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# Solar Powered Cognitive Radio Communication for Natural Disaster Emergency Assistance

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**ABSTRACT:** The states which is prone to disasters and many disasters occurred, claimed a large numbers of casualties. There are three potential disasters, namely natural disaster, non-natural disaster, and social disaster. During a disaster, the delivery of conditions in the place to be informed is necessary to all citizens so that the decision can be quickly taken to protect them. In a disaster system management, the communication is needed starting from planning, mitigation, and emergency response to rehabilitation. One of the technologies used is a 2 meter band transceiver radio working at frequency of 144 MHz that transmits and receives information in the form of audio/analog, widely used by the community organizations. One of the weaknesses of this system is the battery availability or power supply. To fix these weakness, the radio communication is powered by the battery/accumulator which is equipped with solar cell, solar cell is used to charge the battery/accumulator by utilizing the sunlight.

## I. INTRODUCTION

When a natural disaster occurs in a populated zone, a fast and effective organization of disaster management is necessary to assist the affected population, reduce the number of victims, and limit the economic impact. Regardless of community size or the nature of the disaster, local government leaders are responsible for overseeing all three phases of the disaster-management cycle: pre-disaster, response, and past disaster. In all phases, one of the first actions to be taken is to set up a disaster cell for coordination. For major risks, this includes national ministries, civil defense, regional and local administrations, nongovernmental administrations involved in disaster management, experts, crisis staffs, a command chain, an information chain, etc. A non-optimal organization causes supplementary losses and delays returning to - or even preventing returning to -normal conditions.

The present paper deals with the "response phase" of the disaster-management cycle, where information must be delivered to the disaster cell in the shortest possible time. The detection and the monitoring of the impact and effects of natural disasters are generally done via space borne and airborne remote-sensing surveys through radio and optical instruments. However, for the sake of convenience (nighttime IR imagery being more difficult to interpret in specific conditions), only radio observations will be considered.

An international charter facilitates access to the relevant data. This aims at providing a unified system of space data acquisition and delivery to those affected by natural or manmade disasters. The "communication" subsystem is essential for sending and distributing alert messages, exchanging of information among all the actors, disseminating information and instructions to public and private services, and taking care of the radio navigation and observation services. The "data acquisition" subsystem concerns the acquisition of information provided mainly by radio remote-sensing instruments.

## II. LITERATURE SURVEY

1.Design challenges for an management communication and information system Manual efforts have been done since then to solve disaster management. Because of severity of the damages done due to disasters as the "international

decade for Natural disaster reduction (IDNDR)” As far as work on disaster management using technology is concerned, only few solutions have been proposed in literature. In this direction, an early work based on ICT. It identifies various challenges and presented an integrated communication infrastructure based on information technology for disaster response and recover. A Wireless Ad Hoc and Sensor network Architecture for situation management in Disaster response have used ad hoc network for situation management by presenting a novel architecture called Distress Net. The proposal exploits distributed and collaborative sensing, topology aware routing and resource localization for disaster response. Pervasive software environments for supporting Disaster Responses

### **III. EXISTING SYSTEM**

Currently, the research on prevention strategies has been given great attention. To quickly search the desired natural disasters warning documents for enterprise. Cognitive Radio provides opportunistic use of unused frequency bands by secondary users (SUs) if that frequency band is not being used by primary users (PUs). The use of Cognitive Radio for transferring data to the disaster can provide stability in operation and control of the natural disaster management. Therefore, the aim of this research is to check the feasibility of using Cognitive Radio for fast, efficient, secure and reliable machine/device to machine/device communication. Assistance for rescue operations as well as to help restore vital communication links. Uses of solar panels to provide alternative power in the absence of power infrastructure in the immediate aftermath of a disaster etc.

#### **3.1 PUBLIC NEWS:**

A natural disaster is a major event caused by the natural processes of the earth, consisting of floods, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis and other geologic processes.

#### **3.2 MEDIA:**

In times of natural disasters, people tend to use social media for several reasons to check on family and friends seek support gather news about the magnitude of the disaster and provide ground-zero first-hand accounts.

