INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER
INDIA

Impact Factor: 8.165

DTMF Controlled Robot with ESP-32 CAM

Akshata M. Hulagabali[1], Annapurna Y. Torvi[2], Megha M. Elavigi[3], Mukta P. Mandolkar[4],

Shilpa Bhairanatti[5]

UG Student, Dept. of ECE, S. G. Balekundri Institute of Technology, Visveswaraya Technological University,

Belagavi, Karnataka, India[1,2,3,4]

Assistant Professor, Dept. of ECE, S. G. Balekundri Institute of Technology, Visveswaraya Technological University,

Belagavi, Karnataka, India[5]

ABSTRACT: This paper is concerned about applying DTMF technology in the field of robotics which has a major impact in the zone of military. As DTMF is oldest concept but still in use because it has overcome the drawbacks on RF Circuits. Attempt is made to make the project more efficient and overcome the limitations of previous work. Improvement made in the project broaden the applications.

KEYWORDS: Arduino-UNO, Control section, Drive Section, Dual Tone Modulated/Multiple Frequency (DTMF), ESP-32 CAM, Remote Section.

I.INTRODUCTION

Increase in terrorist activity is a threat for all countries. And virtuous losing of soldiers in search of terrorist and protecting people's lives from their inhuman activities is a difficult task. There is a massive need of unmanned robots for rescue, search or spy missions and even for military utilization. Dual Tone Modulated/Multiple Frequency (DTMF) is a technology which comes under telecommunication system. Where a telephone signal is used to move a system/device.

Earlier in 1969's DTMF was known by the term "Touch-Tone" and was introduced to public on the year 1963.It is among oldest signalling system still in use. As it had overcome the drawback of RF circuits such as limited working range-frequency range-control. It works as shown in figure.1
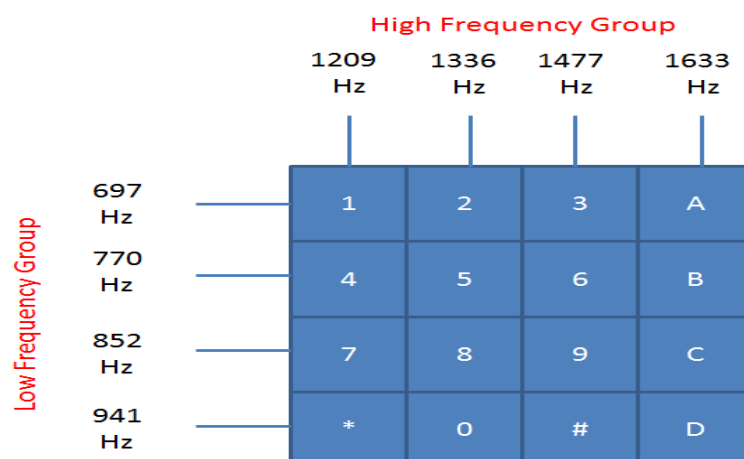

Figure 1. Standard Frequency allotted to key

This paper reveals about the working of DTMF along with ESP-32 CAM- a Wi-Fi module used to have a live scene, Arduino UNO – microcontroller board of ATMEGA32P and efficient battery usage.

II.RELATED WORK

In 2017, the paper [1]came up with DTMF controlled robot using Arduino-UNO, CM8870-DTMF decoder, delay that integrate both band filter and decoder function into single pin. As the paper includes the limitations related to batter system and network range. In the year 2018, [2]they worked on the limitations of the previous paper where the robot was made with 3*2 fully functional max road grip wheels which increase the efficiency of the robot additionally Arduino-UNO, digital relay, GSM technology was used. Abu Tayab Noman et al., [3]applied project of DTMF which described the design and implementation of a microcontroller which is acoustic and visual detecting monitoring child and aged person. The methodology includes with set of sensors and IP web camera [live streaming] future scope of this paper includes with battery, internet and servomotor.

In the year 2020, Sk. Khaja Shareef and N. Shirisha [4]made use of applied DTMF concept in home automation. The working process resembles the previous papers but the output was with automation. This made to have different analogy of DTMF.As DTMF is old concept, but the usage and efficiency make the drawback of DTMF. In the year 2021, P. W. Rusimamto et al. [5]attempted with new method that is usage of Arduino pro-mini, ESP-32 and use of proximity sensor.

III.PROBLEM IDENTIFICATION

Conventionally, robots controlled by wireless communication employ radio frequency circuits, which have the drawbacks of Limited working, frequency range and control, Huge Battery wastage, Efficiency and reliability, Addition of advanced feature. This leads to achievement of the objectives such as remote handling operation, secured camera implementation and battery back-up.

