

AUTONOMOUS ROBOTIC SYSTEM

G. Selva Kumar

¹B. Tech IT

¹ Saveetha School Of Engineering, Chennai, India.

Abstract— There are many engineering challenges involved in exploring remote areas without human assistance and in particular there is a strong need in advanced Robotics. Robots must be able to function in unknown, unstructured environments. Robots are more précised and it can be used where human involvement is dangerous, such as detecting Land Mines. We have developed a Robot which is completely Autonomous and it can also be controlled manually through Mobile phone. Robot interacts with human with the help of mobile communication and it accepts commands through Short Messaging Service (SMS). Robot is also provided with Infra-red sensors for Object detection and path finding mechanism. We have formed an algorithm for its autonomous operation and Artificial Intelligence through Micro-controller.

Key words: Robot, Mobile Phone, Security.

I. INTRODUCTION

This paper proposes a new idea that will enable a mobile robotic system (Mechatronic System), to perform multiple tasks in a domestic environment such as

- (1) Identifying victims during disasters like Earthquake and Land Slides and reporting their location to rescuers with help of CCD Camera and Global Positioning System.
- (2) Guiding a blind in any environment with the help of a guiding handle mounted over the Robot.
- (3) Detecting unusual situations such as trespasses, Land mines, fire, and gas leakage using a multiple sensor system.
- (4) Controlling the Robot from anywhere in the world through mobile phones using DTMF technology.
- (5) Robot sends messages (SMS) during critical situation to the user through the mobile phone provided in the Robot, which is interfaced to a micro-controller through a Data cable.
- (6) Object Recognition and Navigation for Autonomous operation through Infra-Red sensors.
- (7) Finding out the exact location of the Robot through Global Positioning System.
- (8) Controlling the Robot through Voice Recognition.
- (9) Complete Home Security system.
- (10) Manually controlled Recovery Robot.

II. SYSTEM SPECIFICATIONS

A. Micro-controller

It has a microcontroller AT89C55 and two stepping motors. The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology. 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.

B. MOBILE PHONE:

Every Mobile has the option to interface with a PC or micro-controller through a Data cable. Data can be transmitted serially. We have used Nokia 3310/3315 mobile phone to interface with the micro-controller. The interface is achieved with the help of F-Bus. Nokia 3315/3310 has the provision underneath the battery to interconnect the F-bus. F-bus is the later high-speed full-duplex bus. It can transmit data at the rate of 115,200bps.

Form of Hexa-decimal values. SMS can be sent through micro-controller by passing the equivalent Hexa-decimal values.

C. INFRA-RED SENSORS:

Infra red sensors have high reliability. It transmits IR rays at a particular frequency to a shorter distance.

Dual tone Multi-Frequency (DTMF) is used in mobile phones and ordinary telephones. It's a technique where each key in the mobile phone is assigned a tone with unique frequency.

This tone is decoded using DTMF decoder which decodes a particular frequency and enables a switch. Each frequency has a unique switch and we can use this to switch on/off a particular circuit.

D. TSOP1730:

This receives rays at a frequency range of 30 KHz. The TSOP1730 series are miniaturized receivers for infrared remote control systems.

E. GLOBAL POSITIONING SYSTEM:

Global Positioning System (GPS) is the fully functional satellite navigation system. A GPS receiver calculates its position by measuring the distance between itself and three or more GPS satellites. It gives the exact location of the receiver. It gives the location in the form of latitudes & longitudes. For example the location is obtained as 78° N 60° E. using these values exact location can be traced out.

III. DTMF DECODER (8870)

A. SECURITY SYSTEM:

Security System Kit has Fire Detector, Smoke Detector, Metal Detector, Temperature Sensor etc, which works effectively and sends signal to micro-controller during critical situation.

This enables the micro-controller to do necessary action.

