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SMART ROBOT CONTROLLED USING EMBEDDED TECHNOLOGY

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Abstract - *Nowadays everyone wanted to know about the place where they are unable to reach or do the work without getting harm .In this paper we are using Bluetooth technology and IR technology to operate the robot .Industrial robots do not look like human beings but they do the work of humans.. The concept technology covers less distance that is 10m therefore to increase the range or distance we can also use GPS of an industrial robot was patented in 1954 by G.C. Devol. The present industrial robots are actually mechanical handling devices that can be manipulated under computer control. The computer, which is an integral part of every modern robot system, contains a control program and a task program. The task program are generated either by leading the robot through the required job or by using off-line programming language.*

Key Words: **L293D, HC-06, ATMEGA32P-PU, DC MOTORS, IR, TX, RX, PROTEUS.**

1. INTRODUCTION

1.1. Embedded Technology

An embedded technology can be defined as a control system designed to perform specific task. Embedded systems usually only have a single task, or a very small number of related tasks that they are programmed to perform. Embedded systems are considered when the cost of implanting a product design and software on a microprocessor and some small amount of hardware is more reliable and cheap or better for some other reason than a discrete hardware design or we can say embedded technology is the combination of two technologies. In our proposed module we have used two technologies as an embedded technology to control robot. The two technologies are Bluetooth and IR technology.

1.2. Bluetooth Technology

Bluetooth is a wireless radio technology standard for exchanging data over short distances between mobile phones, computers and other devices. It is a short range standard radio link which has unlicensed spectrum about 2.45 GHz (ISM band 2400-2483MHz). Bluetooth Technology adopted Frequency Hopped Multiple Access (FHMA) technology for power efficiency and low cost implementations. In Bluetooth technology the data can be sent in a secure manner by pairing with other devices.

1.3. Infrared Technology

Infrared(IR) is invisible radiant energy, electromagnetic radiation with longer wavelengths than those of visible light, extending from the nominal red edge of the visible spectrum at 70nm (frequency 430 THz) to 1 mm (300 GHz) ,although people can see infrared up to at least 1050 nm in experimentally[1]. Infrared technology was discovered by a Astronomer, Sir William Herschel. A molecules change their rotational-vibration movement if either they emit or absorb infrared energy. When a molecule get or emit infrared signal it will come in vibration state due to change of dipole moment by molecule itself. Infrared technology is used in various places like industries, scientific purpose and medical applications. There are so many applications of this technology such as thermal efficiency analysis, environmental monitoring, industrial facility inspections, remote temperature sensing, short-ranged wireless communication, spectroscopy and weather forecasting. In my proposed design we wave used TSOP-1738 IR detector which can detect any range of IR signal.

1.4. L293D

L293D is a typical motor driver ic which allows dc motor to drive on either direction. L293D is a 16 pin IC which can control a set of two dc motor simultaneously in any directions. It means that you can control two dc motor with a single L293D IC. The L293D can drive small and quiet big motors as well as check voltage specification. It works on the concept of H-bridges. H –bridges is a circuit which allows the voltage to flow in either direction. As we know voltage need to change its direction for being able to rotate the motor in clockwise or anti clock wise direction.

Table -1: Pin Configuration of L293D

SYMBOL	PINS	DESCRIPTION
EN	1,9	Enable pins
A	2,7,10,15	Input pins
Y	3,6,11,14	Output pins
GROUND	4,5,17,13	Ground pins

1.5. HC-06

The Bluetooth serial module named even number is compatible with each other. The slave module is also compatible with each other. HC-06 is former version that user can't reset the work mode (master or slave). HC-06 RF wireless Bluetooth transceiver slave module RS232/ TTL to UART converter and adaptor. This module is an Upgrade from the older HC-05 and has better stable Firmware. HC -06 module is a Bluetooth module which uses SPP (serial port protocol). This module also supports transparent wireless serial communication. This module has enhanced data rate of 3Mbps and also frequency band of 2.4GHz. It has its nominal range of 10m. It has also channel bandwidth of 1 MHz and also 16-bit CRC data protection.[2]