IV.METHODOLOGY

Methodology refers to the overarching strategy and rationale of the project. Involves the study of method used, theories and principles to achieve the objectives defined. The above figure.2. describes the arrangement of the components.
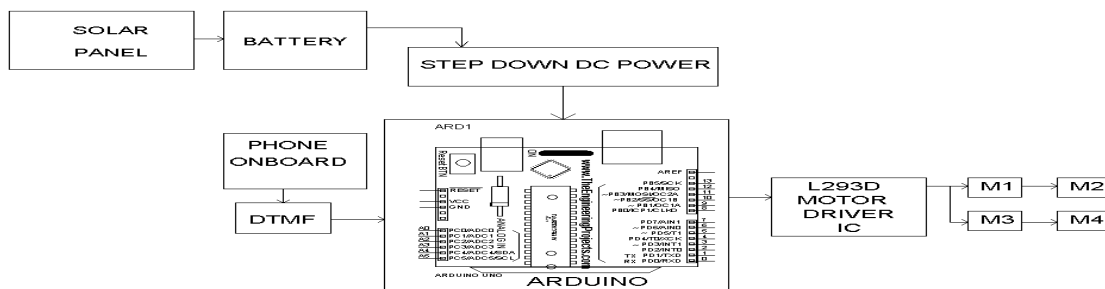

Figure. 2. Block Diagram of DTMF controlled robot

1.Solar panel & lead battery: These are connected together, as lead battery is a rechargeable battery which includes two sockets one through solar panel other through current any one can be used on the basis of requirements as shown in figure.3.
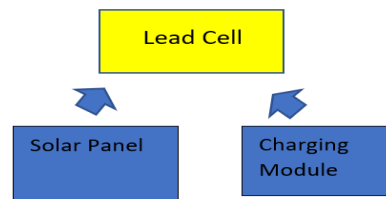
Figure.3. Block Diagram Power
system

2.DC buck converter (Step down dc motor): capability to step down the high voltage to low which is suitable for Arduino UNO and ESP-32 CAM.

3.DTMF Decoder-Received Dual tone signal from mobile is converted to digital signal.

4.Arduino UNO- digital data is read through the signal sent from DTMF Decoder and work accordingly as instructions are given in the program which is dumped through Arduino Uno IDE software.

5.L293D Motor Driver IC- Make motors to move according to the instructions sent by Arduino UNO. i.e., Left-Right-Forward-Backward-Stop. It is explained in figure.5.

6.ESP-32 CAM- is a small size, low power camera module based on ESP-32(connectionless communication protocol) developed by Espressif, it can be widely used in intelligent IOT applications such as wireless video/photo capture monitoring, QR identification and so on. Placed over the kit and programmed through TTL connector and Arduino UNO IDE software.as shown in figure.4.
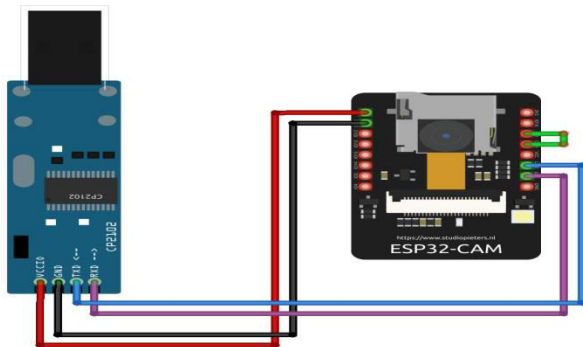

M11	M12	M21	M22	OUTPUT
1	0	1	0	Forward
0	1	0	1	Backward
1	0	0	1	Left
0	1	1	0	Right

Figure. 4. ESP-32 with TTL Connector   Figure.5. Moto driver binary data table

DTMF is a mixture of high frequency and low frequency as described in figure. 4. And gives a dual tone signal as an output when one upper and one lower frequency combine.

