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GSM based advanced robot using android controller

Rahul Singh Rao, Riya Agarwal, Renu Saharan, Ravindra Gehlot, Shrilata Ojha

Poornima College of Engineering, Jaipur, Rajasthan, India

Abstract
This paper describes a wireless robot which performs the necessary actions by receiving a set of instructions in the form a DTMF frequency. In this project we can control the robot directions like forward, backward, left and right by sending call from the mobile and also performs operations like metal detection and video camera surveillance.
This project mainly consists of 2 sections, one is mobile unit and the other one is robot unit. The GSM modem which is fixed at the robot receives the dtmf frequency sent by the mobile and gives the instructions to the microcontroller to control the robot directions. In this project, we interface 8051 microcontroller with GSM Module. The protocol used for the communication between controller and GSM modem is UART (Universal Asynchronous Receiver-Transmitter). This system continuously checks for message to take the decision for controlling the robot.

Keywords: at mega, GSM, android, DTMF, smart phone controlled spy robot

1. Introduction
Robot systems are widely used in many places such as home security, surveillance, and in many war zone areas to provide safety and security. This robot is planned to be a robot which receives signal from a mobile by receiving dtmf signals over GSM connectivity. Also it can sense any obstacle coming in the path and it can detect any metal and also the temperature around it. The Robot also consists of a camera which sends video signals continuously to the mobile phone by which we can control the robot.
In this paper an android controlled spy robot is developed that can be controlled remotely and can send back live image-video data. It receives signal from an mobile by receiving dtmf signals over GSM connectivity. Also it has a metal detector so it can detect metal up to some distance in the ground, which can be useful for military, surveillance and effective policing

2. Block Diagram

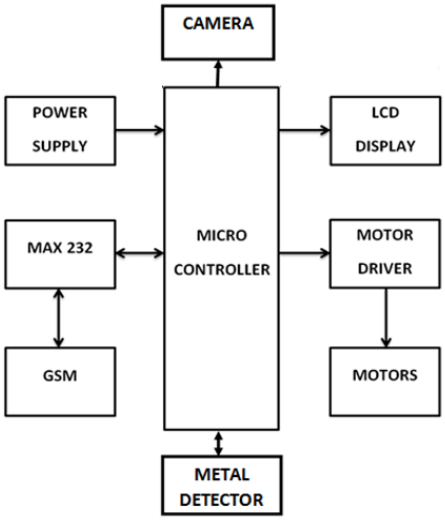

Fig 1

3. Features of Robot
The Robot consists of several advanced features such as live video camera surveillance, metal detection and LED lights for vision in night.

Metal Detector
Metal detector is a device used to pin point metals. the operation of metal detectors is based on the principles of electromagnetic induction. It generates a rapidly changing magnetic field by running the alternating current though coil, which will generate eddy currents inside the metal objects. Thereby, the eddy currents will create a new magnetic field that affects the original one, and then the metal detectors will utter a high-pitched tone. The accuracy and reliability of the metal detectors depend on the stability of frequency of electromagnetic launchers. Generally, the frequency is between 80 to 800 KHz.

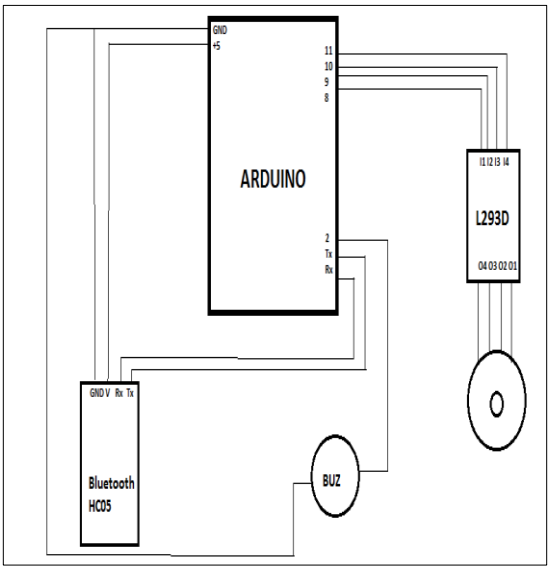

Fig 2

4. Design Description

The robot consists of many features which are controlled by android. A noticeable feature of the robot is that it has a spy-camera mounted on board, to make it capable of spying and surveillance activities, with remotely controlled operation. The camera is controlled by an android mobile phone and the video and image captured is also sent to the android mobile.