#### **3.3 SOCIAL MEDIA:**

Social media during a disaster provides up-to-the-minute news information-road closure updates evacuation routes designated help areas shelter locations . Those networks in turn may connect them to source of support outside of areas directly affected by disaster. Seconds people with more bridging ties may have built those network by moving or traveling more and thus feel more comfortable evacuating far from home during a disaster. Link ties are also important

### **IV. DRAWBACKS OF EXISTING SYSTEM**

Natural disasters can cause immediate physical threats. Collapsed buildings and flying debris can injure and without proper sanitary care even small wounds can become infected. Disasters can also either directly or indirectly release hazardous materials. Volcanic eruption and fires release particulates in the air that make breathing difficult and exacerbate conditions for indirect release of environmental contaminants can happen when industrial or agricultural site are damaged or leak due to a disaster. These release can be small such as paints and other household toxins washed into floodwaters or large such as oil leaking from severed pipelines after an earthquake. In the days and weeks after hurricane Harvey submerged much of metropolitan Houston Internet connection required to get information in social media .Without power supply news in television is also not possible.

### **V. PROPOSED SYSTEM**

Light sensor, sound sensor, temperature sensor, flood sensor, vibration sensor are connected to the microcontroller .Information about the abnormal changes will be conveyed to microcontroller from sensors. The microcontroller passes the information to the transmitter. The information will be passed to receiver Microcontroller in the receiver part

conveys the information at a particular frequency to public as like how FM is playing Internet connection is not required.

**5.1 TRANSMITTER :**

The new wireless technology called Cognitive Radio technology has the potential to overcome problems in wireless communication. There are six main types of level transmitters. Each of these transmitters work in different ways, making them useful for a number of different types of processes.

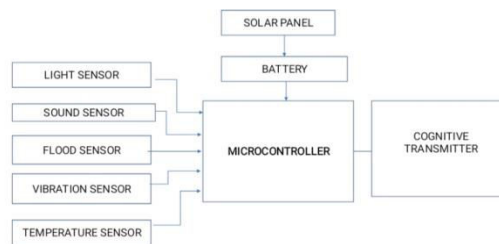


Figure 5.1 Block diagram of transmitter

Light sensor, sound sensor , temperature sensor, flood sensor, vibration sensor are connected to the microcontroller about the abnormal changes will be conveyed to microcontroller from sensors. The microcontroller passes the information to the transmitter.

**5.2 RECEIVER :**

The use of Cognitive Radio for transferring data to the disaster can provide stability in operation and control of the natural disaster management.

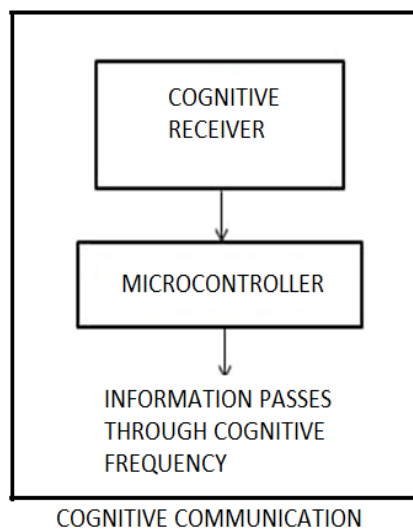


Figure 5.2 Block diagram of Receiver

The information will be passed to receiver. Microcontroller in the receiver part conveys the information at a particular frequency to public as like how FM is playing. Internet connection is not required.

### 5.3 CIRCUIT DIAGRAM :

Cognitive Radio provides opportunistic use of unused frequency bands by secondary users (SUs) if that frequency band is not being used by primary users (PUs). All digital circuits work only with low DC voltage. A power supply unit is required to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and a regulator.

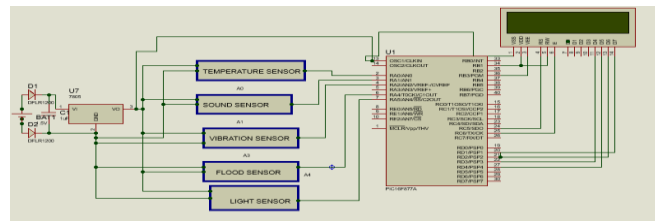


Figure 5.3 Cognitive circuit diagram

The use of Cognitive Radio for transferring data to the disaster can provide stability in operation and control of the natural disaster management. Therefore, the aim of this research is to check the feasibility of using Cognitive Radio for fast, efficient, secure and reliable machine/device to machine/device communication.

#### 5.3.1 COGNITIVE RADIO TRANSMISSION

In CR, smart transceivers finds the white spaces and transmit adaptive signals. The design of the other RF blocks faces main challenges related to the ADC/DAC, the dynamic range or range of signal strengths. The concept of cognitive radios (CRs) goes beyond some applications and aims to improve the quality of information (QOI) of users. This requires an intelligent radio that uses spectrum sensing techniques to observe the RF activities and is able to autonomously adapt to particular situations

## VI. TOOLS/ TECHNIQUES

### 6.1 HARDWARE USAGE

Light sensor, Sound sensor, Temperature sensor, Vibration sensor, Flood sensor, Microcontroller, Solar panel, Battery, Transmitter, Receiver, Frequency (FM).

