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EXPLOSIVES DETECTION USING CELLPHONE OPERATED LAND ROVER ROBOT

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ABSTRACT

This research paper deals with the aim of nation border security and some of the defense base. Many security systems for ground surveillance have been developed, safeguarding from terrorism, by our Indian defense. The concept presented in this paper is novel, which explains some of the advanced and possible technologies to detect explosive material using cellphone operated land rover.

I INTRODUCTION

Nowadays, a lot of attention is being paid towards securing the nation from terrorism. This is being done by enhancing the present technology to detect the explosives by using Cellphone operated Land Rover robot. This robot is being used for the patrolling purpose, which is operated and controlled using a mobile phone attached to the robot. The Block diagram of Cellphone operated Land Rover robot is shown in Fig. 1.

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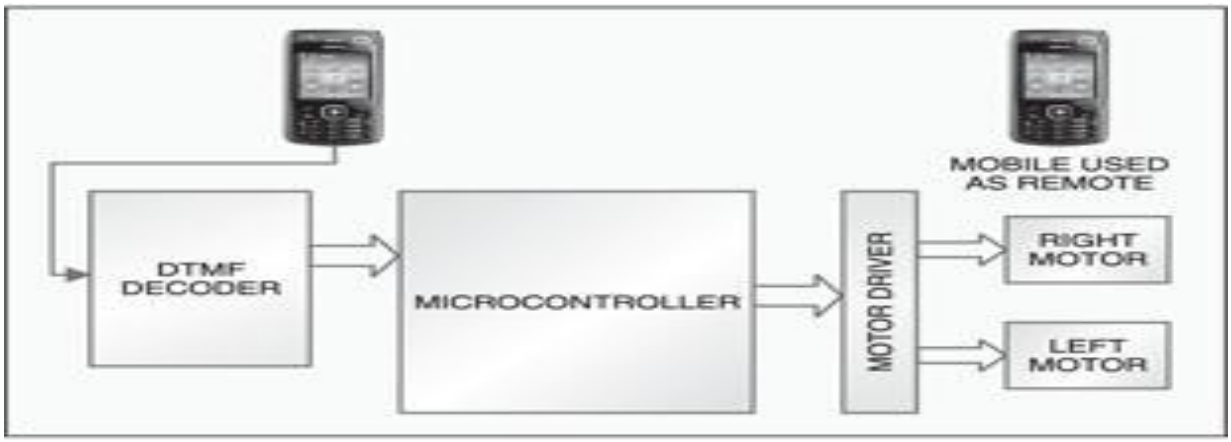

Fig 1: Block diagram of Cell Phone operated Land Rover robot.

II CELLPHONE OPERATED LAND ROVER ROBOT

Fig 2. Cellphone operated Land Rover robot

The Cellphone operated Land Rover robot constructed circuit is shown in Fig. 2. In the course of a call, if the button is pressed by the user in the keypad of the mobile, a tone is produced which corresponds to the pressed button and is heard at the other end of the call. The tone which is produced is called as "dual tone multiple – frequency" (DTMF) tone. The tone when received is processed by ATmega 16 microcontroller with the help of DTMF decoder MT8870. The DTMF decoder is used to convert the DTMF tone into its equivalent binary digit and this binary digit is sent to

the microcontroller. The DTMF decoder circuit is shown in Fig 3. Here, the microcontroller is pre-programmed in order to take up any decision for the given input which is an electrical signal (audio signal). The output is sent to the motor driver so as to move the motor for forward or backward motion or a turn.

