Mobile Controlled Robotic Car using DTMF

Dipti Shevalekar[1], Shambhavi Srivastava[2], Bhairavi Bhoge[3], Vijay Sonpir[4]

[1][Dipti Shevalekar], G.H.Raisoni College of Engineering and Management, Wagholi, Pune
[2][Bhairavi Bhoge], G.H.Raisoni College of Engineering and Management, Wagholi, Pune
[3][Shambhavi Srivastava], G.H.Raisoni College of Engineering and Management, Wagholi, Pune
[4][Vijay Sonpir],G.H.Raisoni College of Engineering and Management, Wagholi, Pune
[5]Prof. Sarita Patil, Dept. of Computer Engineering, G. H. Raisoni college of Engineering and management ,
Maharashtra, India

---***---

Abstract – *A robotic vehicle can be used to implement new technologies. (DTMF)Dual Tone Multi Frequency is used to operate robot. DTMF technology can be useful in day to day life. DTNF technology is peerless to the present generation. DTMF technology is derived on the theory of Digital Signal Processing. Beforehand Radio Frequency circuit is used for wireless controlling but it has the big deprivation that is range. Owing to which it limits the control and has unfavorable effect on the performance of the car. Whereas the DTMF converts this deprivation of Radio Frequency circuit into dominance. It provides increased range of working and also provides better results. This system is controlled and managed using phone in microcontroller. The wireless communication is the remote handling operation of robot using Dual Tone Multi Frequency.*

Formally, wirelessly controlled robots use radio frequency circuits that have the lack of restricted working range, restricted frequency range and the restricted control. Usage of a cell phone for robot control can overcome these restrictions. It provides the dominance of robust control, control range as more as the coverage area of the service provider, no intervention with other controllers and up to 12 controllers.

In spite of the fact that the appearance and the capabilities of robots vary largely, all robots share the feature of a physical, movable structure under some form of control. The Control of robot involves three different phases- perception, processing and action.

Key Words: Dual Tone Multi Frequency, Automatic Voltage Regulator Microcontroller Atmega328P, Cell phone, Motor Driver, DC Motor.

1. INTRODUCTION

A robot is electro-physical machine which is coordinated by computer, Mobile phone or programming, and is thus able to do process on its own. The Robot Institute of America define "A robot is a reprogrammable multifunctional manipulator designed to move material parts, tools or specialized device through variable programmed motions for the performance of a different of works. Formally, wireless robots use radio frequency circuits, that have issues of limited working range & frequency range, use of cell phones can overcome this limitation. It provides the advantages of robust control,

working range as more as the coverage area of the service provider, no intervention with all other controllers and up to twelve controls.

Dual Tone Multi Frequency Mobile controlled ROBOT is a machine that can be operated with a cell phone. In this project, the machine is controlled by a cell phone that makes a call to the mobile phone attached to the robot. When called, if any button is pressed, a tone interrelated to the button pressed is heard at the other part of the call. This tone is called Dual Tone Multiple-Frequency tone. The robot interprets this Dual Tone Multi Frequency tone with the help of the phone connected with the robot. The input tone is processed by the Arduino microcontroller with the help of Dual Tone Multi Frequency decoder MT8870 IC the decoder decodes the Dual Tone Multi Frequency tone is to its interrelated binary digit and this binary number is passed to the microcontroller, the microcontroller is pre-programmed to take decision for any provided input and output its decision to motor drivers in demand to drive the motors for forward or backward movement or a turn.

2. PROBLEM STATEMENT

Formally, robots controlled by wireless communication use radio frequency circuits, those have the drawbacks of limited working range, restricted frequency range and the restricted control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantage of robust control, working range as big as the coverage area of the service provider.

3. LITERATURE SURVEY

[1]In this paper the authors used IC89C51, DTMF, radio control, remote control vehicle and design the new method of construction of cell phone controlled robotic car. The radio frequency circuit is used for limited distance so to overcome this problem authors uses the Dual Tone Multi Frequency which will used for long distance. The main intention of this project is to control a robotic car using Dual Tone Multi Frequency.

