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Cell Phone Operated Land Rover Robotic Vehicle

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Abstract- *A hint of automation is seen in all the areas of development. Recently it has evolved in the field of remotely operated robotic vehicle. In the present project work, the DTMF based Cell Phone Operated Robotic Vehicle system was developed. Replacement of radio frequency controlled robotic vehicle with DTMF based controlled robot would be a cost effective one. The DTMF decoder were used for controlling the robotic movement. A microcontroller was employed to control the robotic functions. Output obtained at motor driver is fed to DC motors, input given through mobile phone. By developing this system and after knowing results it can be concluded that this system is very much cost effective and robust control operation.*

Keywords-Mobile phone, Atmega16 Microcontroller, IC MT8870 DTMF decoder, IC L293D Motor driver, Geared DC Motor.

I. INTRODUCTION

Nowadays everybody ought to be progressed ground-breaking imaginative thoughts which stand taller than a large portion of other experimentation to satisfy the need of people. A robot is a self-assistive vehicle which performs its operation based on the pre-customized/pre-programmed assistive direction loaded into the microcontroller chip of the vehicle. To control any system remotely, there will be always some medium, for example, Radio waves (radio frequency), RF is one such medium utilised for transmitting control signals from one place to another place. The major limitation of radio waves are, it can't be utilised to transmit the large amount of information at once because of use of lower frequencies also continued usage of high beam emission radio waves may prompt to cause diseases like leukaemia and tumour. To overthrow this issue a GSM innovation with DTMF controlled system is utilised for controlling automated vehicle remotely.

Utilization of cellular telephone gives solid control over the robot additionally gives large working zone to address the limitation of radio waves without negotiating any obstruction brought on because of snags from other transmitting mediums. Consequently DTMF (duel tone multi frequency) acts as intermediary between the transmitters and receiver.

In this proposed system, the robot is attached with a mobile phone for all the time, when a call being made through other wireless device (Mobile phone) and if any numeric number on keypad is pressed, relating information tone will be exchanged between the mobile phone through GSM call, taking into account the number pressed on keypad of mobile phone, the decoder present at the receiving mobile phone gets the information and interprets it and sends it to microcontroller which does the fundamental operation of moving a robotic vehicle.

II.BLOCK DIAGRAM OF PROPOSED SYSTEM

The robots consists of several internal components which are packed into single unit. Since robots is to move for one place to another so it is necessary to use less weight materials to move easily.

The below Figure 1 shows block diagram of cell phone controlled robotic land rover.

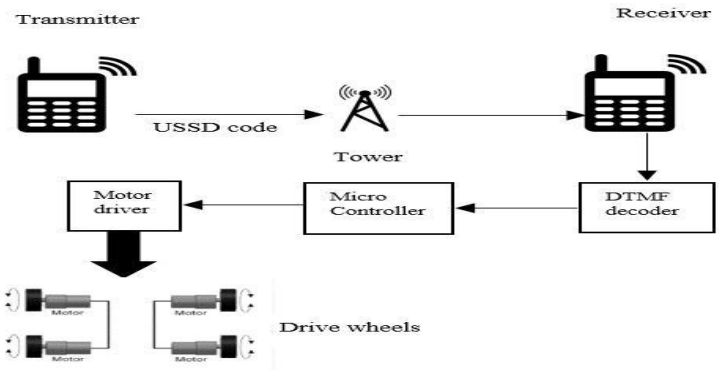


Figure 1 *Shows the block diagram of proposed system.*

2.1 Working of Implemented System.

Step 1A mobile telephone which is associated with the robot is kept in auto accepting mode. For the control of the robot, we need to make a call to the cellular telephone which is fixed to the robot through a headphone.

Step 2 when the call is made then press the keypad of the mobile. DTMF tone is received by the mobile that is associated with the robot through the earphone. These signs are received by the DTMF decoder that decodes the sign in paired grouping to the microcontroller.