### 6.2 SOLAR PANEL :

The growing scarcity of resources isn't hidden from anyone. Therefore to tackle with this issue, several way were and are still being brought up. One such ways was the use of solar energy for the generation of electricity. But it can be done using a few equipment like solar panel, battery, internet, charge controller that as a whole are called a solar system.

### 6.3 BATTERY:

A battery can be defined as an electrochemical device (consisting of one or more electrochemical cells) which can be charged with an electric current. The following are the different types of rechargeable batteries that are commonly used. Lithium-ion (Li-ion) nickel cadmium (Ni-CD) nickel-metal Hydride (Ni-MH) Lead-Acid.

### 6.4 FREQUENCY MODULATION:

Frequency modulation, FM is used in many applications from broadcasting to communications and offers several advantages over other modes.

### **6.5 LIGHT SENSOR:**

Light sensors detect light and convert light energy to an electrical signal output. It converted into electrical energy the radiant energy within the infrared to ultraviolet light frequency spectrum source can then be measured.

### **6.6 SOUND SENSOR:**

A sound sensor defined as a module that detects sound waves through its intensity and converting it to electrical signals. The types of sound sensor include acoustic pressure sensors, pressure micro phones ,high amplitude pressure microphones, probe microphones condenser microphones. Cognitive Radio provides opportunistic use of unused frequency bands by secondary users (SUs) if that frequency band is not being used by primary users (PUs).

### **6.7 TEMPERATURE SENSOR:**

A temperature sensor is a device that detects and measures hotness and coolness and converts it into an electrical signal. The most well-known are pt100(with a resistance of 100 ohms at 0degree c .within our homes ,temperature sensors are used in many electrical applications from our refrigerators and freezers to help regulate and maintain cold temperature as well as within stoves and ovens to ensure that they heat to the required levels for cooking , air confectioners/heaters

### **6.8 VIBRATION SENSOR:**

A vibration sensor is a device that measures the amount and frequency of vibration in a given system, machine, or piece of equipment. Those measurements can be used to detect imbalances or other issues in the asset and predict future breakdowns .the general types of vibration sensor include displacement sensor , velocity sensor ,and accelerometers. A Vibrating object moves back and forth from its normal stationary position .

### **6.9 TRANSMITTER:**

The transmitter combines the information signal to be carried with the radio frequency signal which generates the radio waves which is called the carrier signal. This process is called modulation the information can be added to the carrier in several different ways in different types of transmitters.

### **6.10 MICROCONTROLLER:**

Cognitive Radio provide support use of unused frequency band secondary users (SUs) if that frequency band is not being used by primary users (PUs).All digital circuits work only with low DC voltage. the power . it has also used to denote something very small like a very small processor or micro controller. Micro controller types, For Example Intel 8031and 8051 are 8 bits micro controller.16 bit micro controller – this type of microcontroller is used to perform arithmetic and logical operations where higher accuracy and performance is required. For example. Intel 8096 is a 16 bit micro controller. The main purpose of micro controller is to execute its software.

#### **6.10.1 PIC16F887 MICROCONTROLLER**

This powerful yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 40- or 44-pin package. The PIC16F887 features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 14 channels of 10-bit Analog-to-Digital (A/D) converter, 1 capture/compare/PWM and 1 Enhanced capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I<sup>2</sup>C™) bus and an Enhanced Universal Asynchronous Receiver Transmitter (EUSART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances or consumer applications.

#### 6.10 SOFTWARE TOOL USAGE:

Language is used to develop microcontroller-based applications. Embedded C is a set of language extensions for the C programming language by the C standards committee to address commonality issues that exist between C extensions for different embedded system.

### VII. RESULTS AND DISCUSSIONS

All digital circuits work only with low DC voltage. A power supply unit is required to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and a regulator. AC voltage typically of 230Vrms is connected to a transformer which steps that AC voltage down to the desired AC voltage level. A diode rectifier then provides a full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage.