1.6. TSOP1738 IR SENSOR

The TSOP 1738 is a member of IR remote control receiver series. This IR sensor module consists of a PIN diode and a pre amplifier which are embedded into a single package. The output of TSOP is active low and it gives +5V in off state. When IR waves, from a source, with a centre frequency of 38 kHz incident on it, its output goes low. Lights coming from sunlight, fluorescent lamps etc. may cause disturbance to it and result in undesirable output even when the source is not transmitting IR signals. A band pass filter, an integrator stage and an automatic gain control are used to suppress such disturbances. TSOP module has an inbuilt control circuit for amplifying the coded pulses from the IR transmitter. A signal is generated when PIN photodiode receives the signals. This input signal is received by an automatic gain control (AGC). For a range of inputs, the output is fed back to AGC in order to adjust the gain to a suitable level. The signal from AGC is passed to a band pass filter to filter undesired frequencies. After this, the signal goes to a demodulator and this demodulated output drives an npn transistor. The collector output of the transistor is obtained at pin 3 of TSOP module

The program which is to be uploaded to check TV remote hex key is given below

```
#include <IRremote.h>
int RECV_PIN = 2;
 IRrecv irrecv(RECV_PIN);
decode_results results;
 void setup()
{
 Serial.begin(9600);
 irrecv.enableIRIn(); // Start the receiver
}
 void loop()
 {
 if (irrecv.decode(&results))
{
 Serial.println(results.value, HEX);
 irrecv.resume(); // Receive the next value
}
 }
```

In above program"IRremote.h" library is firstly added to ARDUINO library. And then output pin of TSOP- 1738 is connected to digital pin 2 of ARDUINO UNO, VDD to +5V and GND to Ground.

1.7. DC MOTOR

A dc motor is any of a class of electrical machines that convert direct current electric power into mechanical power. Nearly all types of dc motors have some internal mechanism, either electromechanical or electronics, to periodically change the direction of current flow in part of the motor. Most type produce rotary motion; a linear motor directly produces force and motion in a straight line.

Dc motors were the first type widely used, since they could be powered from existing direct – current lighting power distribution systems.

A dc motor speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small dc motors are used in tools, toys, and appliances. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force". The direction of this force is given by Fleming's left hand rule and it's magnitude is given by F = BIL. Where, B = magnetic flux density, I = current and L = length of the conductor within the magnetic field.

1.8. PROTEUS SOFTWARE

ISI professional is the simulation software which we have used in this project. Proteus 7.0 is a virtual system modeling (VSM) that combines circuit simulation, animated components and microprocessor model to co -simulate the complete microcontroller based designs. This is a perfect tool for engineers to test their microcontroller designs before constructing on hardware. The Proteus Design Suite is an Electronic Design Automation (EDA) tool including schematic capture, simulation and PCB Layout modules. [13] Proteus Design Suit software is a PCB design software integrated with the simulation of the circuit you design. In Proteus working will be done by Load the hex file of program written on Arduino software into the Atmega328 using/in Arduino Uno development board, than start simulation. A virtual terminal window will open, than enter the command that have written in the program to move the robot and its hand.[3]

1.9. ATMEGA32P-PU

The Atmega328 is a single-chip microcontroller created by Atmel in the Mega AVR family. The Atmel 8bit AVR RISC based microcontroller combines 32 KB ISPN flash memory with read while write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte oriented 2wire serial interface, SPI serial port, 6channel 10bit A/D converter (8channels) in TQFP and QFN/MLF packages), programmable watchdog

timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.85.5 volts. The device achieves throughput approaching 1 MIPS per MHz. It operates at maximum frequency of 20MHz and its operating temperature is -45˚C to +85˚C. The power consumption of Atmega328p-pu is approximately 0.6 mA/MHz.

Table -2: Pin Configuration of Atmega328p-pu

PIN NO.	PIN NAME	MAPPED PIN NAME
1	Reset	Reset
2	RXD	RX/Digital i/o 0
3	TXD	TX/ Digital i/o 1
4	Int0	Digital i/o 2
5	Int1	Digital i/o 3
6	T0	Digital i/o 4
7	VDD	Supply voltage
8	GND	Ground
9	Xtal1	Crystal pin1
10	Xtal2	Crystal pin2
11	T1	Digital i/o 5
12	Ain0	Digital i/o 6
13	Ain1	Digital i/o 7
14	Icp1	Digital i/o 8
15	Oc1a	Digital i/o 9
16	Oc1b	Digital i/o 10
17	MOSI	Digital i/o 11
18	MISO	Digital i/o 12
19	SCK	Digital i/o 13
20	AVCC	Supply voltage
21	AREF	VREF
22	GND	Ground
23	Adc0	Analog input0
24	Adc1	Analog input1
25	Adc2	Analog input2
26	Adc3	Analog input3
27	Adc4	Analog input4
28	Adc5	Analog input5