[2]In this paper author used robot, GSM, Arduino, Dual Tone Multi Frequency decoder. In this paper they represented a vehicle development which is controlled by GSM and an Arduino is used for design of the vehicle. This system used

Dual Tone Multi Frequency and it can be controlled over very long distance. The C and C++ languages are used as programming language in this system.

[3]The remote-control technologies have been used in the fields like factory automation, space discovery, in places where human entry is difficult. As this has been accomplished in the domestic systems partially many corporations and laboratories are looking for the methods which enable human to operation and monitor efficiently and easily in the house or outdoor. Operation the domestic system without any restriction of time and space is an important challenge. As the cell phone helps us to connect with the outside devices via cell phone communication network regardless of time and space, the cell phone is an appropriate device to operate domestic systems.

[4]This paper intends to solve the problems of pre-existing methods of control that use simple voice call. Method here uses the Dual Tone Multi Frequency generated when a keypad button of the mobile phone is pressed by the user. The mobile phone user controls the system by sending the DTMF tone to the access point. The basic mode for robot communication uses RF. Radio Frequency is a sure choice for communication because it enables more information to be transferred at high speed and over large distance. However, the use of Radio Frequency contributes in enhancing the mysterious nature of robot technology. To implement communication, dual tone multi frequency technology is used.

[5]The paper present the angular position of a stepper motor has been controlled remotely using Dual Tone Multi Frequency signal through microcontroller. Wireless position control can also be achieved through Radio Frequency

Transmitter and receiver but in case of Radio Frequency communication, devices using equivalent frequencies Such as wireless cell phones, scanners, wrist radios, personal locators etc. can intervene with transmission.

In the present idea Dual Tone Multi Frequency Technology has been used to implement acoustic communication for controlling the angular position of the stepper motor remotely anywhere in the world through mobile phone network. Dual Tone Multi Frequency decoder has been used to decode the Dual Tone Multi Frequency signal.

The decoded signal has been read by the microcontroller through its Input and output port and provides the control signal to position the stepper motor at the desired angle.

4. ARCHITETURAL DESIGN

In demand to operate the robot, one needs to make a call to the cell phone attached to the robot through head phone from any phone, which sends Dual Tone Multi Frequency tunes on pressing mobile does vehicle connected mobile end then made it in hands free mode. So after a bell, the cell phone receives the call.

Now you may press any button on your mobile to perform actions as listed below:

- When pressed 1 the robot will step forward.

- When pressed 4 the robot will step left.

- When pressed 2 the robot will move backwards.

- When pressed 3 the robot will move right.

- When pressed 5 the robot will stop.

The Dual Tone Multi Frequency tones thus

Produced are received by the mobile phone connected to the robot. These tones are sent to the circuit by the headset of the mobile phone. The MT8870 decrypts the received tone and sends the equipment binary digit to the microcontroller, the robot begins moving.
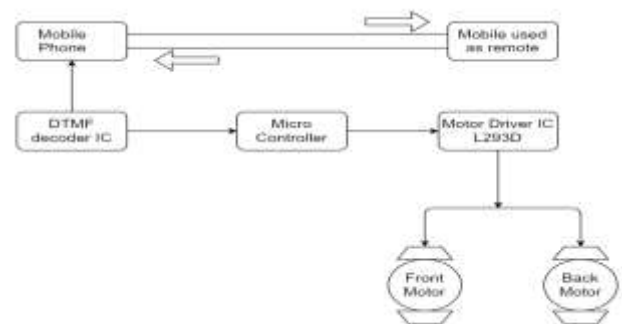

Fig -1: System Architectural Diagram

5. REQUIREMENTS

Formally, Wireless controlled robots use radio frequency circuits, which have the lacuna of limited working range, restricted frequency range and the limited control. Use of a cell phone for robotic operation can overcome these limitations.

It gives the dominance of robust control, working range as vast as the coverage area of the service provider, no intervention with other controllers and up to 12 controllers.

The software model used here is Classic Life Cycle Model. The team meets once a week to discuss the progress done by each member and to share the related information and the documents that have been made. The number of gatherings may increase during the last semester as the group members will have more time.

