

LIFE SAVING EMBEDDED SYSTEM

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ABSTRACT

“Thousands of people killed as a cause of earthquake”

The above words aren't the headlines of the newspaper but daily news everyone come across whenever we go through a newspaper or watching TV news.

A person's life is precious and meaningful to his loved ones.

We, as responsible engineers felt a part of society to bring a system to avoid these mishaps. With the meteoric Embedded Systems along with microprocessor our designed system in preventing deaths and providing safe guided measures.

A new revolutionary microwave life detection system which is used to locate human beings buried under earthquake rubble has been designed. This system operating at certain frequency can remotely detect the breathing and heartbeat signals of human beings buried under earthquake rubble. By proper processing of these signals, the status of the person under trap can be easily judged. The entire process takes place within a few seconds as the system is controlled by the microprocessor (8085) or microcontroller unit. By advent of this system the world death rate may decrease to greater extent as large percentage of death occur due to earthquake.

We welcome and wish you to a safe journey of this paper.

INTRODUCTION:

At present as we all know the need of the hour is to find an effective method for rescuing people buried under earthquake rubble or collapsing building. It has to be done before we experience another quake. Present methods for searching and rescuing victims buried or trapped under earthquake rubble are not effective. Taking all the factors in mind, a system which will be effective to solve the problem has been designed.

PRINCIPLE OF OPERATION:

The basic principle is that when a microwave beam of certain frequency (L or S band or UHF band) is aimed at a portion of rubble or collapsed building under which a person has been trapped, the microwave beam can penetrate through the rubble to reach the person.

When the person is focused by the microwave beam, the reflected wave from the person's body will be modulated or changed by their movements, which including breathing and heart beat. Simultaneously, reflected waves are also received from the collapsed structures.

So, if these reflected waves from the immovable debris are cancelled and the reflected wave from the person's body is properly distinguished, the breathing and heart beat signals can be detected.

By proper processing of these signals, the status of the person under trap can be easily judged. Thus a person under debris can be identified.

MAJOR COMPONENTS OF THE CIRCUIT:

The microwave life detection system has four major components. They are

1. A microwave circuit which generates, amplifies and distributes microwave signals to different microwave components.
2. A microwave controlled clutter cancellation system, which creates an optimal signal to cancel the clutter from the rubble.
3. A dual antenna system, which consists of two antennas energized sequentially.
4. A laptop computer which controls the microprocessor and acts as the monitor for the output signal.

WORKING FREQUENCY:

The frequency computer of the microwave falls under two categories, depending on the type and nature of the collapsed building. They are

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pre-amplifier and then mixed with a local reference signal in a double balanced mixer

- Three-fourth of the output is directed by a microwave detector to provide a DC output, which serves as the indicator for the degree of clutter cancellation.
- When the settings of the digitally controlled phase shifter and the attenuator are swept the microprocessor control system, the output of the microwave detector varies accordingly.

DEMODULATION OF THE CLUTTER

CANCELLED SIGNAL:

- At the double balanced mixer, the amplified signal of the reflected wave from the person's body is mixed with the local reference signal.
- The phase of the local reference signal is controlled by another digitally controlled phase shifter2 for an optimal output from the mixer.
- The output of the mixer consists of the breathing and heart beat signals of the human plus some unavoidable noise.
- This output is fed through a low frequency amplifier and a band pass filter (0.4 HZ) before displayed on the monitor.
- The function of the digitally controlled phase of the local reference signal for the purpose of increasing the system sensitivity.
- The reflected signal from the person's body after amplification by the pre-amplifier is mixed with the local reference signal in a double balanced mixer.