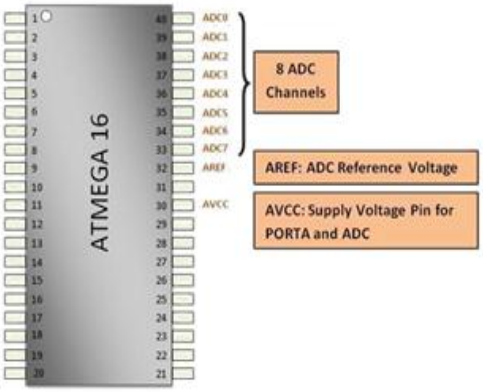

Fig 3: DTMF Decoder **Fig 4:ATmega 16 microcontroller**

The ATmega 16 microcontroller IC is shown in Fig. 4. A specific frequency is assigned by DTMF, which consists of two different tones so that it can be easily identified by the electronic circuit. The Tone assignment table is shown in Fig. 4.

Tones and Assignments in a DTMF System

Frequencies	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

Fig 4: Tones and Assignments in a DTMF System

The signal generated by the DTMF encoder is a direct algebraic summation, in real time, of the amplitudes of two sine (cosine) waves of different frequencies. For instance, if key '3' is pressed, it will send the tone made by adding 697 Hz and 1477 Hz to the other end of the line.

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Wireless security camera as shown in Fig 5 is used to monitor the suspicious movements. It can also be used for detecting some explosive material. These types of cameras are also known as closed-circuit television (CCTV) cameras. The term "Wireless" refers to the transmission of audio/video through a radio band

Fig 5: Wireless security camera

III HALL EFFECT SENSORS

There is emission of magnetic fields from the explosive material, which can be detected by Hall Effect sensor. The Hall Effect sensor is a transducer which varies the output voltage which changes with magnetic field. These are solid state devices.

The magnetically encoded signal is encoded by the magnetic sensor into electrical signal, so that it can be used by the electronic circuit. The output of this sensor is the function of magnetic field density around the device.

The magnetic field is detectable in two ways:

- Head-on detection
- Sideways detection

When the magnetic fields are perpendicular to the Hall Effect sensing device, its approach seems to be "head on' approach onto the active face. This is known as head-on detection. The output voltage depend magnetic field and the distance of the linear device from the sensor as explained in Fig. 7. Nearer the linear device therefore higher is the magnetic field, due to which the output voltage will be greater in magnitude, vice versa.

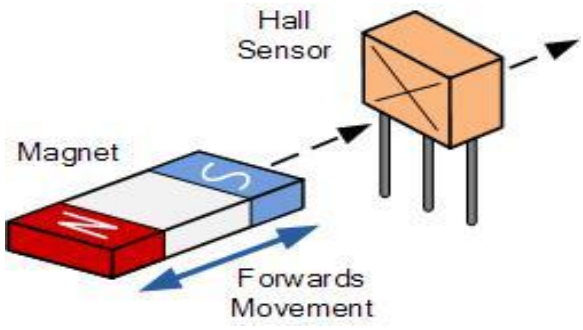

Fig 7: Head- On Detection

When the magnet is moved across the face of Hall-effect element in sideways, this motion is known as sideways detection as shown in Fig 8.

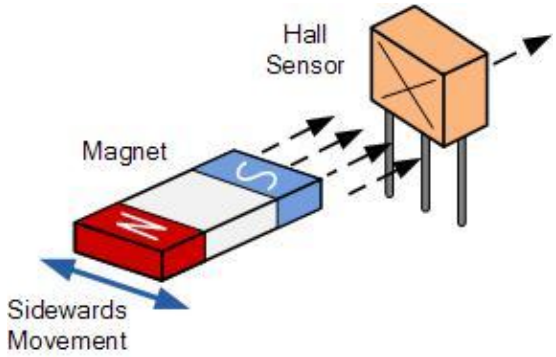

Fig 8: Sideways detection

IV.GLOBAL POSITIONING SYSTEM (GPS)

It is a navigation system based on satellites, made up of a network of 24 satellites placed into orbit by U.S. Department of Defense.

