

Mobile Phone Operated Frisking Wagon with Wireless Video Surveillance

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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 in all directions depending up on the commands received through another mobile phone. The wireless video camera, which is arranged over the vehicle, and which is designed to rotate for capturing the live video of surrounding area is also controlled through the same mobile.

Keywords: DTMF, 3G Technology, RF Communication, DC Motor, Wagon, Frisking.

1. 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.

A. What Is This Cell Phone Operated Search Vehicle?

The Cell phone Operated Search 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 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.

The search vehicle that is equipped with wireless video monitoring system can be controlled through any mobile phone based on the concept of video analyzing. Generally Infrared or RF based remote controlled technology is used for controlling the Robots, but here mobile phone is used for controlling the vehicle, that moves in all directions depending up on the commands received through another mobile phone. The wireless video camera, which is arranged over the vehicle, and which is designed to rotate for capturing the live video of surrounding area is also controlled through the same mobile. The receiving part of the project work, from where the vehicle is controlled through cell phone is equipped with a small TV set along with its video receiver. This technology dominates the other remote controlled systems because of the un-limited range.

To prove the concept practically, one mobile phone is supposed to be attached to the robot and it is controlled by another mobile phone. After establishing a communication link between two mobiles, the caller mobile key pad numbers can be activated to generate different tone frequencies, and at receiving side with the help of DTMF (Dual Tone Multi Frequency) decoder chip, different binary codes are produced corresponding to the button pressed at transmitting side. The output of this DTMF decoder is fed to the microcontroller and depending up on the binary code produced by DTMF chip, the controller is programmed to control the motors independently. Three DC motors with reduction gear mechanism are used to drive the complete mechanical transmission section, depending up on the control signals, the vehicle moves in all directions and camera is also controlled independently.

2. 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 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].

3. 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.

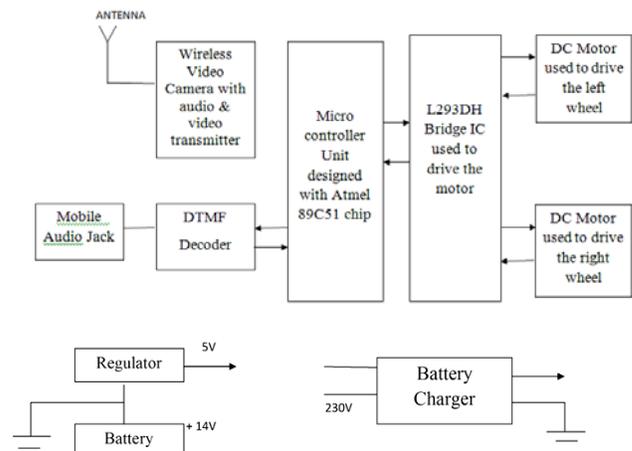


FIGURE 1: Block Diagram of Mobile Operated Frisking Wagon with Wireless Video Surveillance

4. 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 send 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 rotate for capturing the live video of surrounding area is also controlled through the same mobile.

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction sets and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications

4. Applications and Advantages

- "Mobile phone controlled robot" can be used in the borders for disposing hidden land mines.
- The robot can be used for reconnaissance or surveillance.
- The robot can be used anywhere there is the service provider tower of the connection provided that is mounted on the robot.
- The robot is small in size so can be used for spying.

5. Conclusion

The paper has been successfully presented and tested with integrated features of each hardware component for its development. Significance of each block has been resonated out and placed carefully, thus contributing to the best working of the unit. Hence the system is reliable with simple and easily available components, making it light weight and portable.

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Links

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