Step 3 Due to the programming in controller, robot will move when pressing key in the mobile phone. Microcontroller outputs are in paired structure. The high output of the controller drives the motor in the forward direction. Similarly, we can move the motor in reverse, left, right movement and stop condition. Figure 2

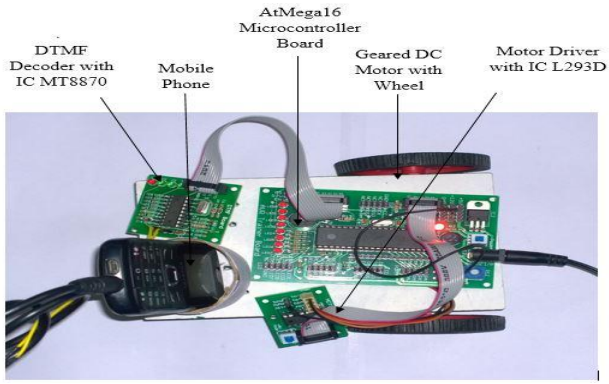


Figure 2 *Shows working model of proposed system*

III. SYSTEM COMPONENTS

3.1 Double Tone Multi frequency

Double tone multi frequency is utilized to convey between handheld portable with remotely altered robot through simple signs in the voice frequency bands. It's likewise called as touch tone.

3.1.1 The Phone keypad

The present keypad is organized in 4*4 framework. At the point when a numeric on a keypad is pressed which creates a tone comprises of 2 synchronous immaculate sin wave frequencies. Row arrangement demonstrates the low frequency keys and column arrangement indicates high frequency tones. This arrangement of DTMF decoder tones has shown in Table 3.1. DTMF framework comprises of eight tones transmitted in two sets to show sixteen signs, for example, 10 digits, A to D and images "#" and '*'.

Table 3.1*shows DTMF decoder tones at different frequency*

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

3.2 Hardware components

3.2.1 Microcontroller

Atmega16 is an 8 bit microcontroller of Atmel`s mega AVR family which has high performance ratio and low power consumption features. Figure 3.1 shows Atmega16 Microcontroller. Most of the instructions will execute in single machine cycle. It can work at a maximum frequency of 16MHz.

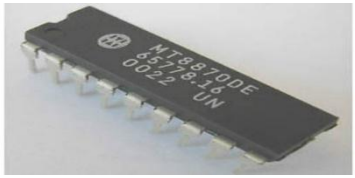


Figure 3.1*Shows Atmega16 Microcontroller****Figure 3.2****Shows DTMF decoder IC MT8870*

3.2.2 DTMF decoder using IC MT8870

This decoder is used to detect the dialled tone from a sender mobile phone and decodes the pressed number on the remote mobile phone attached to the robot. DTMF tone is a type of one way communication medium of transport between dialler and receiver. DTMF decoder IC MT8870 has shown in Figure 3.2.

3.2.3 Motor Driver

3.2.3.1 IC L293D Motor Driver IC

A motor driver IC is an incorporated circuit used to regulate motors in robots. Motor driver ICs act as boundary between microcontroller in robots and the motors used in robot. L293D generally used IC for controlling the motors.These ICs are made to control 2 DC motors simultaneously. It consists of two H-bridge circuits which are simplest form for controlling the low rated motor.

3.2.3.2 Working of an H-Bridge

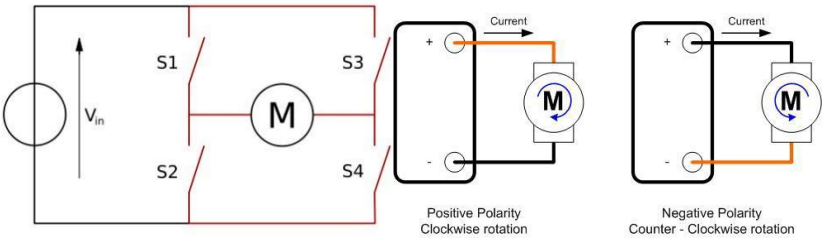


Figure 3.3*Shows H-Bridge circuit****Figure 3.4****Shows working of DC motor*

When S1 & S4 are kept locked and when S3 & S2 are kept unlocked then the circuit get connected diagonally with switch S1 & S4. This makes a path for current flow from Vin to switch S1 to motor then current to S4 to the circuit. This makes the current to flow in one direction. Similarly when S3 & S2 are locked and S1 & S4 are unlocked then current flows in opposite direction. When S1 & S3 are locked and S2

& S4 are unlocked then the motor gets break. Figure 3.3 shows H-bridge circuit and Figure 3.4 shows working of DC motors.

