Imperial Journal of Interdisciplinary Research (IJIR)
Vol-2, Issue-5, 2016
ISSN: 2454-1362, http://www.onlinejournal.in

Three Axis Pick and Place Robot Based On DTMF

Amal M S[1], Anu C S[2],Keerthana Vijayan[3] & Absal Nabi[4]
[1,2,3] B.Tech Student,[4]Assistant professor
[1,2,3,4]Department of Electrical and Electronics, ICET, MVPA, KERALA, INDIA

Abstract- *Conventionally, wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantages of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls. Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: perception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, and the task (action)is performed using motors or with some other actuators*

Keywords: ARDUINO, L293D IC,DTMF

1. Introduction

In this project, the robot is controlled by a mobile phone that makes a call to the mobile phone attached to the robot. In the course of a call, if any button is pressed,a tone corresponding to the button pressed is heard at the other end of the call. This tone is called dual-tone multiple-frequency‘ (DTMF) tone. with the help of the phone stacked in the robot. The received tone is processed by the arduino controller with the help of DTMF decoder MT8870. The decoder decodes the DTMF tone into its equivalent binary digit and this binary number is sent to the arduino controller. The microcontroller is preprogrammed to take a decision for any given input and outputs its decision to motor drivers in order to drive the motors for forward or backward motion or a turn. The mobile that makes a call to the mobile phone stacked in the robot acts as a remote. So this simple robotic project does not require the construction of receiver and transmitter.

2. Circuit description

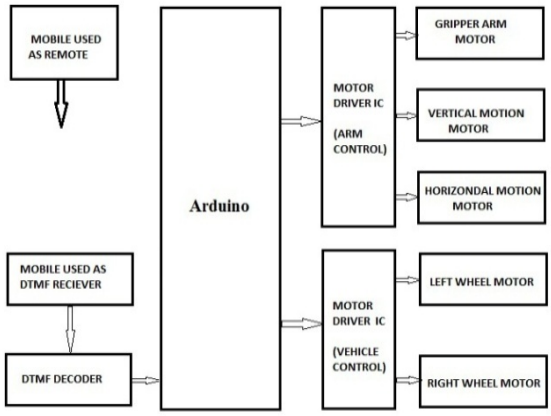

Fig.1 block diagram

Fig 1 shows the block diagram of the pick and place robot. The important components of this robot are a DTMF decoder, microcontroller and motor driver. An MT8870 series DTMF [3] decoder is used here. When the input signal given at pin 2 (IN-) in single-ended input configuration is recognised to be effective, the correct 4-bit decode signal of the DTMF tone is transferred to Q1 (pin 11) through Q4 (pin 14) outputs. Table 1 shows the DTMF data output table of MT8870. Q1 through Q4 outputs of the DTMF decoder are connected to port pins A2 through A5 of Arduino .

The Arduino Uno is a microcontroller board [2] based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial

converter. Outputs from port pins 2 through 13 of arduino are fed to inputs of motor driver L293D, respectively, to drive two geared DC motors.

The controller output is not sufficient to drive the DC motors,so current drivers are required for motor rotation. The L293D is a quad, high-current, half-H driver designed to provide bidirectional drive currents of up to 600 mA at voltages from 4.5V to 36V. It makes it easier to drive the DC motors. The L293D consists of four drivers. Pins IN1 through IN4 and OUT1 through OUT4 are input and output pins, respectively, of driver 1 through driver 4. Drivers 1 and 2, and drivers 3 and 4 are enabled by enable pin 1 (EN1) and pin 9 (EN2), respectively. When enable input EN1 (pin 1) is high, drivers 1 and 2 are enabled and the outputs corresponding to their inputs are active. Similarly, enable input EN2 (pin 9) enables drivers 3 and 4

3. Working

In order to control the robot, you need to make a call to the cell phone attached to the robot (through head phone) from any phone, which sends DTMF tunes on pressing the numeric buttons. The cell phone in the robot is kept in 'auto answer' mode. (If the mobile does not have the auto answering facility, receive the call by 'OK' key on the rover-connected mobile and then made it in hands-free mode.) So after a ring, the cellphone accepts the call. Now you may press any button on your mobile to perform actions as listed in Table 1. The DTMF [4]tones thus produced are received by the cellphone in the robot. These tones are fed to the circuit by the headset of the cellphone. The MT8870 decodes the received tone and sends the equivalent binary number to the microcontroller. According to the program in the microcontroller, the robot starts moving.When you press key '2' (binary equivalent 00000010) on your mobile phone, the microcontroller outputs '10001001' binary equivalent. Port pins PD0, PD3 and PD7 are high. The high output at PD7 of the microcontroller drives the motor driver (L293D) [1]. Port pins PD0 and PD3 drive motors M1 and M2 in forward direction (as per Table 1). Similarly, motors M1 and M2 move for left turn, right turn, backward motion and stop condition as per Table.1.

