# MOCHA (Man Operated Car Having AI)

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*Abstract*— DTMF based robotic vehicle circuit consists of DTMF decoder IC, driver IC l293D IC and motors. DTMF decoder IC used is CM8870. It has 18 pins. Tone from DTMF encoder is given to the DTMF decoder IC. The decoder IC internally, consists of operational amplier whose output is given to pre lters to separate low and high frequencies. Then it is passed to code detector circuit and it decodes the incoming tone into 4bits of binary data. This data at the output is directly given to the driver IC to drive the two motors. These motors rotate according to the decoded output. If the button pressed from mobile is 1, it gives a decoded output of 0001. Thus motor connected to the rst two pins will get 0 volts and second motor will have 5 volts to one pin and 0 volts to the another pin. Thus second motor starts rotating and rst motor is off. So, robot moves in one direction either to left or right. If the robot is to rotate forward or backward then the binary value should be either 0101 or 1010.These values indicate that two motors rotates in the same direction i.e. either forward or backward. The following table gives the low frequency, high frequency and binary output value of each button pressed in the keypad.

## I. INTRODUCTION

DTMF is the acronym for Dual tone modulation frequency. Robotic vehicle based on DTMF technology is explained in this article. Here is a circuit that operates the robot without using a microcontroller. This circuit consists of simple ICs. When a key is pressed from our mobile, it generates a tone combination of two frequencies from our keypad. In the two frequencies, one is high frequency and another one is low frequency. This frequency can be decoded by the decoder IC into binary sequence. The vehicle we are making will also involve object recognition tasks using the camera of the mobile phone which will be on the DTMF robotic vehicle. This vehicle is made Semi-autonomous using AI. This is trained by Deep Learning using ResNet data set due to lack of computational power. There are 4 layers of Fully Connected Network and 3 layers of Convolutional Neural Network perfomed on a live video feed fetched from an IP address to give a prediction. If the prediction is very high for a Gas Stove , it moves towards that direction. It also has an LPG Sensor and Buzzer to warn off against leaking LPG.
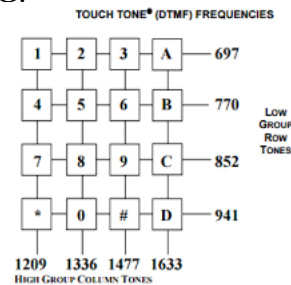


FIG 1: Dual Tone Multi Frequency Standard Conversion Table

### A. Working of DTMF Decoder

The main components of the circuit are DTMF decoder IC, motor driver IC and motors. The decoder IC used here is CM8870 IC. The second pin of decoder IC is an inverting pin of the operational amplier. Tone is applied to the IC through a series of capacitor and resistor. The output of the OpAmp is fed back through GS pin of the IC. An external crystal is connected to the 7th and 8th pins of the IC. Motor driver IC used is L293D. It has 16 pins. 2, 7, 10, 15 pins are the inputs of motor driver IC connected from output pins of the decoder IC. The output pins are 3, 6, 11, 14. These pins are connected to the two motors of robotic vehicle. 8th pin is connected to the VEE. VCC is the input voltage which enables the enable pins(1,9,16) of L293D motor driver IC. Motors cannot be driven with 5Vof decoder IC. So, a driver IC is used to amplify this voltage. VEE pin provides this voltage.

## II. CIRCUIT COMPONENTS

- DTMF Decoder IC (CM8870)
- Motor Driver IC(L293D)
- Motors
- Resistors 100K*2, 300K

- Capacitors 0.1Uf * 2
- Crystal oscillator 3.579545Mhz
- Arduino Uno
- Video Camera LCD
- Decoder IC (CM8870)

## III. ROCKER BOGIE MECHANISM

Inspired by NASAs Mars Rover introduced by NASA for its unmanned MSL mission, we have tried our hands at making do with the unsophisticated and easily available water pipes to create and implement the Rocker Bogie mechanism into our MOCHA project. Our primary concern was if the house was a multi-storeyed or a duplex for that matter it may be necessary for our MOCHA to run up and down the staircase. The Rocker Bogie not enables this but also increases the overall suspension of the vehicle with a wide enough ground clearance to overcome smaller obstacles.