3.2.4 DC motor

Dc motor is mainly used for moving robot for required path. In this project it uses 5-12V working range Geared DC motor employed which rotates at 100 RPM. Figure 3.5 shows Geared DC motor.

Figure 3.5*Shows 12V geared DC motor****Figure 3.6****shows lead acid battery*

3.2.5 Power supply

Supply of power can be through battery which can be attached to robotic vehicle itself or a DC adapter
Which supply power directly from supply mains. For compatibility it is used a 6V, 4.5Ah lead acid battery.

3.3 Software used

The product is composed in "C" dialect and accumulated using code vision AVR "C" compiler. The source project code is altered over into hex code by the compiler. Burn this hex code into an Atmega16 AVR microcontroller. Different tools are: 1) AVR studio and 2) AVR compiler (WINAVR)

WINAVR is a collection of executable, open source programming improvement devices for the Atmel AVR arrangement of RISC chip and AVR32 arrangement of microchips facilitated on the windows stage. It incorporates the GNU GCC compiler for C and C++. The software is burned to microcontroller using AVR USBASP programming kit.

3.4 Circuit diagram

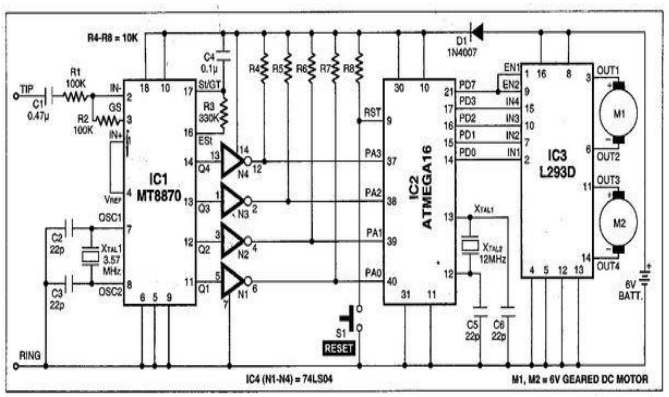


Figure 3.7*shows complete circuit connection*

The circuit diagram of mobile phone controlled robotic vehicle is shown in Fig.3.7. All types of the MT8870 arrangement use advanced numbering tactics to distinguish and interpret all the 16 DTMF tone collections into a 4-bit binary code outputs. The implicit dial tone dismissal circuit takes out the requirement for pre-filtering. At the socket when the data signal given at pin 2 (IN-) in single-ended input configuration is perceived to be successful, the right 4-bit translate sign of the DTMF tone is transferred to Q1 (pin11) over to Q4 (pin 14) outputs. Table II demonstrates the DTMF information. Q1 over to Q4 yields of the DTMF decoder (IC1) are associated with port pins PA0 over to PA3 of ATmega16 microcontroller (IC2) after reversal by N1 over to N4, separately. The ATmega16 is an 8bit, low powered, CMOS microcontroller taking into consideration of AVR improved RISC architecture.Receivedyield from output pins of the microcontroller is connected to inputs IN1 to IN4 and enabled pins (EN1 and EN2) of motor driver L293D, individually, to drive 2 geared DC motor. The microcontroller outputs are not satisfactory to function the DC motors, hence motor drivers are necessary for motor operation.

IV. RESULTS AND DISCUSSION

4.1 Results

Different results obtained during experimentation in tabulated in different Tables.

