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Wireless Hand Gesture Controlled Robot

[1]Loojee Bijoura, [2]Madhuri Bhoi, [3]Shailja Banjare, [4]Sonali Gupta, [5]Anjali Deshpande

[1-4]8th Semester E&Tc
MM College Of Technology
Raipur(492001), C.G (India)

[5]Asst. Prof., Dept. of Electronics & Telecommunication Engg.,
MMCT, Raipur,C.G.,India

Abstract- Now a day's robots are controlled by remote or cell phone or by direct wired connection. If we thinking about cost and required hardware's all this things increases the complexity, especially for low level application.Now the robot that we have designed is different from above one. It doesn't require any type of remote or any communication module. it is self activated robot, which drive itself according to position of user who stands in front of it. It does what user desires to do. it makes copy of it's all movement of the user standing in front of it. Hardware required is very small, and hence low cost and small in size.

Keywords- *Microcontroller8051,Transmitter, Receiver Embedded system.*

1. Introduction

In market many types of robot are available that are controlled by remote or cell phone. But limitation of this robot is that they can only perform those activities which are present in their program. They don't have ability to sense the situation and react as per that and more over their cost are high even for low application activities. So we decided to design a robot that doesn't require any type of remote or any communication module. It should be self-activated robot which will be driving itself according to position of user which stands in front of it. It does what user desires to do. It makes copy of its all movement of the user standing in front of it. Hardware required is very small, and hence low cost and small in size.

This robot consists of mainly three parts. First is sensor, which works as vision of robot. We have used accelerometer that act as sensor for our robot.
A Gesture 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, it will transmit by connecting wire. At the receiving end this data is processed by a microcontroller (P89V51RD2) and finally our motor driver to control the motor's. As user makes movements of his hand in front of it, it senses and according to that it sends the signal for decision. Output from accelerometer is gathered for process by microcontroller. As per sensor output, the controller is made to work according to the program written inside it and it sends the respective signal to third part which is motors. This is the last part which drives the wheel of our robot. It uses two dc motors to make movement. To drive them one motor driver is IC used which provides sufficient current to motors. All this material is mounted on metal chesi. As we move our hand to right robot will move to right side. Similar to this it will copy all our movements.

Robotics is the branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing. These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior, and/or cognition. Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics. Now day's robots are controlled by remote or cell phone or by direct wired connection. If we thinking about cost and required hardware's all this things increases the complexity, especially for low level a These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior, and/or cognition. Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics.

Now day's robots are controlled by remote or cell phone or by direct wired connection. If we thinking about cost and required hardware's all this things increases the complexity, especially for low level application.
Now the robot that we have designed is different from above one. It doesn't require any type of remote or any communication module. it is self activated robot, which drive itself according to position of user who stands in front of it. It does what user desires to do. it makes copy of it's all movement of the user standing in front of it. Hardware required is very small, and hence low cost and small in size. This project has two Module that is

Transmitter Module and Receiver Module. Transmitter module will consist of mainly four parts. As name Accelerometer, comparator, encoder and RF transmitter Receiver module will consist of mainly five parts as RF transmitter, Decoder, Microcontroller, Actuator and Motor.

2. Transmitting Module

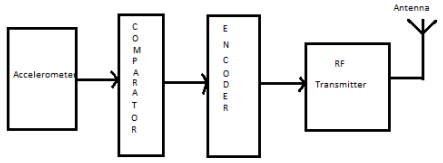

Figure 1: Block diagram of transmitter module

Transmitter module will consist of mainly four parts. As name Accelerometer and comparator, Encoder, RF transmitter. 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. If we tilt these sensors in any direction then the data at that corresponding pin will change in the analog form. For the purpose to change the analog voltage into digital we use comparator which compare that analog voltage to a reference voltage and give a particular high or low voltage. Output voltage from comparator with transmitted through wire to receiver (robot) circuit.

Circuit diagram of transmitter module consist of accelerometer ADXL335 following by a comparator LM339. To provide smooth +5volt supply we have connected one voltage regulator 7805 with 9 volt battery. Voltage regulator 7805 can converts supply voltage more than 8volt into 5volt output. Here it converts 9 volt battery supply into smooth 5 volt supply to accelerometer and comparator as they required.
For smooth output voltage regulator required grounding of its two terminals (input and output terminals) along with two capacitor 1 microfarad and 10 microfarad.
Accelerometer converts movement change in x and y axis into analog form and provide it at its output x and y pins. These two outputs of accelerometer is connected to comparator for comparison with reference input voltage. For comparison four potentiometer of 10K ohm is connected with comparator. After comparison comparator provide four outputs. Further with is transmitted through wire to receiver module**.**

3. Receiver Module

Receiver module will consist of mainly five parts. As name RF receiver, Decoder, Microcontroller, Actuator, Motor. that data we have to make some decision so here the role of microcontroller is coming up. We use an 8051 microcontroller for our circuit to give them a decision capability. The Actuator's are those devices which actually gives the movement or to do a task like motor's. In the real world there are various types of motors available which works on different voltages. So we need motor driver for running them through the controller. To get interface between motor and microcontroller.

