

Cell Phone Controlled Ground Combat Vehicle

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Abstract—Robotics is an interesting field where every engineer can showcase his creative and technical skills. As the development of individual and cooperating autonomous robots advances, the need for a robust and reliable communication method becomes apparent. This paper summarizes a the feasibility of implementing Dual-Tone, Multi-Frequency (DTMF) as an alternative mean of robotic communication to Radio Frequency (RF). The user in order to control the robot should make a video call to the 3G enabled phone attached in the Vehicle, from any another 3G enabled phone, which can send DTMF tones by pressing the numeric buttons and can view the video output. The cell phone in the Vehicle will be kept in auto answer mode. So, after a ring the cell phone accepts the call and starts video transmission. Now for the DTMF tones pressed, the tones are fed to the circuit and the corresponding actions such as move forward or backward, turn left or right, target identification and locking, missile launching and parameter monitoring using black box are performed.

Index Terms—DTMF technology, 3G wireless communication, black box.

I. INTRODUCTION

As interest in robotics continues to grow, robots are increasingly being integrated into everyday life. The results of this integration are end-users possessing less and less technical knowledge of the technology. For example, consider the application of mobile robots in the health care industry, where the intended end users are patients themselves. In this case, the need for simplified, reliable, and user-friendly robot designs is of almost importance. Mobile phones today became very popular an essential entity for one and all and so, for any mobile based application there is great reception. Wireless controlled robots utilize RF circuits. However, the use of RF contributes to enhancing the already mysterious nature of robotic technology, which had limitations like limited range, limited frequency ranges and controls. But a mobile phone controlled robot can hold up these limitations. It has a robust control, unlimited range (coverage area of the service provider), and we can have as much as 12 controls.

A. What Is This Cell Phone Controlled Ground Combat Vehicle?

The Cell phone controlled Ground Combat Vehicle is a robot that can be controlled from anywhere around the world. Just by using a 3G enabled mobile phone, the user can control the robot from anywhere in the world also can see live video transmission from the robot to the controlling mobile.

B. How This Thing Works?

The user in order to control the robot should make a video call to the 3G enabled phone attached in the Vehicle, from any another 3G enabled phone, which can send DTMF tones by pressing the numeric buttons and can view the video output. The cell phone in the Vehicle will be kept in auto answer mode. So, after a ring the cell phone accepts the call and starts video transmission. Now for the DTMF tones pressed, the tones are fed to the circuit and the corresponding actions are performed.

C. Need For Study

- To investigate the feasibility and efficiency of implementing DTMF as a method of communication.
- To investigate advance capability of robotics technology in Military Technology.
- To produce an alternative method to RF communication and reduces the amount of RF noise in the environment.
- To decrease the mystery of robots for the average user.
- To check the feasibility and reliability of implementing Black box as a method to integrate functions of vehicle's monitoring behaviour pre-crash, during crash and post-crash to the current or developed motor vehicles systems.

II. MOTIVATION

Currently there are many different robotic options available to modern militaries. Robots can be run by wire, run by remote control or steered thru tele-robotics. There are plenty of "fire and forget" weapons, dumb weapons and smart munitions as well, which can fire thru human command or by way of software rules that include target identification and firing. But that is just the start as these technologies will save thousands of lives on our Nation's Highways thru Smart Car Systems and Net-Centric Automobiles of the future. Motivated from this background, this project will outline autonomous "ground combat vehicles" which is controlled by simple mobile phone (with 3G support).

III. LITERATURE REVIEW

The human mind always needs information of interest to control systems of his/her choice. In the age of electronic systems it is important to be able to control and acquire information from everywhere. Although many methods to remotely control systems have been devised, the methods have the problems such as the need for special devices and software to control the system. The DTMF tone generated

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when the user pushes mobile phone keypad buttons or when connected to a remote mobile system [1].

The remote control technologies have been used in the fields like factory automation, space exploration, in places where human access is difficult. As this has been achieved in the domestic systems partially [2], many corporations and laboratories are researching the methods which enable human to control and monitor efficiently and easily in the house or outdoor. Controlling the domestic system regardless of time and space is an important challenge. As the mobile phone enables us to connect with the outside devices via mobile communication network regardless of time and space, the mobile phone is a suitable device to control domestic systems.

This paper proposes to solve the problems of existing methods of control that use simple voice call. Method proposed uses the DTMF (Dual Tone Multi Frequency) [3], [4], [5] generated when a keypad button of the mobile phone is pressed by the user. The mobile phone user controls the system by sending the DTMF tone to the access point.

There are two mobile phones one act as a remote and the other act as a receiver which is mounted on the Robot. To continuously monitor the movements of Robots and work area we use the available 3G technology. 3G is the advanced technology in the communication field, which will transfer the voice and streaming videos simultaneously. That is a mobile with 3G technology option is used at both ends. One is placed in the Robot and other is used as a monitor. A camera with a transmitter circuit can transmit video only to a short distance. To avoid this we go for 3G technology [6].

The primary mode for robot communication uses RF (radio frequency). RF is an obvious choice for communication since it allows more information to be transferred at high speed and over long distance. However, the use of RF contributes to enhancing the already mysterious nature of robotic technology. To implement simple communication, dual-tone multi-frequency (DTMF) technology is used [7].

IV. METHODOLOGY

A. DTMF technology

The DTMF technology is associated with digital telephony and provides two selected o/p frequencies (One high band and one low band). The DTMF technique consist of 16 common alphanumeric characters (0-9, A-D, *, #) on the telephone. Each characters is uniquely referenced by selecting one of the four low band frequencies associated with the matrix rows, coupled with selecting one of the four high band frequencies associated with the matrix columns.

