

Mobile Controlled Robot using DTMF Decoder

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Abstract---This Paper describes about developing a robotic prototype of unmanned land vehicle. The Robot Uses an ATmega8 Microcontroller to control the motors of locomotion. The robot can be controlled from a remote area as it uses GSM based cellular phones to send and receive signals. 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 which is recognized by the DTMF decoder connected to the cellular phone at robot end which decodes the signal and passes it on to the Microcontroller which in turn controls the motors of locomotion through L293D Motor Driver. While this idea is can be easily implemented in the Electric vehicles as they run on motors, it might be a challenge to incorporate this technology in the vehicles that run on petroleum based fuels.

I. INTRODUCTION

Remotely controllable devices have always been a challenging and major research area in robotics. Though early studies in this field were inspired by science fictions, slowly this field has gained significant amount of importance. The results of early research in this field and huge progress in computing power and network connectivity and devices lead us towards the thought of having an unmanned vehicles, drones etc.

However there are a lot of challenges which are tough to address and they pose a serious trouble to researchers working in this field. The major problem is lack of connectivity in some remote areas because of which it turns out to be not possible to operate these kind of vehicles as they cannot send or receive signals. Moreover in most parts of the world, there is always a delay in the transmission of signals from the senders end to the receiver's end and hence due to this problem it becomes highly difficult or nearly impossible to control vehicles remotely in real time. This delay may prove to be fatal to the system and makes it highly unreliable. So if this problem is addressed, this technology will be an instantaneous hit and it will in course change the way of transportation system.

A. Atmega8 Microcontroller: The ATmega8 is a low power consuming 8-bit single chip microcontroller which was developed by Atmel in 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time. ATmega8 consists of 28 pins divided into 3 ports namely PORT B, C and D. It is based on the AVR enhanced RISC architecture. It processing speed clocks 12MHz.

The Atmel AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving

throughputs up to ten times faster than conventional CISC microcontrollers.

B. Key Parameters:

Flash (Kbytes): 8 Kbytes
Pin Count: 28
Max. Operating Freq. (MHz): 16 MHz (12MHz is common)
CPU: 8-bit AVR
Max I/O Pins: 23
USB Interface: Yes
Max voltage: 15 Volts
Power source: AC/DC

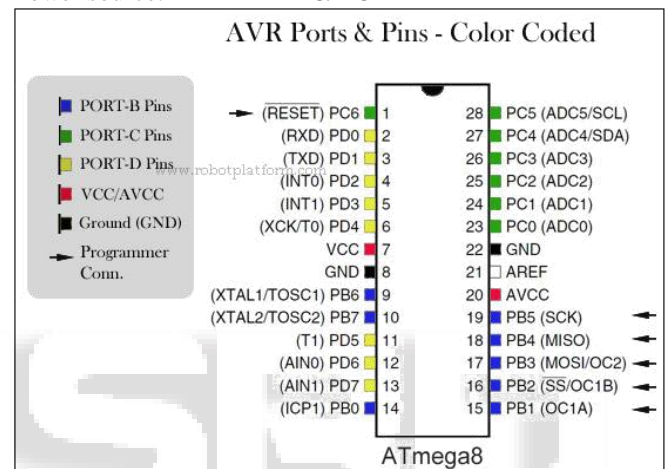


Fig. 1: ATmega8 Microcontroller

II. LITERATURE REVIEW

The Atmega8 Microcontroller being the most basic and entry level microcontroller, it is the most commonly used microcontroller in our day to day activities. For example, it is very common to see the decorative lights which blink in a certain pre-defined pattern in the functions or in the shopping areas. The pattern in which these lights blink is controlled by a microcontroller and Atmega8 being cheap is a best microcontroller for this task. The blinking of the indicators in the automobiles is also controlled by Atmega8 microcontroller in most of the cases. It is also widely used in 8-segment displays. Fig1. ATmega8 Microcontroller

The Atmega8 microcontroller is also extensively used in simple robots such as obstacle avoider robot, path follower robot etc. it is more commonly used by students for their projects since it is cheap and low power consuming. It has very few real world applications due to various reasons like low memory space and limited functionality.

The ATmega8 microcontroller is intended to be used as a tool for learning assembly, C programming, and microcontroller architecture. Besides a tool for learning, it also provides a stable platform for the development of other projects requiring a microcontroller [3]

III. PROPOSED METHODOLOGY

In this project, the Robot can be controlled by making a call from the GSM cellular Phone to another GSM cellular

phone which is connected to the DTMF decoder of the robot. The DTMF decoder is conned to the PD5, PD6, PD7 and PBO pins of the microcontroller. During the call when a button is pressed, the tone corresponding to that button is heard on the mobile connected to the robot. This tone is called *Dual tone multiple frequency* (DTMF). The DTMF decoder receives this tone, decodes it and converts it into digital signal (or binary signal) and it is passed on to the Microcontroller. The microcontroller is pre-programmed to take decisions based on the input received by the DTMF Decoder. After processing the inputs, the microcontroller gives output to the motor driver (L293D) which is connected to the microcontroller through PB1, PB2, PB3 and PB4 pins. The motor driver based on the signals given by the microcontroller controls the motors of locomotion.

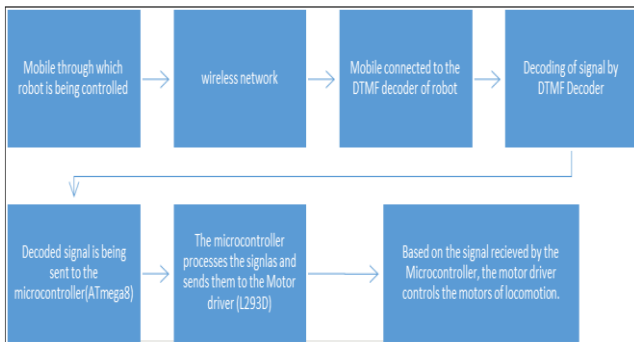


Fig. 2: Proposed architecture

The GSM cellular phone through which call is made acts as a transmitter (or remote) and the GSM cellular phone connected to the robot acts as a receiver.

DTMF signaling is used for telephone signaling over the line in the voice- frequency band to the call switching center. The version of DTMF used for telephone tone dialing is known as “Touch-Tone”. DTMF assigns a specific frequency (consisting of two separate tones) to each key so that it can easily be identified by the electronic circuit. The signal generated by the DTMF encoder is a direct algebraic summation, in real time, of the amplitudes of two sine (cosine) waves of different frequencies, i.e., pressing “1” will send a tone made by adding 697 Hz and 1207 Hz to the other end of the line.

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

Table. 1: Frequency assignments

Some of the important components of the Mobile controlled DTMF robot

- ATmega8 Microcontroller
- DTMF decoder
- L293D Motor Driver
- Regulated power supply.

A. *Software Description:* The ATmega8 microcontroller is coded using “embedded C” and compiled using Atmel Studio compiler. The source program is converted into hex

file by compiler. The hex file is burnt into the flash of microcontroller.

B. *Applications:*

- The system can be further developed and incorporated into vehicles such as cars and can be controlled remotely.
- Cell phone controlled robot can be used in the borders by army force and during war to carry warheads.
- The robot can used for reconnaissance or surveillance.
- Robot is small in size so can be used for spying.

IV. CONCLUSION

The robot was constructed mainly to develop a prototype of unmanned vehicles which can be controlled remotely using radio signals. It was successfully test operated in general physical conditions. It provides robust control and can be operated from any remote area until there is access to radio signals.

REFERENCES

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