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DTMF Controlled Robotic Car

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***Abstract*— This paper summarized a robotic car control by DTMF generated cell phone. 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 Multi Frequency" (DTMF) tone. The robot perceives this DTMF tone with the help of the phone stacked on the robot. The received tone is processed by the microcontroller with the help of DTMF decoder. The microcontroller then transmits the signal to the motor driver ICs to operate the motors & our robot starts moving**

Keywords—Dual Tone Multi Frequency (DTMF), Integrated Circuits (IC), Microcontroller (µC), Radio Frequency (RF), Radio Control (RC) etc.

I. INTRODUCTION

In 1898, Nikola Tesla built the first propeller driven radio controlled boat, which can be regarded as the original prototype of all modern-day uninhabited aerial vehicles and precision guided weapons. Records state that it is the first among all remotely controlled vehicles in air, land or sea. It was powered by lead-acid batteries and an electric drive motor.

In the recent past, wireless controlled vehicles had been extensively used in a lot of areas like unmanned rescue missions, military usage for unmanned combat and many others. [1]

As shown in Fig: 1 the major disadvantage of these wireless unmanned robots is that they typically make use of RF circuits for maneuver and control.

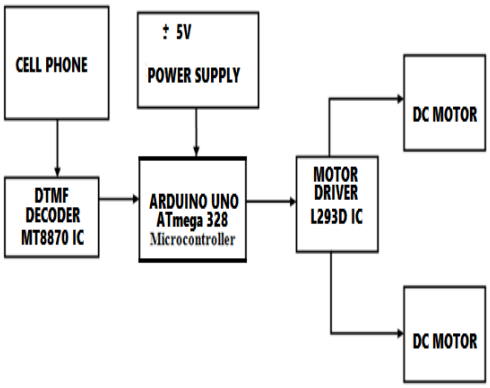

Fig: 1 Block Diagram of recently used in robotic car construction.

The objective of designing this robot is simply to facilitate the humans in the future for security purposes. In the present scenario, there are many recent developments of robotics and communication on a large scale. The robot is in the form of a vehicle mounted with a web cam, which acquires and sends pictures PC. The movement of vehicle is controlled by microcontroller. Our idea is to make a robot to tackle the hostage situation & the worst conditions which cannot be handled by human being. Hence Humans are moved out from direct exposure to potentially dangerous situations. Robotic system can perform many security and surveillance functions more effectively than humans.

II. HARDWARE USED

A. DTMF (Dual Tone Multi Frequency):

Our cell phone is DTMF generator if it produces sound when we press any alphanumerical key. When we press the buttons on the keypad, a connection is made that generates two tones at the same time. A "Row" tone and a "Column" tone. These two tones identify the key we pressed to any equipment we are controlling. If the keypad is on in our phone, the telephone company's

"Central Office" equipment knows what numbers we are dialing by these tones, and will switch our call accordingly. If we are using a DTMF keypad to remotely control equipment, the tones can identify what unit we want to control, as well as which unique function we want it to perform is predefined by us. [2]

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

Fig: 2 DTMF keypad frequencies

B. Description of DTMF

Fig: 2 shows DTMF technique outputs distinct representation of 16 common alphanumeric characters (0-9, A-D, *, #) on the telephone. The lowest frequency used is 697Hz and the highest frequency used is 1633Hz. The DTMF keypad is arranged such that each row will have its own unique tone frequency and also each column will have its own unique tone frequency. Above is a representation of the typical DTWMF keypad and the associated row/column frequencies.

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C. *Working of DTMF*

When we press the digit1 on the keypad, we generate the tones 1209 Hz and 697 Hz. Pressing the digit 2 will generate the tones 1336 Hz and 697 Hz. Sure, the tone 697 is the same for both digits, but it take two tones to make a digit and the decoding equipment knows the difference between the 1209 Hz that would complete the digit 1, and a 1336 Hz that completes a digit 2.

D. Arduino a Microprocessor

Arduino as shown in Fig: 3 is an open-source physical computing platform based on a simple input or output board and a development environment that implements the Processing/Wiring language. [3]

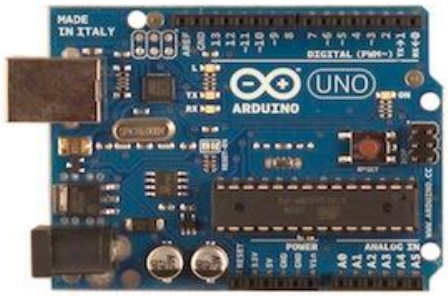

Fig: 3 Arduino UNO

E. Motor Driving IC L293D

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. Table: 1 gives details about the pin configuration used in our research. [4]

Table: 1 Configuration of Motor Driver IC

D 0	D 1	D 2	D 3	Condition of Motors
0	0	0	0	Left & Right Motor-Stop
1	0	0	1	Left & Right Motor-Clockwise
0	1	1	0	Left & Right Motor- Anticlockwise
1	0	1	0	Left Motor- Anticlockwise, Right-Clockwise
0	1	0	1	Left Motor- Clockwise, Right-Anticlockwise

