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Efficient Robot Control System With High Security Using DTMF

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ABSTRACT

In recent years, the definition of a robot is generally used to mean an unmanned system or automation, as often seen in industrial applications, deep sea planetary probes. It is 0magazines, animation and science fiction. Because they are artificially created, they are called "artificial man". And since they look like humans in appearance, they are often called "androids" or "humanoids."This robot is controlled by a DTMF decoder. This project uses ARM7 LPC2148 as its controller. To control the devices from remote place we are using a DTMF technique. DTMF (Dual Tone Multi Frequency) is used which converts the desired frequency in to analog signals which is received by DTMF Decoder and given to ARM7microcontroller. The microcontroller is used for controlling the robot according to the frequency received by the DTMF receiver. Security module includes AT89S52, PIR, smoke, RF module and sprinkler. To find the person entry in house PIR sensor is used, which is connected to security module, from this it sends information to robot using RF module. If smoke is detected by smoke sensor security module automatically on the water sprinkler system to stop the fire and simultaneously total data is send to robot from that information is passed to user by GSM module. So that user can get alert and by using robot he can watch the present condition in the home. This system increases the security levels and safety futures.

Keywords-
Robot, DTMF, camera GSM, sensors.

1. INTRODUCTION

Technology is the word coined for the practical application of scientific knowledge in the industry. The advancement in technology cannot be justified unless it is used for leveraging the user's purpose. Technology, is today, imbibed for accomplishment of several tasks of varied complexity, in almost all walks of life.

The society as a whole is exquisitely dependent on science and technology. Technology has played a very significant role in improving the quality of life. One way through which this is done is by automating several tasks using complex logic to simplify the work.

2. RELATED WORK

The controller is the robot's brain and controls the robot's movements. It's usually a computer of some type which is used to store information about the robot and the work environment and to store and execute programs which operate the robot. The control system contains programs, data algorithms, logic analysis and various other processing activities which enable the robot to perform. Mobile robots can operate by remote control or autonomously. A remote control robot receives instructions from a human operator. In a direct remote control situation, the robot relays information to the operator about the remote environment and the operator then sends the robot instructions based on the information received. This sequence can occur immediately (real-time) or with a time delay. Autonomous robots are programmed to understand their environment and take independent action based on the knowledge they poses. Some autonomous robots are able to "learn" from their past encounters. This means they can identify a situation, process actions which have produced successful/unsuccessful results and modify their behavior to optimize success. This activity takes place in the robot controller. The body of a robot

is related to the job it must perform. Industrial robots often take the shape of a bodyless arm since it's job requires it to remain stationary relative to its task. Space robots have many different body shapes such as a sphere, a platform with wheels or legs, or a balloon, depending on its job. The free-flying rover, Sprint Aercam is a sphere to minimize damage if it were to bump into the shuttle or an astronaut. Some planetary rovers have solar platforms driven by wheels to traverse terrestrial environments. Aerobot bodies are balloons that will float through the atmosphere of other worlds collecting data. When evaluating what body type is right for a robot, remember that form follows function.

3. SYSTEM OVERVIEW

The main objectives of the project is to design a robot capable of being controlled remotely using keypad tones from a mobile phone and Video calling, a 3G based technology, will provide the visual feedback in relation to the robot's movements. This video feedback will allow the operator to view the robot's movements in real time.

The idea for this project was developed from an interest in the tones produced from a standard telephone keypad. These tones known as 'DTMF tones' are used for more than just dialing and connecting phone calls. The technology is used in many different consumer based services to date, including credit card booking lines, automated information services and prepaid phone top up services to name a few.

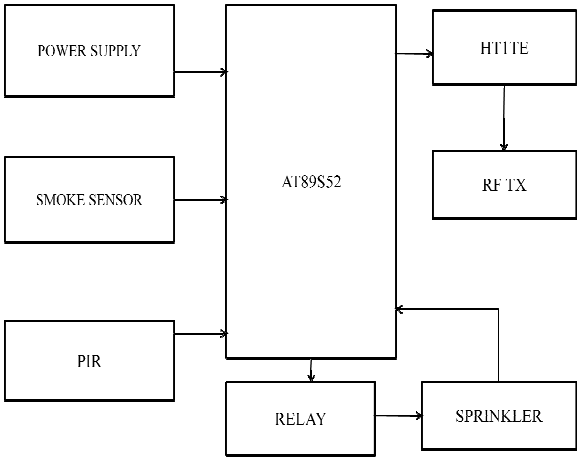


Fig 1(a):BLOCK DIAGRAM OF SECURITY MODULE

Figure 1(a) represents the block diagram of the security module (room).Security module includes AT89S52, PIR, smoke, RF module and sprinkler. To find the person entry in ho -use PIR sensor is used, which is connected to security module, from this it sends information to the robot using the RF module and the same information is sent to the mobile user. If smoke is detected by smoke sensor security module automatically on the water sprinkler system to stop the fire and simultaneously data is sent to robot through RFTX. So robot will send SMS to the predefined mobile number so that he will get information that particular room had caught fire and sends information whether sprinkler is ON or OFF.

