System to Detect Human Being Buried under the Rubble During Disaster: A Review

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ABSTRACT

"Thousands of person killed as a cause of earthquake". Such headlines of the newspaper come after the unavoidable casualty. Due to this, unlimited number of people die. It is nothing but the result of disasters such as snowfall, tunnel dropping and fall of landslides. In June 2013, the worst incident happened in Uttarakhand, when continuous rain came as effect of fall of landslides. The most important question arise that how to enable rescue teams to enter the area, where many bodies are buried under rubble during disaster. The microwave life detection system is developed to detect rescue of victims trapped under the rubble of collapsed building during the earthquake or other disasters. The proposed system uses microwave frequency signal which is able to detect movement of heart and respiratory system. The operation principle is based on Doppler frequency shift of the electromagnetic wave. These wave reflected back from the user which is present below the ground level. We decrease world death rate to greater extent by using such system.

Keywords: *Life under rubble, Doppler shift, dual antenna system, clutter signal, modulation due to body oscillations.*

1. INTRODUCTION

Every year, most of the victims of earthquake or other natural disasters in the various parts of the world are trapped under rubble due to fall of buildings. Life of people can save due to detection of the victims. While using radar application, the phase of the incident wave can be changed due to the body motion. Depending upon this fact "A Revolutionary System to Detect Human Being Buried under the Rubble" [1] used to trap the buried victims under earthquake rubble or collapsed buildings by the utilization of microwave frequency and microcontroller has been designed. The basic block diagram of system as shown below:

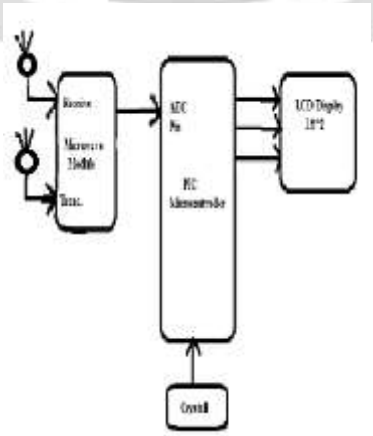

Fig.1: Basic block diagram of system

In this figure, microwave module connect with microcontroller and microcontroller connect with LCD display. In additional, we provide buzzer. When system detect vital sign of human being, LCD display it and buzzer become on. Otherwise, it become as it is in their position.

2. LITERATURE SURVEY

Event's images causing damage in which people have been trapped or buried under rubble serve as constant reminders of the vulnerability of the places where we live and work. To organize rapid rescue operations, emergency forces required timely information on the exact position of people trapped or buried under rubble all over the world, information about collapse of debris and standardized intervention procedures as well as information on the state of the victims health. Fall down of man-made structures such as buildings, houses and bridges, this is occur with varying frequency across the world. In such situation, people survive are usually trapped in the cavities created by collapsed building material. The concept of microwave life detection system was emerged with the development in the systems for rescue operation. Initial dogs were used to detect presence of human then acoustic detectors and robot radar come into existence. But these systems are having major drawbacks. The history of "Revolutionary System to detect Human Being Buried under the Rubble" starts with K. M. Chen who brings out the concept of detection of buried victims using microwave beam in 1985[1].In 1991, Ku Mem Chen after the depth study of microwave signals and Doppler's effect, had been proposed the basic principle for the operation of life proposed the basic principle for the operation of life detection system [5].In 1996, a mobile microwave sensor used for human detection [4]. After that in 1997, W. S. Haddad used Low Power Hand-Held Microwave Device for the Detection of Trapped Human Personnel [6].While passing few years, the device discovered called as Rubble Rescue Radar (RRR) which uses Micro power Impulse Radar technology which was developed at Lawrence Livermore National Laboratory. P. K. Banerjee and A. Sengupta proposed the basic block diagram for the clutter cancellation system in 2003. In 2004, M.Bimpas gave the concept of three band radar system [7]. The researcher put their efforts to study the various effect of various bands of microwave signals and depending upon this, finally system which detect human being with ka-band with double sidebands in 2006. It states that short wavelength of band increases the sensitivity of antenna which will detect the small body vibration [10].In 2007, a paper on 'An X-band microwave life detection system' has been presented by Huey Ru. In this paper, author present the idea of detecting human being located behind the wall using a microwave signal [8]. The phase change of a reflected microwave signal will provide the precious information about the buried victim's heartbeat as well as breathing [9]. A rescue radar system is proposed by M. Donelli in 2011. In radar system a SAW oscillator is used to generate 10GHz frequency signals. While receiving through patch antenna the signal is process by the ICA (Independent Component Algorithm) [2].A microwave life detection system operated on radio frequency was proposed in 1985 [3].