III. OUR APPROACH TO PROCESS DATA

We connect a mobile phone as Fig: 4 on robotic car and call to that phone from other cell phone. Mobile no. 2 is in auto answering mode. Call is pickup automatically then after we press number from mobile 1 keypad that produces DTMF tone. DTMF tone is identified by MT8870 decoder IC connected through mobile ear pin. The data is processed in Arduino and Arduino send signal to motor driver IC to control the rotation of motors. Fig: 5 robotic car moves when we press 2, 4, 6 & 8 button on mobile after call on cell phone 2 from other cell phone. [5]

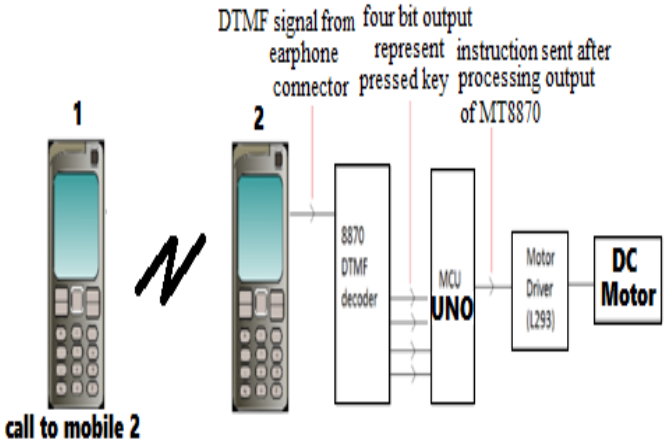

Fig: 4 Approach of our research

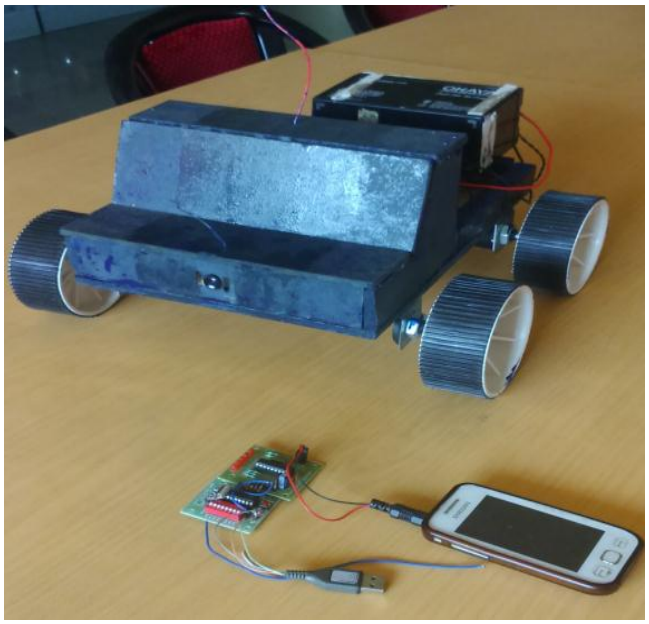

Fig: 5 Our research Image

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IV. COST ANALYSIS

Cost analysis is an integral part of any research that is carried out. In this section, we try to provide an approximate cost estimate of the research as given in Table: 2. The components used here can be brought from any of the online electronics stores which are found on the internet.

TABLE: 2 Cost of Components

Components	Quantity	Cost in Rs.
MT8870 I.C	1	150
L293D I.C.	1	30
ARDUINO	1	1350
DC MOTOR	2	350
VEHICLE CHAHISE	1	300
WIRES	5 Mtr.	30
BATTERY	2	500
CAMERA	1	950
Pins and Sockets	2	50
OTHER	-	500
	TOTAL	4250

V. SCOPE

Cell phone controlled robot can be used in the borders for displaying hidden Land mines.
The robot can use for reconnaissance or surveillance.
The robot can be used anywhere there is the service provider tower of the connection provided that is mounted on robot.
Robot is small in size so can be used for spying.
Robotic Car can be used in power plant to control different units.

VI. FUTURE SCOPE

A. IR Sensors

IR sensors can be used to automatically detect & avoid obstacles if the robot goes beyond line of sight. This avoids damage to the vehicle if we are maneuvering it from a distant place. [6]

B. Password Protection

Research can be modified in order to password protect the robot so that it can be operated only if correct password is entered. Either cell phone should be password protected or necessary modification should be made in the assembly language code.

V. CONCLUSION

On the rise such a robotic surface vehicle, we have overcome the drawbacks of the typically used RF circuits. This RCV includes advantages such as robust control, minimal interference and a large working range. The car requires five commands for motion control. The remaining controls are available to serve purposes dependant on the area of application of the RCV. We have tried to reduce the circuit complexity and improve upon the human machine interface. The cost analysis of the research described in previous section of this paper clearly indicates a huge improvement in the cost expenditure of the production of these unmanned vehicles. Moreover handling these USVs does not require much skill on the part of the user. Even an ordinary person can maneuver these USVs without having to know much about the internal circuitry. In this way the cost involved in training people to use such USVs can also be saved.

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