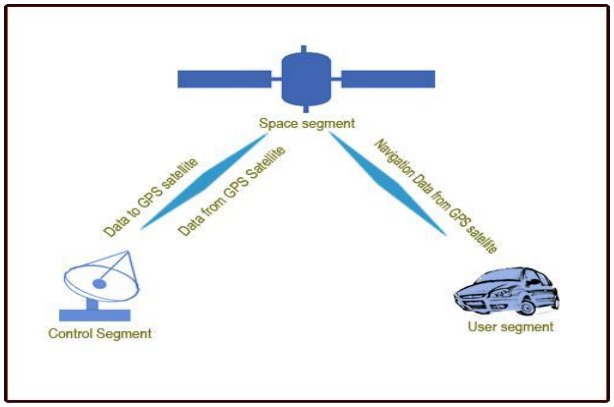

Fig 9: Structure of GPS

The control segment helps the whole system to work efficiently. The signals are passed to the space segment from control segment. The space segment is the heart of GPS which helps to locate the position by broadcasting the signal used by the receiver. The signals can be blocked due to the obstacles such as-people, building, trees etc. So, to calculate the exact position, the signals of for satellites are locked together and have to be moved continuously to get the clear reception. Then, the signals are received by the user segment which constitutes of military or civilian user. The structure of GPS is shown in Fig. 9.

Global System for Mobile communication (GSM) is a system which is used by all over the world. It uses variation of time division multiple access (TDMA) and widely used of the three digital wireless telephony technologies (TDMA,GSM and CDMA).

The Metal and chemical bomb detector is able to detect metallic material such as – anti-tank mines, grenades, chemical explosives. As soon as, the detector encounters any such material it generates sound signals, which gives an indication that metallic or chemical bomb is detected.

V PROPOSED METHOD

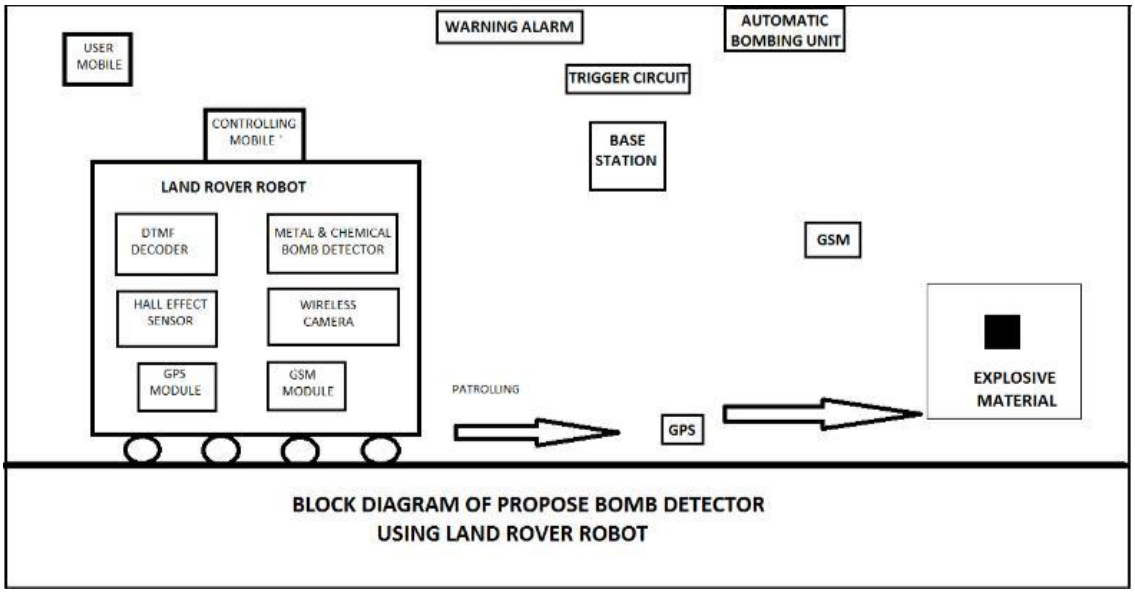

Fig 10: Block diagram of Proposed System.