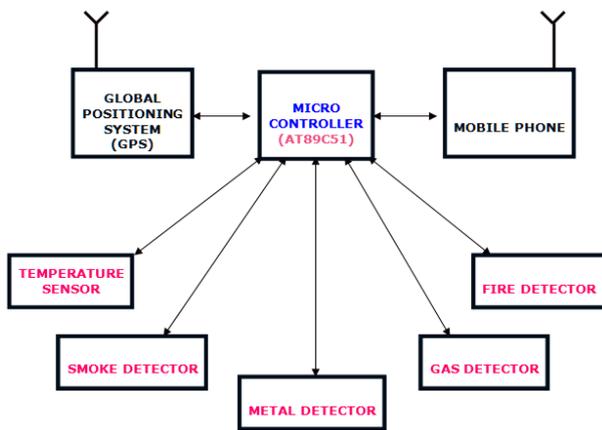


Fig. 1: General Block Diagram

B. WORKING:

1) CONTROLLING THE ROBOT THROUGH DTMF USING MOBILE PHONE

Dual Tone Multi Frequency is the technology used to identify the numbers while making phone calls. The DTMF keypad is laid out in a 4x4 matrix, with each row representing a low frequency, and each column representing a high frequency. Pressing a single key such as '1' will send a sinusoidal tone of the two frequencies 697 and 1209 (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 center to determine which key was pressed.

	1209 Hz	1336 Hz	1477 Hz
697 Hz	1	2	3
770 Hz	4	5	6
852 Hz	7	8	9
941 Hz	*	0	#

Steps involved:

- In phone settings, Auto-answer option is enabled.
- Then we have to make the call to the mobile which is connected to the robot.
- When the call gets accepted, we have to press the defined keys to make the robot to move in particular direction.
- We can also use similar operation to switch on or switch off a particular device using latches.

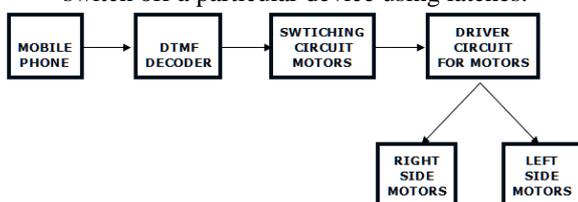


Fig.4: BLOCK DIAGRAM OF CONTROL SECTION OF THE ROBOT USING DTMF

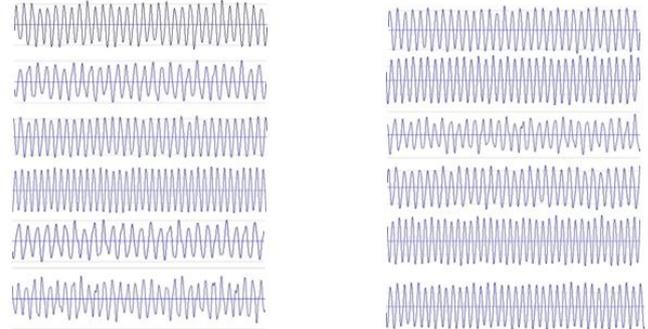


Fig.3: FREQUENCY GENERATED FOR EACH KEY

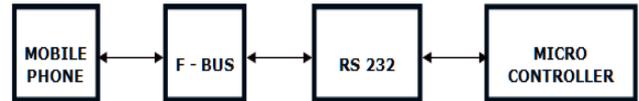


Fig.4: BLOCK DIAGRAM OF INTERFACING MOBILE WITH MICRO-CONTROLLER



Fig.5: INTERFACING MICRO-CONTROLLER WITH MOBILE PHONE

O	L	L	E	H	(ALPHABETS)
6F	6C	6C	65	68	(ASCII characters)
1101111	1101100	1101100	1100101	1101000	(The ASCII characters shown in binary)
06	FD	9B	32	E8	(The 8 bit segments decoded into hex)
H	E	L	L	O	} Message in display
E8	32	9B	FD	06	} Message transmitted in F-bus

IV. ADVANTAGES

- This Robot is very cheap and can be used for Homes & Industries for security purpose.
- The Robot can also be used for Defense purpose to Detect Land Mines.
- The Robot has Artificial Intelligence and takes decision on its own.
- The Robot obeys the commands from the user.
- The Robot interacts to the user with the help of mobile communication.
- The Robot is provided with IR sensors to find out the path.
- Manual controlling is very easy through Mobile using DTMF.
- Robot can be operated from world-wide and user can interact from any part of the world.