TABLE 1: LOW BAND AND HIGH BAND FREQUENCY TABLE OF DTMF [1].

Frequency	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

Corresponds to each character, there is unique tone frequency given by,

$$x(t) = A \cos(\omega t) + B \cos(\omega h t + \phi)$$

where ωl and ωh are the low and high frequencies of the sine waves being used, A & B are the amplitude of the signals and ϕ is the initial phase shifts.

B. Third Generation Mobile Phones (3G Mobile)

1) What Is 3G?

3G is the third generation of wireless technologies. It comes with enhancements over previous wireless technologies, like high-speed transmission, advanced multimedia access and global roaming. 3G is mostly used with mobile phones and handsets as a means to connect the phone to make voice and video calls, to download and upload data and to surf the net.

2) How 3G is better?

3G has the following enhancements over 2.5G and previous networks,

- Several times higher data speed.
- Enhanced audio and video streaming.
- Video-conferencing support.
- Web and WAP browsing at higher speeds.
- IPTV (TV through the Internet) support.

3) 3G Technical Specifications

Since the formal definition of third generation (3G) systems was officially completed by the International Telecommunications Union Radio communication Sector (ITU-R) in 1997. A set of requirements was specified by the ITU-R regarding minimum peak user data rates in different environments through what is known as the International Mobile Telecommunications 2000 project (IMT-2000). The requirements included 2048 kbps for an indoor office, 384 kbps for outdoor to indoor pedestrian environments, 144 kbps for vehicular connections, and 9.6 kbps for satellite connections.

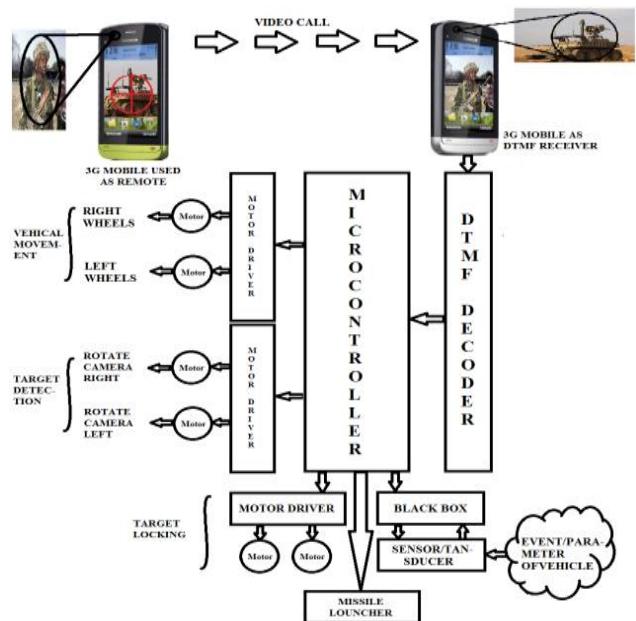


Fig. 1. Block diagram of Cell phone controlled "GROUND COMBAT VEHICLE"

V. WORKING STEPS

In the present paper the Ground Combat Vehicle is controlled by a mobile (with 3G support) which makes a video call to the mobile phone (with 3G support) attached to the vehicle as shown in Fig. 1. In the course of a video 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 DTMF tone. The vehicle perceives this DTMF tone with the help of phone stacked in the vehicle. The processing of received DTMF tone is done by Atmega 32 microcontroller with the help of DTMF decoder. The decoder decodes the DTMF tone into its equivalent binary digit and this binary number is sent to the microcontroller.

The microcontroller is preprogrammed to take a decision for any given input. The microcontroller outputs its decision to motor driver to move forward or backward, turn left or right, target identification and locking, missile launching and parameter monitoring using black box. Any mobile which makes a video call to the mobile phone stacked in the tank will act as remote. So, this is a simple robotic project which even does not require the construction of receiver and transmitter kits, but has an innovated application of cell phone, 3G and robust control.

A. Block Diagram Description

1) Remote Mobile

The remote mobile is with the operator which is used to send DTMF tones on the other mobile on the vehicle.

2) Receiver Mobile

It is used to receive DTMF signals transmitted by the remote mobile.

3) DTMF Decoder

The decoder decodes the DTMF tone into its equivalent Binary Digits & this binary Number is sent to the microcontroller. It acts as an intermediate device between receiver mobile and microcontroller to decode the DTMF tone in a compatible signal accepted by microcontroller.

4) Microcontroller

It processes on the DTMF signal and gives corresponding actions which is to be taken by the motor driver on which the direction is controlled by the operator.

The Microcontroller is pre-programmed to take a decision for any given input & outputs its decision to motor drivers in order to drive the motors for forward or backward motion or a turn, rotate camera to detect and identify target, rotate missile launcher Black box application.

5) Missile Launcher

Also called rocket launcher is a device that launches a rocket-propelled projectile, although the term is often used in reference to mechanisms that are portable and capable of being operated by an individual.

6) Black box

Black box opens new possibilities and perspectives of the traffic accident research. It concerns Monitoring and recording of parameters of the car's systems & Detect and record details about the accident.

VI. SUMMARY

Advance capability of robotics technology in Military Technology can be verified. From this investigation we should conclude that it is possible to produce an alternative method to RF communication and reduces the amount of RF noise in the environment. It should decrease the mystery of robots for the average user.

Black box that is Motor vehicle event data recorder can be satisfactorily installed to record physical parameters of vehicle during crash, pre-crash & post-crash.

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