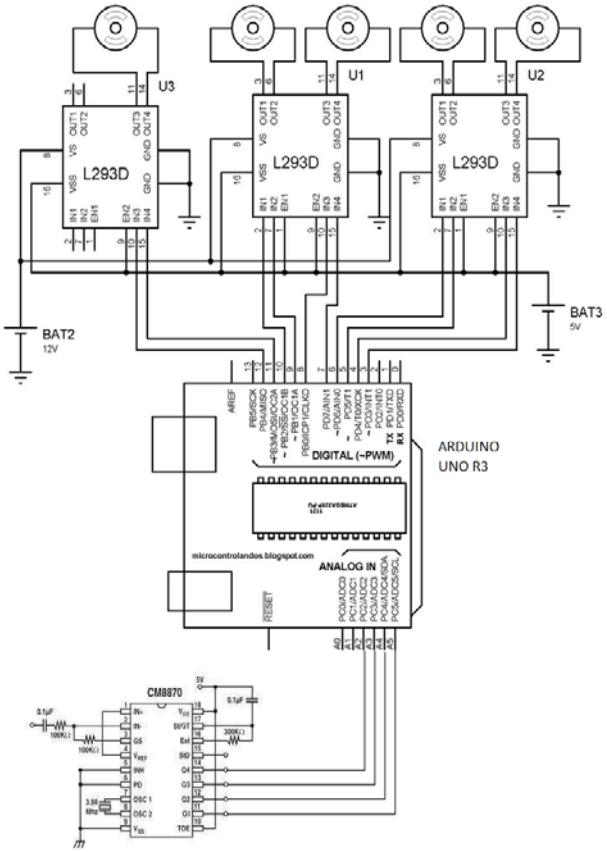

Fig.2 circuit diagram

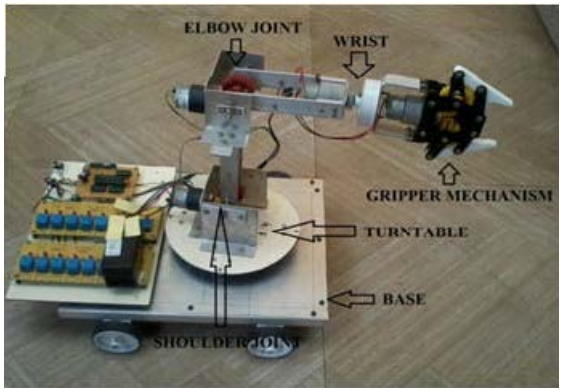

Fig.3 actual view of robot

Number pressed by user	Output of DTMF	Output of Arduino	Action performed
1	0001	0000010000	Arm horizontal left
2	0010	1010000000	Vehicle forward
3	0011	0000100000	Arm horizontal right
4	0100	0110000000	Vehicle left
5	0101	0000000000	All movements stop
6	0110	1001000000	Vehicle right
7	0111	0000001000	Arm vertical up
8	1000	0101000000	Vehicle reverse
9	1001	0000000100	Arm vertical down
*	1011	0000000010	Arm contract
#	1100	0000000001	Arm expand

Table.1 Actions Performed Corresponding to the Keys Pressed

4. Software used

Arduino software**:** The Arduino Uno can be programmed with the Arduino software[5]. The ATmega328 on the Arduino Uno comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500protocol

Proteus 8 professional**:** It has been used to simulate the result in software[6]. It is a software used for simulation of electronic circuits as well as PCB designing

5. Conclusion

Conventionally, wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. In our project with the use of a mobile phone for robotic control can overcome these limitations. It provides the advantages of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls. Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: reception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, and the task (action) is performed using motors or with some other actuators. So the motive is that to increase the range of remote controlled products. For this mobile phone operated control is best because we can globalize our project & no limitation of range.

6. References

[1] L293D Motor Driver http://luckylarry.co.uk/arduino-projects/control-a-dc-motor-with-arduino-and-l293d-chip/

[2] Arduino uno R3 https://www.arduino.cc/en/main/arduino

[3] DTMF Decoder http://www.circuitsgallery.com/2012/07/dtmf-dual-tone-multi-frequency-decoder-circuit-schematic-using-m8870-ic2.html.

[4] Yun Chan Cho; Jae Wook Jeon, "Remote robot control system based on DTMF of mobile phone," Industrial Informatics, 2008. INDIN 2008. 6th IEEE International Conference on , vol., no., pp.1441,1446, 13-16 July 2008 doi: 10.1109/ INDIN. 2008. 4618331

[5] arduino software https://www.arduino.cc/en/Guide/Introduction

[6] proteus software https://electrosome.com/getting-started-with-proteus-beginner