2. CIRCUIT DIAGRAM AND WORKING

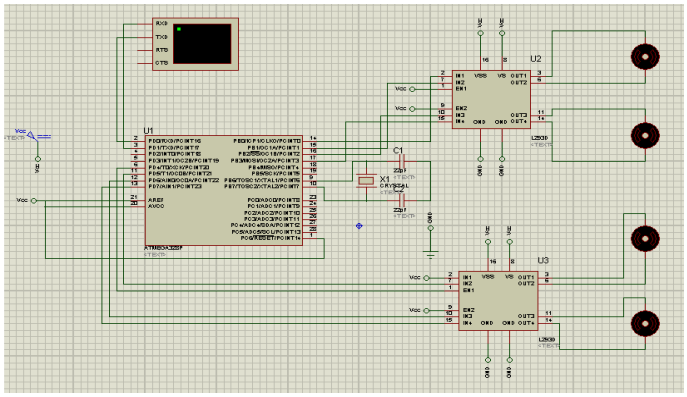

Fig:- 1 SCHEMATIC DIAGRAM ON PROTEUS

In the Proteus design suite, we design a simulation for our proposed project on “Smart Robot Controller Using Embedded Technology”. In this simulation, Virtual terminal is taken as Bluetooth module HC-06 and used as the TV remote. We upload a specific program for the keypad. Here, Bluetooth terminal and remote acts as the transmitter section.

Our proposed model for “Smart Robot Control Using Embedded Technology” consists of two parts i.e., Transmitter part and Receiver part. Transmitter is an android phone and a TV remote. Our proposed receiver part contains TSOP-1738 IR receiver, ATMEGA328P-PU AVR series microcontroller based Arduino Uno, 9V battery, LM and l293d motor driver IC. Actually in our proposed module when a key of remote control is pressed, then IR receiver receives this infrared signal and a specific hex code is generated which is sent to microcontroller. According to received hex-code by microcontroller this specifies the work i.e. to move the robot forward, backward, left, right and move them up, down, hold and release the object .

Here, we have used two motor driver is L293D. First motor driver IC for moving the robot left, right, forward, backward and the next motor driver IC for moving the hand of robot up and down and holding the object and releasing the object. These all motor driver IC input is connected with the input pin of Arduino or microcontroller atmega328p-pu and the output is connected to the motors. For receiving the

command from android phone we have used Bluetooth module hc-06 and for receiving the command from remote we have used ir receiver sensor TSOP-1738 these both Bluetooth module and IR receiver is also connected with the Arduino or atmega328p-pu microcontroller.

3. CONCLUSIONS

- It is feasible to implement Bluetooth communication and remote communication between Smart phone, remote and microcontroller.
- User friendly.
- Mobile and remote controlled system.
- Easily implemented because of its wireless communication standards.

Future scope

- It can be used in various industries for packing various objects where human intervention is not deserved.
- On a large scale it can used to develop robots with military application. It can used to target enemy without any human beings crossing the territories.
- It is a robust, sensitive and fast moving. Hence can be applied in rescue operations.
- With tremendous Smartphone in makers. It is bound to have many more applications in near future.

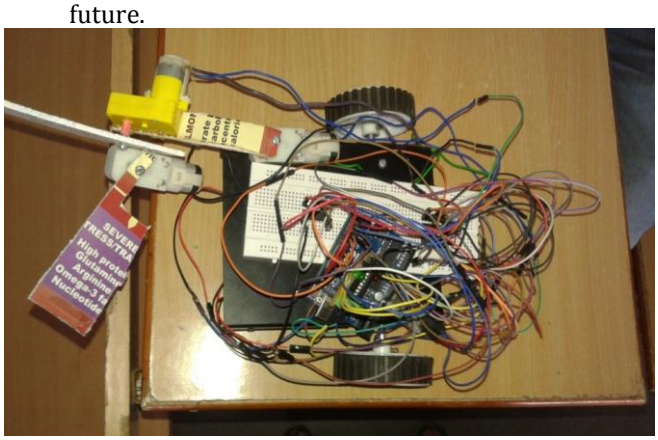

Fig 2: Hardware of our proposed model

REFERENCES

[1] creative.sulekha.com/use-of-infrared-technology
[2] http://hc-06 slave Bluetooth module .html
[3] http://proteus-7-professional.softwere.informer.com
[4] https://www. brian w. evans, "arduino programming note book", first edition,2007,page no.54,40,12
[5] banzi,"getting started with arduino", second edition, 2011,male books, page no.13,17,23
[6] http://building an arduino robot, part2-programing the arduino- migulgrinberg.com

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