MICROPROCESSOR CONTROL UNIT:

The algorithm and flowcharts for the antenna system and the clutter cancellation system are as follows

ANTENNA SYSTEM:

Initially the switch is kept in position1 i.e. Signal is transmitted through the antenna1

- ❖ Wait for some predetermined sending time ,Ts
- ❖ Then the switch is thrown to position2 i.e. Signal is received through the antenna2
- ❖ Wait for some predetermined receiving time Tr

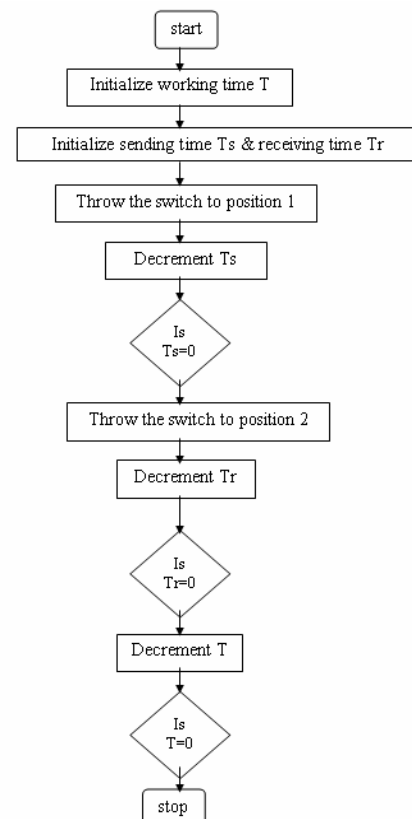
❖ Go to step 1

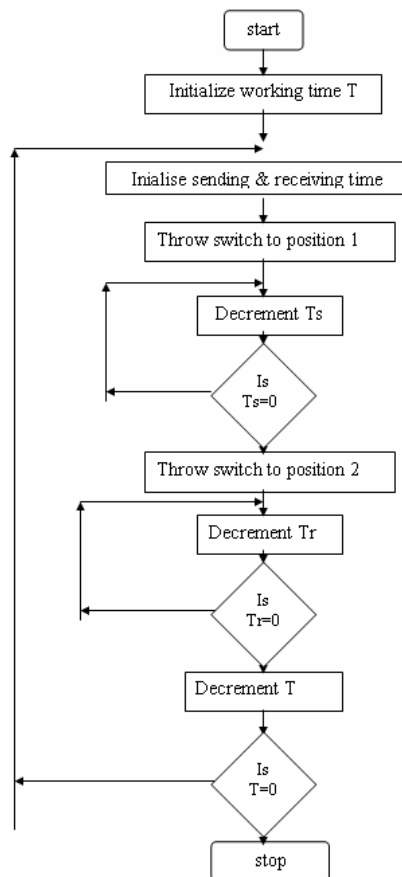
❖ Repeat the above procedure for some predetermined time, T.

CLUTTER CANCELLATION SYSTEM:

- Send the signal to the rubble through antenna1.
- Receive the signal from the rubble through antenna2.
- Check the detector output .if it is within the predetermined limits go to step5.
- Otherwise send the correction signal to the digitally controlled phase shifter1 and the attenuator and go to step1.
- Check the sensitivity of the mixer. If it is optimum go to step 7 .
- Otherwise send the correction signal to the digitally controlled phase shifter2 to change the phase and go to step1.
- Process the signal and send it to the laptop.

FLOW CHART FOR ANTENNA SYSTEM



FLOW CHART FOR CLUTTER CANCELLATION SYSTEM**ADVANTAGES OF L OR S BAND FREQUENCY SYSTEM:**

Microwaves of L or S band frequency can penetrate the rubble with metallic mesh easier than that of UHF band frequency waves.

ADVANTAGES OF UHF BAND FREQUENCY SYSTEM:

Microwaves of UHF band frequency can penetrate deeper in rubble (without metallic mesh) than that of L or S band frequency waves.

FREQUENCY RANGE OF BREATHING AND HEART BEAT SIGNAL:

The frequency range of heartbeat and breathing signals of human beings lies between 0.2 and 3 HZ

HIGH LIGHTS:

- ❖ Since it will not be possible to continuously watch the system under critical situations, an alarm system has been set, so that whenever the laptop computer system processes the received signal and identifies that there is a human being, the alarm sound starts.
- ❖ also under critical situations, where living beings other than humans are not required to be found out, the system can detect the signals of other living beings based on the frequency of the breathing and heart beat signals.

CONCLUSION:

Thus a new sensitive life detection system using microwave radiation for locating human beings buried under earthquake rubble or hidden behind various barriers has been designed. This system operating either at L or S band, UHF band can detect the breathing and heart beat signals of human beings buried under earthquake rubble.