3. PROPOSED SYSTEM

The microwave signal is sent through rubble to detect human being become alive or not. This signal having characteristic to pass through barriers and would reflect back from some objects (human being).When beam of signal hits the body, signal reflected with additional modulation created by movement of heart and lungs. Due to reception of modulated signals, it shows the presence of human being become alive under rubble. There are some other signal (called clutter signal) which are reflected from stationary object. The microwave detection system can work on different range of frequency from 2GH (L-band) to 10GHz(X-band) [5].

3.1 System Architecture

The following figure shows system architecture:

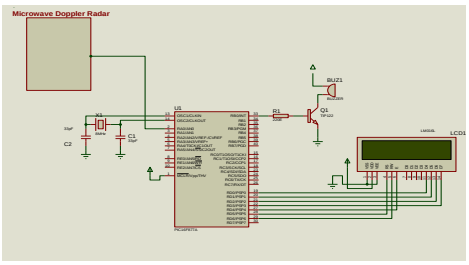

Fig.2: Architecture System of life

Detection system

The microwave life detection system has four important parts. These four parts are as given below:

- Microwave circuit which generates, amplifies and distributes microwave signals to different microwave components.
- A dual antenna system, which consists of two separate antennas energized sequentially.
- A microwave controlled clutter cancellation system, which creates an optimal signal to cancel the clutter from the rubble.
- Laptop or computer which act as monitor for output signal.

3.2 Microwave Doppler Radar Sensor for Motion

This sensor can detect motion or speed of moving objects through Doppler principle. It transmits a 10 GHz microwave frequency electromagnetic signal and waits for the signal to receive back and monitors the shift in frequency signal. In general, the Doppler Effect is a shift in frequency perceived by a receiver from a signal source due to relative movement of the source and/or receiver.

A microcontroller used is 'Peripheral Interface Controller'PIC16F877A device are available in 40 pin packages. It has 8K*14 words of flash memory and 368*8 bytes of data memory. It offers tight integration with MATLAB environment and either drive MATLAB Library Browser. Simulink software includes extensive library of functions commonly used in modeling a system.

The flow chart of system are as flows:

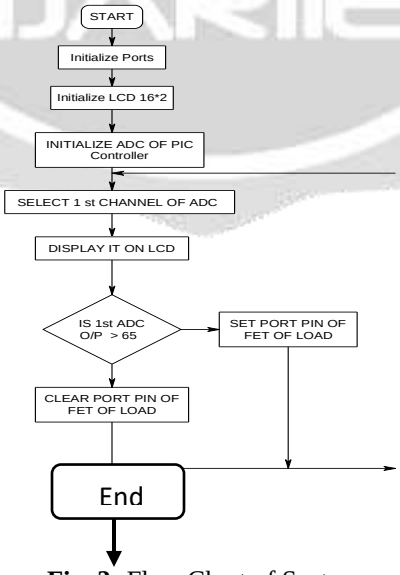

Fig. 3: Flow Chart of System

4. CONCLUSION

Microwave life detection system and matlab simulation system used to detect human beings under rubble during disaster. Such system is applied for search and rescue of victims during any disaster. So, using such system, we decrease world death rate to greater extent.

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