a) Hardware Requirements

i) 8051 Microcontroller

Microcontroller consists of 40 pins, 3 system inputs, 3 control signals and 4 ports (for external interfacing). A Vcc power supply and ground is also there.

ii) AT89C51 Programming board

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM).

iii) MAX 232 level converter

MAX 232 is an integrated circuit first created in 1987 by Maxim Integrated Products that converts signals from a TIA-232 (RS-232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter / dual receiver that typically is used to convert the RX, TX, CTS, RTS signals.

iv) GSM Module

SIM 300 is a GSM modem with a simple serial interface. SIM 300 modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. With this module one can send/receive sms, connect to internet via GPRS and receive calls. The modem can either be connected to PC serial port directly or to any microcontroller.

v) L293D Motor Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

vi) Arduino Kit

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL) permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

vii) Bluetooth HC05 Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

viii) Stepper motor

A stepper motor or step motor or stepping motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor (an open-loop controller), as long as the motor is carefully sized to the application in respect to torque and speed. Switched reluctance motors are very large stepping motors with a reduced pole count, and generally are closed-loop commutated.

ix) Piezoelectric Buzzer

A piezoelectric speaker or buzzer is a loudspeaker that uses the piezoelectric effect for generating sound. The initial mechanical motion is created by applying a voltage to a piezoelectric material, and this motion is typically converted into audible sound using diaphragms and resonators. Compared to other speaker designs piezoelectric speakers are relatively easy to drive; for example they can be connected directly to TTL outputs, although more complex drivers can give greater sound intensity. Typically they operate well in the range of 1-5 kHz and up to 100 kHz in ultrasound applications.

x) Metal detector coil

A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. If the sensor comes near a piece of metal this is indicated by a changing tone in earphones, or a needle moving on an indicator. Usually the device gives some indication of distance; the closer the metal is, the higher the tone in the earphone or the higher the needle goes.

b) Software Requirements

i) Keil µ vision

The Keil Software LPC2148 development tools listed below are programs you use to compile your C code, assemble your assembly source files, link and locate object modules and libraries, create HEX files, and debug your target program. µVision for Windows™ is an Integrated Development Environment that combines project management, source code editing, and program debugging in one single, powerful environment.

ii) Proteus

Proteus is a simulation and design software tool developed by Lab center Electronics for Electrical and Electronic circuit design. It also possess 2D CAD drawing feature. It deserves to bear the tagline “From concept to completion”.

iii) IP Webcam

An Internet protocol camera, or IP camera, is a type of digital video camera commonly employed for surveillance, and

which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet. Although most cameras that do this are webcams, the term "IP camera" or "netcam" is usually applied only to those used for surveillance. The first centralized IP camera was Axis Neteye 200, released in 1996 by Axis Communications.

iv) Bluetooth electronic controller

Control your electronic project with an Android device. This app communicates using Bluetooth to an HC-06 or HC-05 Bluetooth module in your project. This app comes with a library containing 10 Bluetooth examples for Arduino. It can also be used with Raspberry Pi or any other rapid prototyping system in which you have included a suitable Bluetooth module to your project.

5. Wireless Control Operation of the Robot

The spy-robot's control operation is carried out in a completely wireless way. For this purpose various wireless connection protocols can be used. These can be selected as per user's choice and convenience.

In this Spy robot we have used DTMF.

DTMF (Dual-tone multi-frequency): DTMF is an in band telecommunication signaling system that uses the voice frequency band for communication over telephone lines, other communications devices and switching centers. In DTMF, when each key is pressed, it generates two tones with specific frequencies. One tone is generated from a high-frequency group of tones and the other from a low-frequency group, as illustrated in Fig. DTMF is used widely due to its longer range. Other reasons include its speed, reliability and easy to decode.

6. Summary and Conclusion

In this paper we develop a reliable mechanism of communication and control, and capture image-video data for a spy-robot. An android controlled spy robot is developed that can be controlled remotely and can send back live image-video data. It receives signal from an mobile by receiving dtmf signals over GSM connectivity. Also it has a metal detector so it can detect metal up to some distance in the ground, which can be useful for military, surveillance and effective policing.

7. References

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