There are reviews being taken once in a week during the group meetings. A whole technical review will be conducted at the end of the Design Phase. There will be reviews carried out at the completion of every single testing phase.

The major milestones to be achieved are as follows:

1. Results of research of pre-discovered system and discussions with the team leader.

2. Results of the Design Phase, which comprises a number of modeling figures, like the use cases, class diagrams and etcetera.

3. Outputs of the first coding phase will be an initial code that will be tested.

4 Based on the outputs of the testing, the code will be inspected in the second coding phase

5.1 Functional Requirements

A functional requirement states a system or its component.

Data-pre-processing and priority

- Input request gathered
- Priority High

Stimulus/Response to Sequences

- Request gathered by the on board mobile
- Call is attempted
- Connection is made to the remote mobile
- Data further processed by Decoder
- receive to the Arduino board
- Result is in the form of DC motors moving in the desired direction

5.2 Non-Functional Requirements

A **non-functional requirement** states the performance attribute of a software system.

- **Performance Requirements**

Network: The System uses GSM cell call to join to the robot and hence require good network connection to establish a strong connection

Accuracy: System should rightly evaluate the inputs provided by the remote cell and give the desired result. This means all the Components are working without any disturbance.

- **Hardware Requirements:**

1) Arduino UNO

2) Dual tone multi frequency decoder Module-MT8870

3) Motor Driver L293D

4) DC Motor

5) 9V Battery

6) Battery Connector

7) Mobile phones

8) Aux wire

9) Robot Chassis with wheel

10) Connecting Wires

- **Safety Requirements:**

Data safety should be ensured as anyone with the connected cell phone address may get the connection to the system and therefore the GSM address should be known to only authorized persons and the on board mobile should be protected with password.

6. WORKING

The Dual Tone Multi Frequency robot car has two mobile phones each one as both ends. Both mobile phones are used to give the commands to the robot car. The phone one works as transmitter. It provides the command to the robot car to the phone two which acts as a receiver. The phone two takes the commands and processes the command as stated. In demand to control the robot one need to call the cell phone connected to the car from the phone one placed at the transmitter end. The mobile phone act as dual tone multi frequency generator with tone depending on the key pressed. The cell gives the as dual tone multi frequency tones at the input signal on pressing the numeric button available at the display or keypad of mobile phone. The mobile phone connected to the robot is kept in auto answer mode. This is answerable automatically to specific contact saved in it. So when the transmitter, mobile phone one makes a call, the mobile phone two, receiver, receive it by default. The numeric button provided at the mobile phone is used to perform action as listed in commands in the AVR controller or program saved to the IC. The generated dual tone multi frequency tone are then received by mobile phone in the robot,

The received tone is processed by the microcontroller with the help of DTMF decoder. DTMF decoder decodes the received tone and gives binary equivalent of it to the microcontroller. The Atmega328 is programmed accordingly to execute the appropriate command. The result of the Atmega328 is given to the motor driver IC. This motor driver is connected to DC motors. This motor driver is able of handling two motors simultaneously. The motion of two DC motors is operated by this motor driver. When a key is pressed on the transmitter mobile phone, phone one then it received at the mobile phone two. The Dual Tone Multi Frequency decoder is attached to the cell phone two so it will receive the signals and changes it into binary form and provides to the AVR microcontroller. In AVR microcontroller the Atmega328 IC is used with the help of the programming the command will be provided to the driver motor. Then the driver motor provides the command

to DC motors to rotate the motors and move the vehicle. So with the help of driver motor and DC motor, car will move in various directions so the driver motor will act as the operator of the movement of the vehicle.

7. FUTURE SCOPE

- IR sensors can be used to automatically detect and avoid obstacles if the robot goes ahead of the line of sight. This avoids harm to the vehicle if we are maneuvering it from a place away.

- Passwords Protection Project can be reshaped in order to password protect the robotic car so that it can be controlled only if correct password is provided. Either mobile phone should be password protected or necessary alteration should be made in the assembly language code. This introduces conditioned contact and increases security to a great level.