Block diagram of receiving module is as shown in figure2. This contain basically 8051 microcontroller actuator and motors

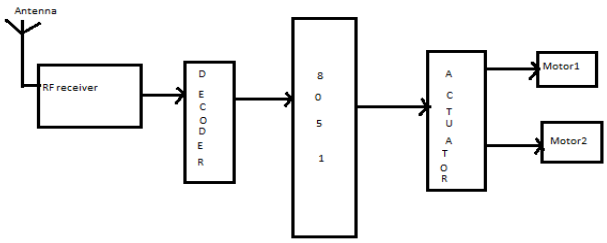

Figure 2: Block diagram of receiver module

Receiver module is our robot. Which will perform action according to hand gesture or we can say that data coming from transmitter.
It will also consist of three parts, as name microcontroller and actuator. Processing is the most important part of the robot.

Accelerometer

The accelerometer is a built-in electronic component that measures tilt and motion. It is also capable of detecting rotation and motion gestures such as swinging or shaking. 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. If we tilt these sensors in any direction then the data at that corresponding pin will change in the analog form. An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer.

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic Acceleration resulting from motion, shock, or vibration.

Comparator

LM324 is a 14pin IC consisting of four independent operational amplifiers (op-amps) compensated in a single package. Op-amps are high gain electronic voltage amplifier with differential input and, usually, a single-ended output. The output voltage is many times

higher than the voltage difference between input terminals of an op-amp. These op-amps are operated by a single power supply **LM324** and need for a dual supply is eliminated. They can be used as amplifiers, comparators, oscillators, rectifiers etc. The conventional op-amp applications can be more easily implemented with LM324. . Diagram of transmitter module consist of accelerometer ADXL335 following by a comparator LM339. To provide smooth +5volt supply we have connected one voltage regulator 7805 with 9 volt battery. Voltage regulator 7805 can converts supply voltage more than 8volt into 5volt output. Here it converts 9 volt battery supply into smooth 5 volt supply to accelerometer and comparator as they required.

Encoder

An encoder will encode the input data applied on it basically it converts the input parallel data into serial data.

RF Transmitter

And finally RF transmitter transmits the data through antenna.

Receiving Module

RF Receiver

The RF receiver module will receive the data which is transferred by the gesture device. It is also working as similar to the transmitter module.

Decoder

Decoder decodes the incoming data or we can say that it converts that serial data into parallel which is received by the RF receiver module. The input data is decoded when no error or unmatched codes are found.

Microcontroller

A microcontroller (sometimes abbreviated µC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.

Microcontroller P89V51RD2

The P89V51RD2 is a 80C51 microcontroller with 64 kB Flash and 1024 bytes of data RAM. A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI.

The Flash program memory supports both parallel programming and in serial In-System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The P89V51RD2 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running

Actuator

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. 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-Now the processing is the most important part of the robot. Till now we get the data from the decoder now based on that data we have to make some decision so here the role of microcontroller is coming to actuator and it drives motor.

Flow of decision process by microcontroller is as shown in flow chart. Accelerometer senses the change in direction as per hand moment of user.
Accelerometer gives logic ‘0’ output for that respective pin for change in any direction. So microcontroller checks all input regularly and take decision is it finds any of input as low. If any one of input will be low then it give instruction to motor drive to change the direction of wheel in respective direction.

4. Result and Discussion

As user makes movements of his hand in front of our robot, it senses and according to that it sends the signal for decision. Output from accelerometer is gathered for process by microcontroller.

As per sensor output, the controller is made to work according to the program written inside it and it sends the respective signal to third part which is motors. This is the last part which drives the wheel of our robot. It uses two dc motors to make movement. To drive them one motor driver is IC used which provides sufficient current to motors. All this material is mounted on metal chassis. As we move our hand to right robot will move to right side. Similar to this it will copy all our movement.

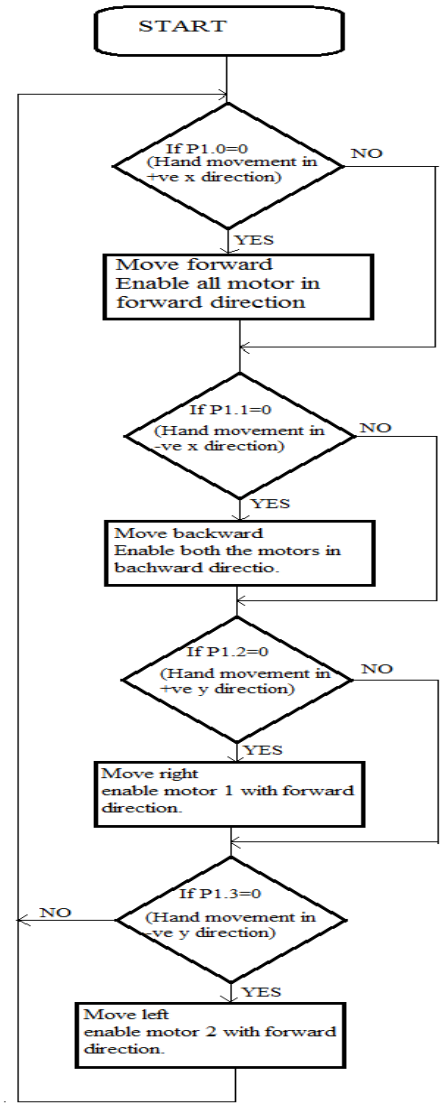

Figure 3 Flow chart

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