Table 4.1*shows DTMF decoder output****Table 4.2****shows HEX readings*

Low frequency(Hz)	High frequency(Hz)	digit	StD	D3	D2	D1	D0
-	-	Any	0	z	z	z	z
697	1209	1	1	0	0	0	1
697	1366	2	1	0	0	1	0
697	1477	3	1	0	0	1	1
770	1209	4	1	0	1	0	0
770	1336	5	1	0	1	0	1
770	1477	6	1	0	1	1	0
852	1209	7	1	0	1	1	1
852	1336	8	1	1	0	0	0
852	1477	9	1	1	0	0	1
941	1336	0	1	1	0	1	0
941	1209	*	1	1	0	1	1
941	1477	#	1	1	1	0	0
697	1633	A	1	1	1	0	1
770	1633	B	1	1	1	1	0
852	1633	C	1	1	1	1	1
941	1633	D	1	0	0	0	0

Key pressed	O/P from DTMF decoder	I/P to the µ controller	O/P from µ controller	Action Occurred
2	0x02	0xFD	0x89	Forward movement
4	0x04	0xFB	0x85	Left turn
6	0x06	0xF9	0x8A	Right turn
8	0x08	0xF7	0x86	Reverse movement
5	0x05	0xFA	0x00	Autonomous mode

DTMF decoder is the data decrypting device in 4 bit binary digit its action by adding two high and low frequency tones to produce a unique tone which is decoded at the other end of receiving centre. Results of 4 bit binary digit at output pins of decoder is tabulated in Table 4.1. StD represents delayed steering (Output), D3-D0 represents three state output data from DTMF decoder.

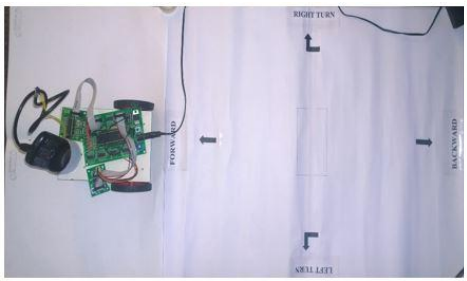
The HEX readings obtained at the outputs of MT8870 and L293D are shown in Table 4.2 Whenever anyone presses a key '2' it's binary equivalent is 00000010 on the cellular phone, it decodes and sent to microcontroller through MT8870 then microcontroller output is 10001001 is obtained. Port D socket pins PD0, PD3 and PD7 are high enabled. The high logic level of the output obtained at PD7 of the microcontroller actuates the motor driver (L293D).

4.2 Discussion

DTMF decoder produces a 4-bit binary data by addition of two lower and higher frequency tones. Here whenever a key 2 is pressed then the resultant output tone is a combination of two sine wave frequencies of lower and higher ranges. Hence the lower frequency at 697Hz gets added with 1366Hz higher frequency range to produce an output in 4-bit binary digit given by 0010. This combination is shown in Table 4.1. Similarly it can be explain for other keys pressed on keypad of mobile phone. Power supply to Robotic vehicle is given through 12V adapter or 6V 4.5Ah Lead acid battery whichever is convenient.

Step by step procedure of operation of implemented model is explained for operation of system when an user press the key on their keypad of mobile phone for controlling the remotely operated robot for

controlling its motion for forward when key 2 pressed, backward when key 8 pressed, left turn when key 4 pressed, right turn when key 6 pressed and stand still/stop state when key 5 pressed.



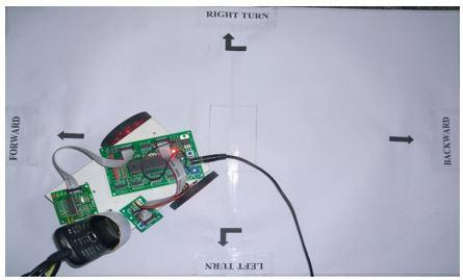
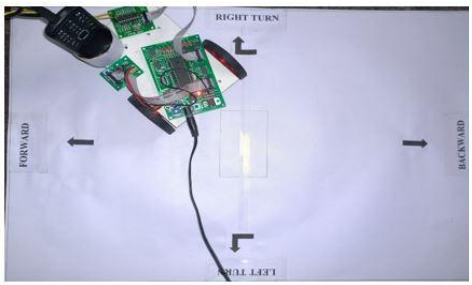


Figure 4.1*shows forward motion when key 2 pressed****Figure 4.2****shows Left turn when key 4 pressed*