V.IMPLEMENTATION

Robot movement and predefined binary data input for motor rotation are shown in figure.5. and figure.7. and the procedure is defined in figure.6.
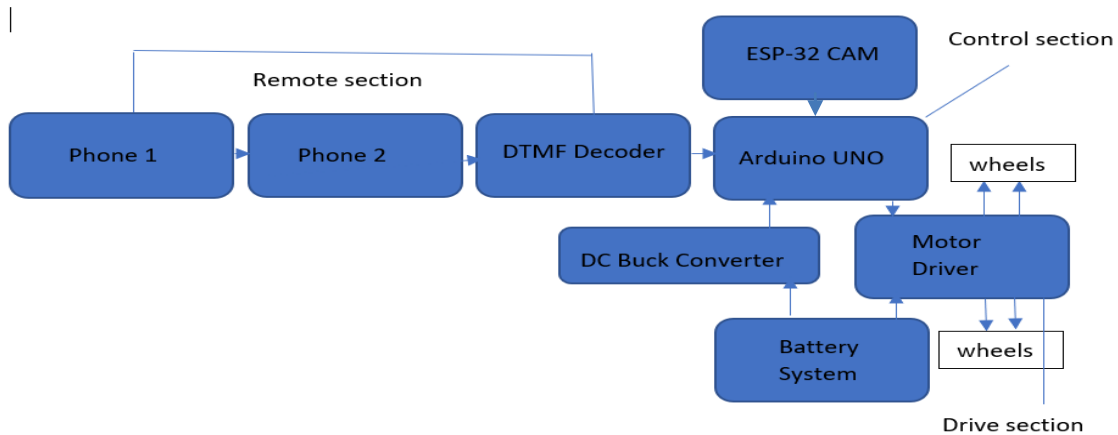
Figure.6. working of DTMF Robot

The whole working procedure is divided into three sections:
1.**Remote section.**
2.**Control section.**
3.**Drive section.**

Processes goes as follows, the call is established from **phone 1** and received at **phone 2**-instructions are sent by pressing keys from phone 1 i.e, upper frequency combined with lower frequency of phone 2 and dual tone signal is sent to **DTMF Decoder**-converts dual tone to digital and fed to **ArduinoUNO**-**arduino** reads the data and transmitt the corresponding instuction (signal) to **motor driver** -motordriver moves the wheels accordingly.
Battery is directly connected to Driver so that it can consume how much amount is required. Where as to arduino it is connected via **dc buck converter** so that it receives the required low voltage.Through **ESP-32 CAM** which given by the IP address can visualize the current scene.
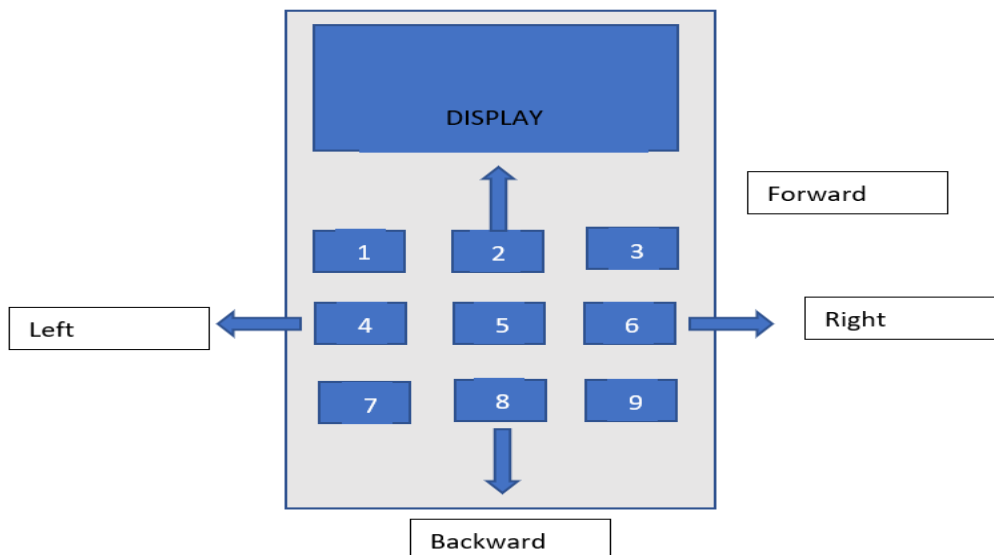