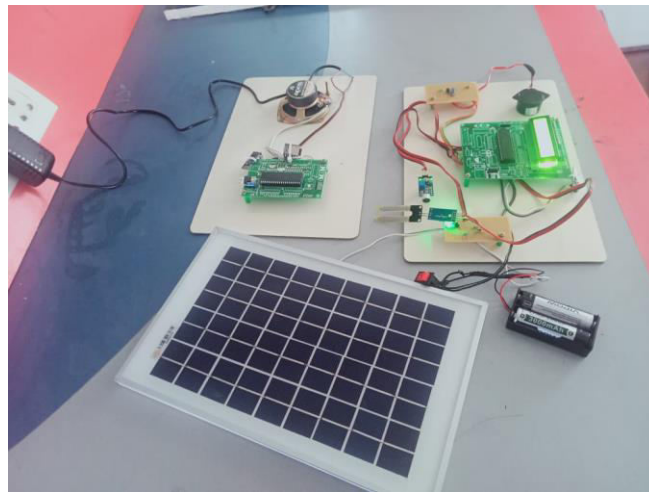


Figure 7.1 Natural Disaster output kit

This resulting DC voltage usually has some ripple or AC voltage variations. Regulator circuit can use this DC input to provide DC voltage that not only has much less ripple voltage but also remains in the same DC value, even when the DC voltage varies, or the load connected to the output DC voltage changes. The required DC supply is obtained from the available AC supply after rectification, filtration and regulation. Block diagram of power supply unit

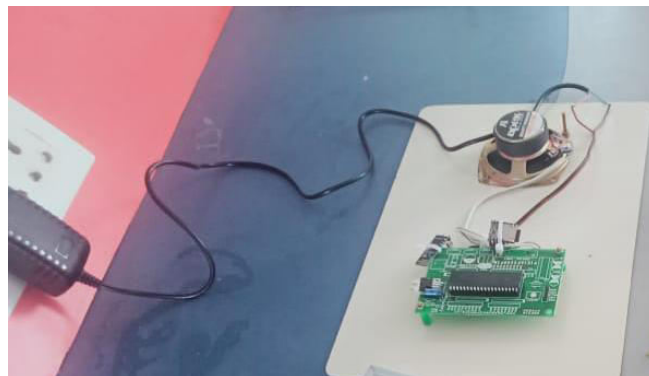
#### 7.1 LCD DISPLAY

Innovative alphanumeric display or LCD (2x16 A) Module provides versatile display functions. Through its straight forward connections, it may be controlled by Innovative BASIC Commander for a good vary of alphanumeric applications. During this module, 2 show lines, each with sixteen characters on every line may be displayed. By exploitation the indicator management command, the position of the character to be displayed on the screen may be arbitrarily modified. The main components used in the power supply unit are Transformer, Rectifier, Filter and Regulator. The 230V AC supply is converted into 9V AC supply through the transformer. The output of the transformer has the same frequency as in the input AC power. This AC power is converted into DC power through diodes. Here the bridge diode is used to convert AC supply to the DC power supply. This converted DC power supply has the ripple content and for normal operation of the circuit, the ripple content of the DC power supply should be as low as possible.



7.2 Output image

. Here the bridge diode is used to convert AC supply to the DC power supply. This converted DC power supply has the ripple content and for normal operation of the circuit, the ripple content of the DC power supply should be as low as possible



7.3 Information passes through the cognitive radio.

This filtered output will not be the regulated voltage. For this purpose IC7805 regulator. Because the ripple content of the power supply will reduce the life of the circuit. So to reduce the ripple content of the DC power supply, the large value of capacitance filter is used IC is used in the cognitive ratio

### VIII. ADVANTAGES

The advantages of use are easy and reliable operation, Low cost and efficiency, The emergency time solar battery backup is provided, Maintenance cost is low, The communication instruments required supply is given.

### IX. APPLICATIONS

When providing advance warning of disasters, solar panels and battery banks can keep an emergency notification system running in any weather condition so that local emergency response plans can be successfully executed. This may involve public announcement system as well as data acquisition technologies, such as supervisory control and data acquisition, telemetry and remote terminal unit systems controlling municipal systems. Mobile command centers on trailers, skids or trucks. Public announcement systems. Radio cell and other communication systems. Early detection and warning systems.



## X. CONCLUSION

Early warning plays a key role in people's daily behavior activities. The reuse of natural disasters warning documents can provide the effective prevention strategies of natural disasters for enterprise staffs to further reduce the economic losses of enterprise. As existing keywords-driven documents search approach only relies on exact keywords-matching technique for the natural disasters warning documents retrieval, the recommended documents can place a heavy burden on the enterprise staffs to select and learn, especially when the enterprisestaffs have little background knowledge of the contents of the natural disasters warning.

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