The Block diagram of Proposed System is shown in Fig 10.The mobile operated land rover robot consists of many small units, contributing towards the strengthening of the surveillance system. There is a mobile phone which is connected to the robot, user's mobile phone, a DTMF decoder, wireless security camera, Hall Effect sensor, metal or chemical bomb detector, GPS & GSM modules.

When the land rover robot is patrolling, it will be able to locate the position of the explosive material due to the presence of sensors like metal or chemical bomb detector and Hall Effect sensor along with GPS module. The Hall Effect sensor is used to sense the magnetic signals, which are converted into the electrical signals for the electronic circuit. Then, the message is sent to the user via base station, through the GSM module. During this course of action the base station gives a warning alarm and simultaneous action by the automatic bombing unit takes place, so that our soldiers and the people living nearby can be alerted. And our soldiers can get ready with all the equipment's.

Meanwhile, a signal is sent to the trigger unit so that the explosive can be destroyed by hitting onto the target. The wireless security camera is used to monitor the suspicious movements or something else which is not in favor of human lives. The proposed method has certain advantages and disadvantages which are discussed here.

Advantages:

- Helps in strengthening the surveillance system at the nation borders.
- To destroy the explosive before its detonation.
- Quick remedies for terrorism and give the quick response against terrorism, by getting ready with all the equipment before destruction.

Limitations:

As of now it is difficult to implement this system for water bodies and even for air because of its high cost and instability of the circuit. There is a possibility, explosive not getting detected may be due to low vapor emission, bad weather etc. It is suggested that the explosives which are used by our defense, should be kept in some well-defined air tight units, so that there are no traces of explosives for detection. Hence, only the destructive materials of the enemy will be detected.

VI. RESULT & CONCLUSION

Innocent people will not be killed without any reason, if such a surveillance system is established.

ABOUT THE AUTHORS

Mandavi Dubey is a 7th semester student studying in the department of Electronics and communication engineering at Sambhram Institute of Technology, Bengaluru.

Dr. M. Levy is currently working as Professor in the Department of Electronics and Communication Engineering. He is also the P.G Coordinator and Research Head in ECE Department. He has obtained his Ph. D Degree in the thesis entitled “Investigations on fractal concepts in smart antennas, ultra-wide band antennas and optical antennas” jointly from University of Saskatchewan, Saskatoon Canada and National Institute of Technology, Tiruchirappalli, Tamil Nadu, India. Entering as Topper in Government Engineering College, Pondicherry affiliated to Pondicherry University; he completed Bachelor of Technology in Electronics and Communication Engineering. He studied

Masters of Technology in Electronics and Communication Engineering as a top GATE candidate in the Government college of Engineering, Pondicherry affiliated to Pondicherry University and completed as University Top Ranker and Gold Medalist. He has also won the Best Student Award and Chief Ministers Gold Medal Prize. He is also the Recipient of Best Project Award for his M.Tech Project. He has attended several Workshops, Seminars, Faculty Development Programs, National and International Conferences, Specialized training Programs and presented several technical papers and also delivered special talks at various colleges, special gatherings and Institution of Engineers, India (IEI). He was a participant in the President meeting held at Anna university, Chennai and attended the special lecture delivered by Dr.A.P.J.Abdhul Kalam, the then President of India in the year July 2003. He has Keen interest for Research in the Field of Smart Antennas for Wireless Communications, optical antennas and Ultra-Wide Band Antennas applying fractal concepts and working in the Areas of Applications and developing new algorithms in Smart Antennas Technology for Mobile Communications, designed and developed novel UWB antennas and done numerical analysis for the designed antennas. He has around 25 national and international conference papers, published 12 international journal research papers in reputed journals and four journal papers are under preparation. He has won the MHRD scholarship and Canadian common wealth scholarship and is having International research experience at Canada from January 2012 to July 2012 at the University of Saskatchewan, Saskatoon, Canada under the leadership of Dr. Anh Dinh, Professor, Dept. of Computer and Electrical Engineering. He is having total 19 years of teaching experience and taught many subjects and guided many B.Tech and M. Tech projects.

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