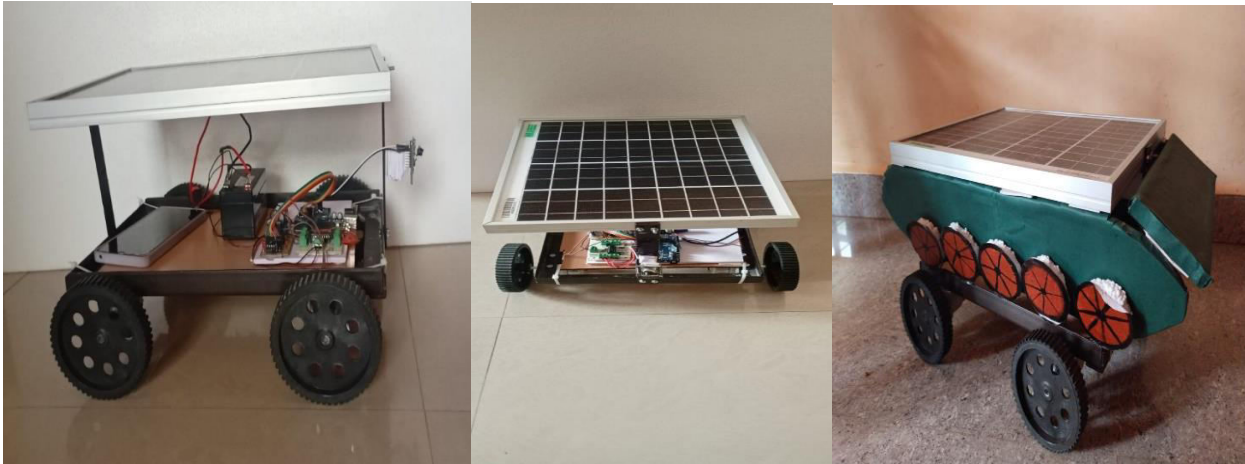Figure. 7. Key instruction through Keypad

VI.RESULTS AND DISCUSSION

Figure.8. DTMF Robot

Figure. 8. Gives the final outlook of the robot which describes the movement accordingly. i.e., when, **2** is pressed the robot moves **Forward**- **8** is pressed moves **Backward** – **4** is pressed turn **Left** – **6** is pressed turn **Right** -**5** is pressed **Stop.**
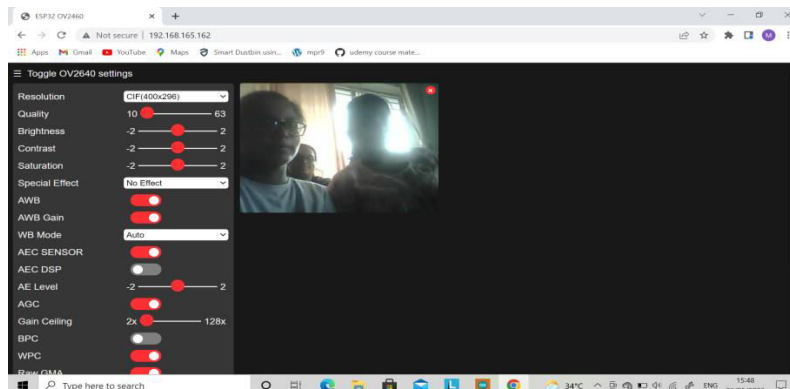

Figure 9: ESP-32 CAM Output

The output of the ESP-32 camera is shown simultaneously with the robot control operations as shown in the figure 9. We can also add additional features like Face Detection, Recognition & Quality Control.

VII.FUTURISTIC CHALLENGES

Device completely relies on the network. If required network is present, then the system works or stand alone. Likewise, if Wi-Fi connection is good, then camera works and shows live capturing else it is difficult to record. In future this problem may be solved by good network around or any alternate solution to make more efficient.

VIII.CONCLUSION

DTMF technology can be helpful for military purposes. This device overcomes from huge battery wastage, efficiency and many more problems. The programing used gives very good control on the movement of the robot. The robot is built keeping military, police, security, and surveillance forces in mind.

ACKNOLEDGEMENT

REFERENCES

[1] S. Ronanki, D. Tandra, P. Pogiri, and D. Rao, "DTMF CONTROLLED ROBOT USING ARDUINO."
[2] Institute of Electrical and Electronics Engineers, *2018 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence) : 11-12 Jan. 2018.*
[3] *2019 International Conference on Electrical, Computer and Communication Engineering (ECCE)*. IEEE, 2019.
[4] S. K. Shareef* and N. Shirisha, "Efficient Automation using DTMF," *Int. J. Recent Technol. Eng.*, vol. 8, no. 5, pp. 3965–3967, Jan. 2020, doi: 10.35940/ijrte.E6762.018520.
[5] P. W. Rusimamto, Endryansyah, L. Anifah, R. Harimurti, and Y. Anistyasari, "Implementation of arduino pro mini and ESP32 cam for temperature monitoring on automatic thermogun IoT-based," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 23, no. 3, pp. 1366–1375, Sep. 2021, doi: 10.11591/ijeecs.v23.i3.pp1366-1375.

INTERNATIONAL JOURNAL
OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

📱 9940 572 462 🟢 6381 907 438 ✉ ijircce@gmail.com

Scan to save the contact details