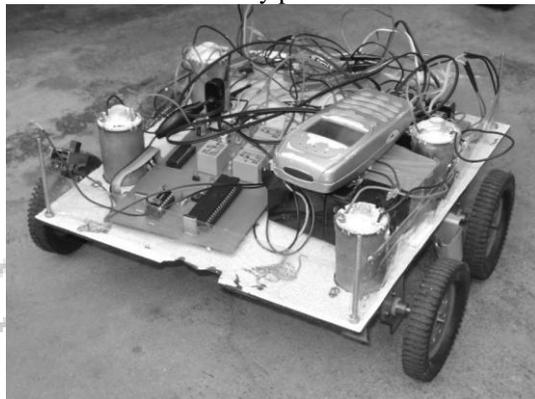
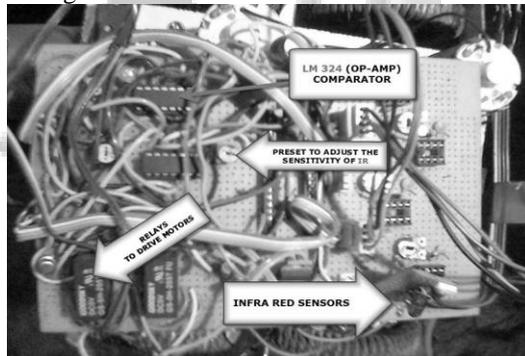


Fig.7: ROBOT UNDER CONSTRUCTION



MOBILE INTERFACED WITH MICRO-CONTROLLER



Fig.10: CIRCUIT DIAGRAM OF DRIVER CIRCUIT (For Motors)

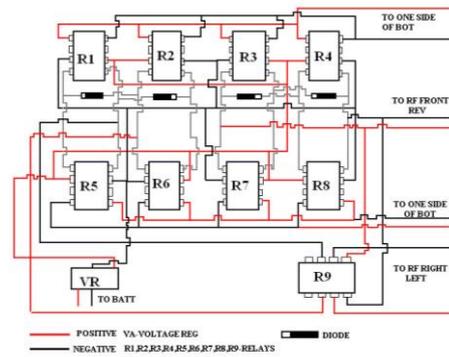


Fig. 11: CIRCUIT DIAGRAM OF IR SENSORS USING LM324

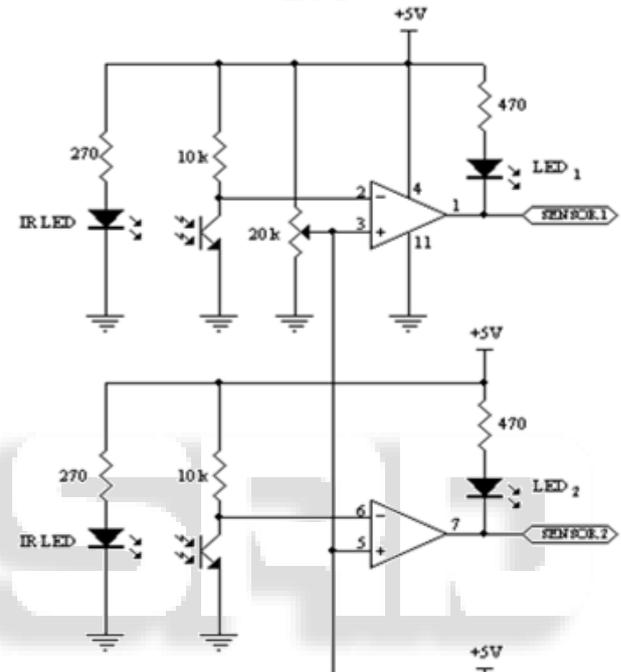
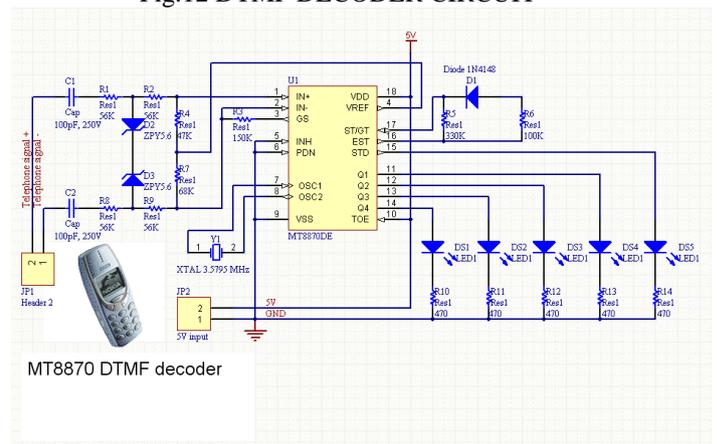


Fig.12 DTMF DECODER CIRCUIT



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