite a large range.
- The idea of "gesture controlling" to control any device can be done by any part of the body not just by hand.Medical purpose.

6. REFERENCES

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