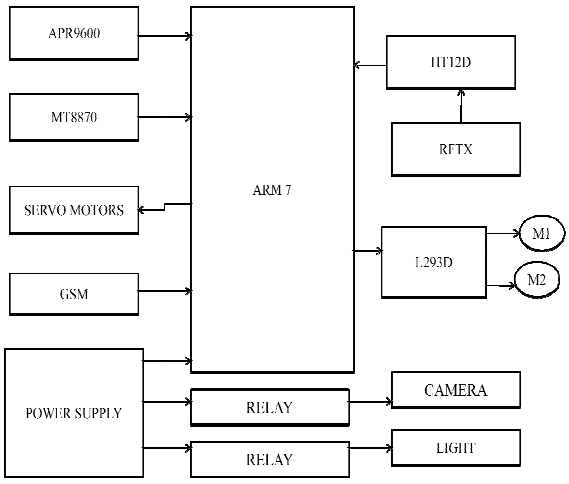


Fig 1(a): BLOCK DIAGRAM OF ROBOT

So that user can get alert and by using robot he can watch the present condition in the home through 3G technology. This system increases the security levels and safety futures.

4. HARDWARE DESCRIPTION

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC).

This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set.

4.1 DTMF Decoder

Dual-tone multi-frequency signaling (DTMF) is used for telecommunication signaling over analog telephone lines in the voice-frequency band between telephone handsets and other communications devices and the switching center. The version of DTMF that is used in push-button telephones for tone dialing is known as Touch-Tone. It was first used by AT&T in commerce as a registered trademark, and is standardized by ITU-T Recommendation Q.23. It is also known in the UK as MF4.Other multi-frequency systems are used for internal signaling within the telephone network. The Touch-Tone system, using the telephone keypad, gradually replaced the use of rotary dial starting in 1963, and since then DTMF or Touch-Tone became the industry standard for both cell phones and landline service.

The DTMF keypad is laid out in a 4×4 matrix, with each row representing a *low* frequency, and each column representing a *high* frequency(5). Pressing a single key (such as '1') will send a sinusoidal tone for each of the two frequencies (697 and 1209 hertz (Hz)). The original keypads had levers inside, so each button activated two contacts. The multiple tones are the reason for calling the system multi frequency. These tones are then decoded by the switching centre to determine which key was pressed.

DTMF keypad frequencies (with sound clips)

	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

- The DTMF is a popular signaling method between telephones and switching centers
- DTMF is also used for signaling between the Telephone network and computer networks
- The DTMF signals are Transmitted over a telephone line
- Uses speech frequency signals
- DTMF signals are the superposition of 2 sine waves with different frequencies.

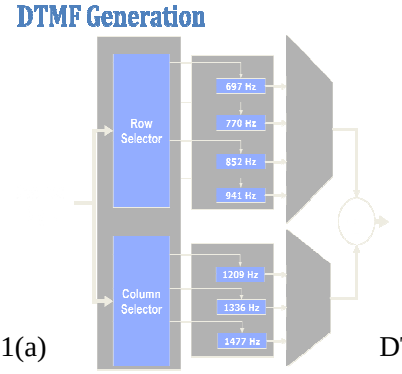


Fig:4.1(a) DTMF Generation

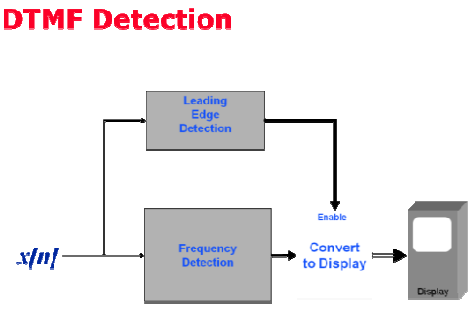
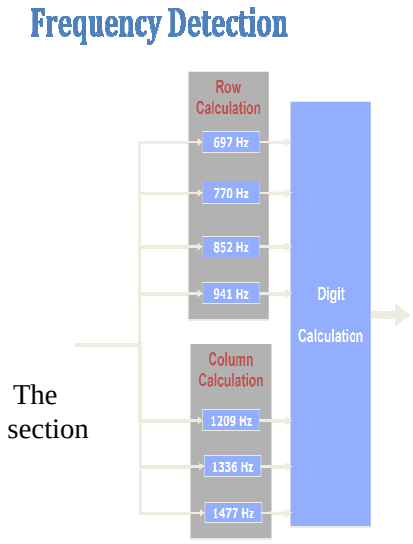


Fig:4.1(b) DTMF Detection

Description: The MT8870D/MT8870D-1 is a complete DTMF receiver integrating both the band split filter and digital decoder functions.