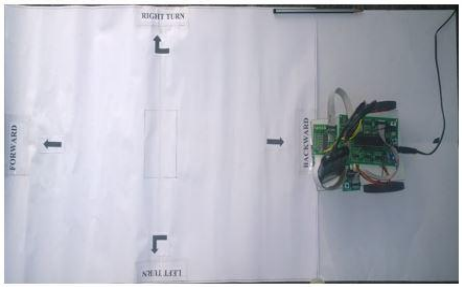


Figure 4.3*shows Right turn when key 6 Pressed.****Figure 4.4****shows backward motion when key 8 pressed*

V. FLOW CHART FOR THIS SYSTEM

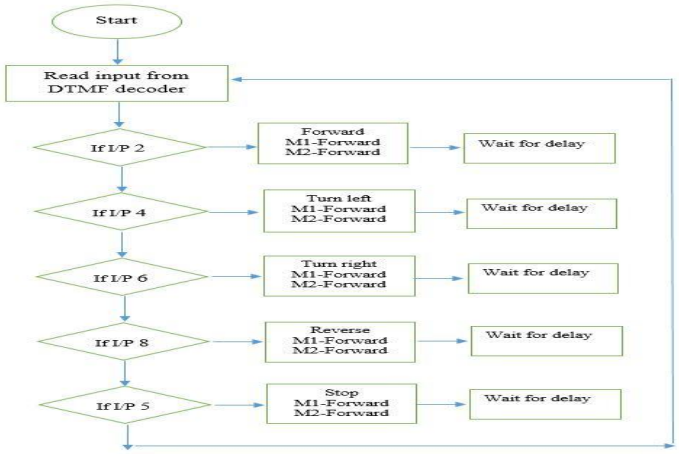


Figure 4.5*shows flow graph of data processed at different stages*

VI. CONCLUSION

The cell phone operated land rover robotic vehicle developed is capable of working at any place. It operated using dual tone multi frequency (DTMF) tones generated at mobile phone keypads.

- In present work robotic vehicle can be moved to any hazardous area without human intervention for its operation.
- A study of this work revels that DTMF tones are efficient and gives robust control over robot. Hence remotely it can be controlled without any disturbance from other wavelengths signals.
- All the voltage levels measured at different locations of the robotic systems comes par with theoretical values.
- An evaluation of the market trends and economic statuses gives use of this type of robotic system to be low cost and light weight.
- The speed at which it travels is found to be
- All the five basic keys are pressed and tested the movement of robot in forward, backward, left, right and stop conditions.

REFERENCE

[1] Ashish Jadhav, "Cell phone controlled ground combat vehicle", International Journal of computer & communication engineering ,Vol.1, No 2 July 2012

[2] Rajesh Singh, "DTMF Controlled Robotic Car", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV5IS010548, Vol. 5 Issue 01, January-2016

[3] R.C. Luo, T.M. Chen, and C.C. Yih, "Intelligent autonomous mobile robot control through the Internet," IEEE International Symposium ISIE 2000, Vol. 1, pp. 6-11, December 2000

[4] Yun chan cho and Jae wook jeon, "Remote robot control system based on DTMF of mobile phone", 6th IEEE international conference on industrial informatics, pp.14411446, 2008

[5] Anup saha and Amit saha, "Mobile phone controlled Autonomous robot", International journal of scientific and engineering research, Vol 4, issue 9, 2013.

[6] Tuljappa M Ladwa, Control of remote domestic system using DTMF, ICICI-BME, 2009 IEEE International Conference.

[7] B. Dinesh kumar, "DTMF based mobile operated surveillance vehicle", International Journal of Engineering and Computer Science, ISSN: 2319-7242 Volume 4 Issue 4 April 2015

[8] Sumona Biswas and Bipin Kumar, "Cell phone operated land Rover", International journal on recent and innovation trends in computing and communication, ISSN: 2321-8169 Vol 2 Issue: 3 March 2014.

[9] K. Aruna, "Mobile operated land rover using DTMF decoder, IJMER, pp-898-902, April 2013

[10] Sourangsu Banerji, "Design & implementation of an unmanned vehicle using a GSM network without microcontrollers", Journal of Electrical Engineering, volume 14, Issue.1 2014

[11] Y. Cao, "Cooperative mobile robotics: antecedents and directions, Autonomous Robots", Vol.4, No. 1, pp.7-27, 1997.