8. RESULT
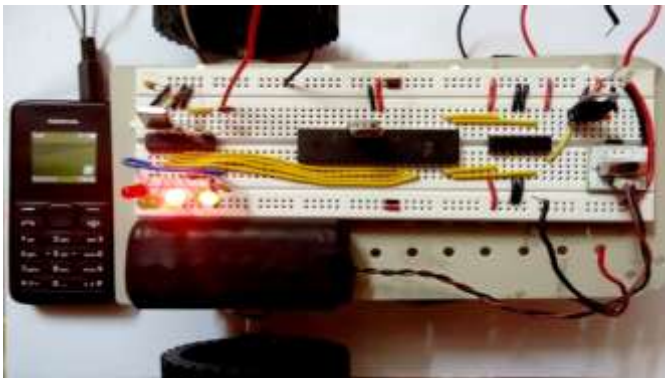
Fig -2: Final Proposed System Output
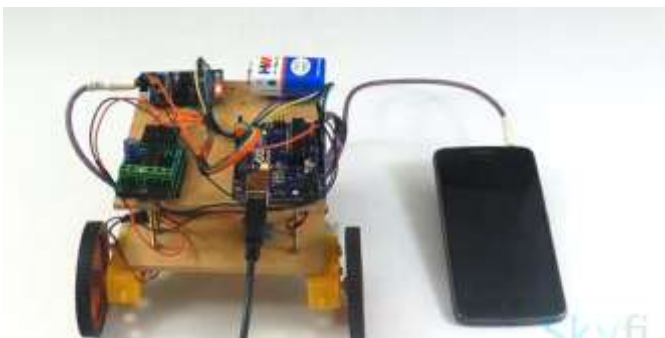
Fig -3: Final Proposed System

Mobile controlled robotic car is designed using an IC CM8870 DTMF decoder, IC 7404 inverter, AT89C51 microcontroller and L293D motor driver components. The robot's movements and directions are operated by pressing the keys stated on the mobile phone.

9. CONCLUSION

Hence, it can be concluded that mobile operated robots can be designed using IC CM8870 DTMF decoder, IC 7404, AT89C51 microcontroller and L293D driver motor components. The position of the robot in different directions can be controlled and operated by pressing the keys stated on the cell phone. Household electrical appliances can be controlled with the help of ULN2003 and relay circuits.

This paper has stated the design and implementation of experiments to test the convenience of using a dual tone multi frequency encoding India as a method for simple message communication.

REFERENCES

[1] The authors A Faikh, J Serao presented a paper titled Cell phone operated robotic car

[2] The author amey k presented a paper "Implementation of unmanned vehicle using GSM network with Arduino"

[3] T Ladwa, S. Ladwa, and R. Kaarthik, A. Dhara, and Dalei, "Control of Remote Domestic System Using DTMF" presented at ICICI-BME 2009 Bandung, Indonesia, 2009.

[4] Y. Cho and J. Jeon, "Remote Robot control System based on DTMF of Mobile Phone," IEEE International Conference INDIN, 2008, July 2008.

[5] Authors S Pal, Niladri Tripathy "Remote Position Control System of Stepper Motor Using dual tone multi frequency Technology"

[6] Madhavi suryawanshi, Sarita Patil. "Avoiding the data leakage and providing privacy to data in networking",2016 International Conference on Computing Communication Control and Automation(ICCUBEA),2016

[7] www.nex-robotics.com/.../motor-controllers/l293d-motor-driver-ic.html

[8] www.learn-android.com

[9] www.active-robots.com/.../av-modules.shtml - United Kingdom

[10] www.spyville.com/camera-detector.html

[11] J lovine's Second Edition McGraw-Hill Robots.

[12] Douglas Williams Mc Graw-Hill PDA Robotics Using Personal Digital Assistant.

[13] www.epanorma.com

[14] www.robotics.com

[15] www.automation.com

[16] www.mtechworld.com

[17]   www.datasheetarchive.com/MT8870datasheet.html

[18]   Datasheet MT8870 Zarlink Semi conductor on page 6.

[19]   http://www.atmel.in/devices/ATMEGA328.aspx

[20]   http://www.robotplatform.com/howto/L293/motor_driver_1.html

[21]   http://www.dialabc.com/sound/dtmf.html