The section filter uses switched capacitor techniques for high and low group filters; the decoder uses digital counting techniques to detect and decode all 16 DTMF tone pairs into a 4-bit code. External component count is minimized by on chip provision of a differential input amplifier, clock oscillator and latched three-state bus interface.

5. RADIO FREQUENCY

Radio frequency (abbreviated RF) is a term that refers to alternating current (AC) having characteristics such that, if the current is input to an antenna, an electromagnetic (EM) field is generated suitable for wireless broadcasting and/or communications ((6). These frequencies cover a significant portion of the electromagnetic radiation spectrum, extending from nine kilohertz (9 kHz),the lowest allocated wireless communications frequency (it's within the range of human hearing), to thousands of gigahertz(GHz).

4.2 RF TRANSMITTER STT-433MHz:

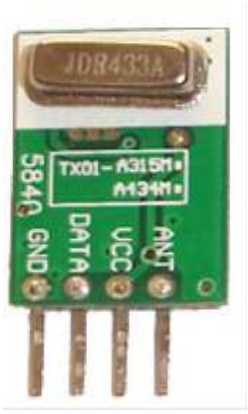


Fig: 4.2 STT-433 MHz TRANSMITTER

ABOUT THE TRANSMITTER:

- The STT-433 is ideal for remote control applications where low cost and longer range is required.
- The transmitter operates from a1.5-12V supply, making it ideal for battery-powered applications.
- The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance.
- The manufacturing-friendly SIP style package and low-cost make the STT-433) suitable for high volume applications.

4.3. RF RECEIVER STR-433 MHz:

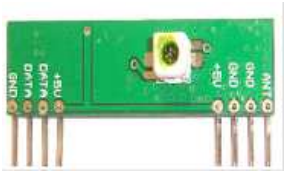


Fig:5.2. RF receiver STR-433 mhz

The data is received by the RF receiver from the antenna pin and this data is available on the data pins. Two Data pins are provided in the receiver module. Thus, this data can be used for further applications.

PINOUT:

ANT: Antenna input.

GND: Receiver Ground. Connect to ground plane.

VCC (5V) :VCC pins are electrically connected and provide operating voltage for the receiver. VCC can be applied to either or both(4). VCC should be bypassed with a .1µF ceramic capacitor. Noise on the power supply will degrade receiver sensitivity.

DATA: Digital data output. This output is capable of driving one TTL or CMOS load. It is a CMOS compatible output.

4.4 LIGHT DEPENDENT RESISTOR:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically.

4.5 PASSIVE INFRARED SENSOR

A Passive InfraRed sensor(PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view. PIR sensors are often used in the construction of PIR-based motion detectors(3). Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.

4.6 GLOBAL SYSTEM FOR MOBILE COMMUNICATION:

It is a globally accepted standard for digital cellular communication. GSM is the name of standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900MHZ.Throughout the evolution of cellular telecommunications, various systems have been developed without the benefit of standardized specification. This presented many problems directly related to compatibility, especially with the development of digital radio technology. The GSM standard is intended to address these problems.

Fig:8.1.GSM Operation

4.7 STEPPER MOTOR

A stepper motor is a widely used device that translates electrical pulses into mechanical movement. The stepper motor is used for position control in applications such as disk drives, dot matrix printers and robotics. Stepper motors commonly have a permanent magnet *rotor* surrounded by a *stator*. The most common stepper motors have four stator windings that are paired with a center-tapped common. This type of stepper motor is commonly referred to as a four-phase or unipolar stepper motor. The center tap allows a change of current direction in each of the two coils when a winding is grounded, thereby resulting in a polarity change of the stator.

The direction of the rotation is dictated by the stator poles. The stator poles are determined by the current sent through the wire coils. As the direction of the current is changed, the polarity is also changed causing the reverse motion of the rotor.

The steps involved to finish this project are listed below:

Step 1 collecting the information about the topic from many sources like books, papers, websites, etc

Step 2 choosing equipments available for the study and developing idea about cell phones to act as a remote controlling device

Step 3 designing the circuit using circuit stimulating software like Spice

Step 4Observing the output signal by varying the input signal and recording the charging and discharging time

Step 5Reducing the error

The performance of the vehicle was observed carefully. Thus the study of the project was successfully completed, overcoming the limitations to some extent.

V. CONCLUSION

The key purpose was to develop a circuit that can drive an electric vehicle in any directions using GSM based cell phones as a distant controller, and the trial approached has been a success. This system utilizes a renewable energy based battery management system and a GSM technologically operated mobile phone for its operations. The second part of this project highlights on security acquired for the robot which studies the RF communication As well. This system can be a test-bed for any future projects and or appliances interested to work with both security and remote control communication technology together.

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