FIG 2: Test model with DTMF decoder cicuit and cell-phone



FIG 3: Rocker Bogie Mechanism for the model

## IV. INTRODUCTION OF A.I.

We were successfully able to implement IoT based Live video feed using AirDroid, a software application which enables us to remotely access the on-board cell phone. We also used the IP Webcam application. There the video feed URL was used to access the video frames for further image processing and object detection tasks. The object recognition tasks involved Deep Neural Networks which is a subsection of Machine Learning which in turn is a subset of the larger umbrella called Artificial Intelligence. We used the open-source version of the ResNet neural network which used three fully connected neural networks and four convolutional neural networks for object detection and recognition. We also tested our model using the open-source version of AlexNet neural network. MATLAB was used as the platform for the software implementation of the whole model which involved live video feed capture from the on-board cell phone and object detection and recognition.
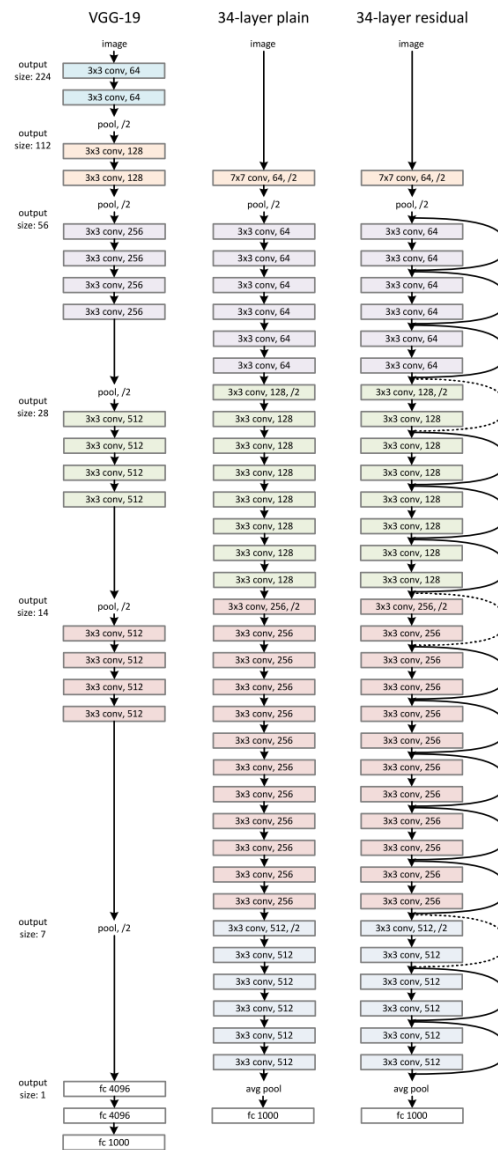


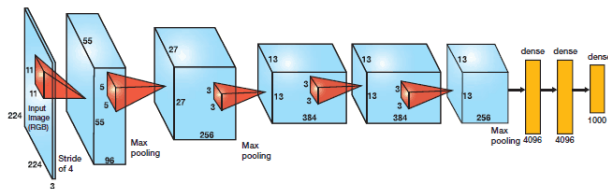FIG 3: This shows the basic structure of ResNet

FIG 4: This shows the basic working of AlexNet

## V. CONCLUSION

This is currently a multi funtional semi-autonomous car trained on ResNet using 3 Fully Connected NNs and 4 CNNs to get a prediction. We have written and ran our code in MATLAB and have used Arduino Micro -Controller to interface the Sensors. The bot is fully responsive and functional.

### A. Future Plans

We have a lot of plans in store for our MOCHA :

- Use a Robotic Hand to interact with the physical world in a much more human friendly way.
- Use Solar Panel and a charge limiter circuit to harvest Green Power.
- Make the bottom rounded and attach propellers at the bottom to make it move in water and also, waterproof the circuits.
- We already have a drone up and running, connecting the three areas of our biosphere would be our nal target.

## VI.

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