IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Aid System For Finding Trapped Earthquake Victims

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Abstract: An earthquake is the shaking of the Earth's surface due to the sudden release of energy in the earth's crust.Earthquakes are usually caused when underground rock suddenly breaks and there is rapid motion along a fault. This sudden release of energy causes the seismic waves that make the ground shake. During and after the earthquake, the plates or blocks of rock start moving and they continue to move until they get stuck again.Using the robot vehicle which is provided with sensors such as PIR Motion detector, Voice detector, DTH11 sensor all this sensors connected to Wifi module.Wifi module is programmed to get the data from sensors and send the information to our mobile phone by which we can view victims motion, voice and body temperature using the app Wifi module uses the internet it can be connected to wifi router or mobile hotspot

Keywords:PIR Motion Detector,Sound Detection Sensor,DHT11 Sensor,ESP-12F ESP8266 Wifi Module,Motor Driver Module

I.INTRODUCTION

Earthquakes are usually caused when underground rock suddenly breaks and there is rapid motion along a fault. This sudden release of energy causes the seismic waves that make the ground shake. During and after the earthquake, the plates or blocks of rock start moving and they continue to move until they get stuck again. The spot underground where the rock first breaks is called the focus, or hypocenter of the earthquake.In Order to save the lives of the public during this situation they get awareness such as moving away from windows, turning off the gas stove, etc. But procedures for finding people in collapsed buildings are not very efficient and consists of, among other things, asking neighbours where there might be people, using search dogs, and shouting for survivors and listening for a response. These procedures could be easier if there was some information about where the victims are trapped available to the rescue workers.

II. Components

2.1 PIR Motion Detector Sensor Module HC-SR501

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensor's range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.PIRs are basically made of a pyroelectric sensor (which you can see below as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

2.2 Sound detection sensor module

Sound detection sensor module detects the intensity of sound where sound is detected via a microphone and fed into an LM393 op-amp. It comprises an onboard potentiometer to adjust the setpoint for sound level.
Sound Detection Sensor Module consists of four pins i.e. VCC, GND, DO, AO. Digital out pin is connected to the output pin of LM393 comparator IC while the Analog pin is connected to Microphone.Using a Sound Detection Sensor Module with a microcontroller is very easy. Connect the Analog/Digital Output pin of the module to the Analog/Digital pin of Microcontroller. Connect VCC and GND pins to 5V and GND pins of the Microcontroller. When the sound level exceeds the setpoint, an LED on the module is illuminated and the output is set low.

2.3 Temperature and Humidity Sensor Module

The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data.The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you.

2.4 Motor Driver Module

This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

2.5 DC Gear Motors

This DC Motor with Metal Gear Head is ideal for low RPM, High Torque application like lifting an object through Hook, This DC Motor is generally used in various robotics applications, it has following electrical and mechanical specifications.DC Motor –300 RPM – 12 Volts geared motors are generally a simple DC motor with a gearbox attached to it. This can be used in all-terrain robots and a variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly

2.6 DC-DC 12V to 3.3V 5V 12V Power Module Multi-Output Voltage Conversion

This DC-DC 12V to 3.3V 5V 12V Power Module Multi-Output Voltage Conversion is also known as Buck converter or also asStep-Down Voltage Converter.
The module is capable of altering the output of the power source/supply before supplying it to the load so as to deliver thespecified power to your load.
The device is very flexible and easy to use. The module is powered by 6V to 12V DC input, and provides three fixed DC outputs:3.3V, 5.0V, and a third output which is a direct connection to the DC input(input to the module).
Perfect for providing support power for your electronic design, every DIY hobbyist should have a couple of these flexible powersupplies on their electronics workbench. They can also be used as a multi-output fixed voltage DC power supply in electronic equipment designs.

2.7 CP PLUS 2MP Full HD Smart Wi-Fi CCTV

1080p full HD Plug & Play Wi-Fi PT camera, which enables crisp images that reveal the smallest details with absolute clarity. Now, I work with Alexa & Ok Google so you can go hands-free and enjoy the safety of a smart home.
36o Degree View offered by this EzyKam, saves cost and trouble of installing multiple cameras in any space to cover the full view of the area. ;Home-on-Phone, View the live video footage of your home/office anytime anywhere in the world on your phone.
Hassle-free Installation, Connect to your local Wi-Fi in a moment. Simply select a network, input the password, and you are good to go;Talk to the person on the other side while you see their live video feed and stay connected to your loved ones around the clock. Up to 128GB SD Card supported.ezyKam+ Supports Mobile APP with 4 Split Live Views.; ezyKam+ Supports Web Client with 9 Split Live Views.Material Type: Metal; Included Components: Camera And Usb; Specific Uses For Product: SurveillanceMotion Detection & Human Detection : Human Detection avoids false alarms from moving pets. Smart Tracking

function makes the camera follow moving objects, records real-time videos and sends instant alerts to your mobile.

2.8 Connecting probes

A jumping viral connecting wire is an electrical wire, or group of them In cable, With a connector or pin at each end, which isusually used to connect the components of a breadboard or any other prototype of a circuit without soldering.

Individual jumper wires are fixed by inserting their end connectors into the provided slots in a breadboard or any other test circuitof a circuit board for a piece of test equipment.

Jumper wires at the end of multicoloured Ribbon cable are used to connect the pin header at the left side of a blue USB-to-serialboard to the Bluetooth module for the motor driver.

2.9 Lithium Battery

1200mAh 3.7V 18650 Li-ion lithium rechargeable cell

batterySpecification18650 Li-ion rechargeable battery

2.10 ESP8266 Wifi Wireless IoT Board Module Wifi Module

Wifi modules or wifi microcontrollers are used to send and receive data over Wi-Fi. They can also accept commands over the Wi- Fi. Wi-Fi modules are used for communications between devices. They are most commonly used in the field of Internet of Things. ESP8266 is the most widely used Wi-Fi module. It is a low-cost microchip with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections.

Scanning and displaying available WiFi networks using ESP8266

ESP8266 comes with a built-in micro-controller. It has Arduino support and can be programmed easily.

Arduino support for ESP8266

1. Download Arduino IDE from Arduino.cc(1.6.4 or greater) https://www.arduino.cc/en/Main/Software
2. Install the ESP8266 Board Package

III. Connections and System Design

IV. ROBOTS:

There are many different kinds of catastrophes in natural and man-made disasters: earthquake, flooding, hurricane and they cause different disaster areas like collapsed buildings, landslides or crater. During these emergency situations, and specially in urban disasters, many different people are deployed (policeman, firefighters and medical assistance). They need to cooperate to save lives, protect structural infrastructure, and evacuate victims to safety.In these situations, human rescuers must make quick decisions under stress, and try to get victims to safety often at their own risk. They must gather to determine the location and status of victims and the stability of the structures as quickly as possible so that medics and firefighters can enter the disaster area and save victims.All of these tasks are performed mostly by human and trained dogs, often in very dangerous and risky situations. This is why for some years, mobile robots have been proposed to help them and to perform tasks that neither humans dogs nor existing tools can do. For this project, we will focus only on robots which will work in a disaster environment of man made structure, like collapsed buildings. They are called Urban Search And Rescue (USAR) robots.

V. Problem specification:

One of the biggest problems for networking in disaster-stricken areas is the lack of infrastructure. Access points can either be down because of a power outage or damage to physical links. The collaboration between rescue workers is therefore made difficult due to the inability to send data between units. The rescue workers expressed a need to send more data than which was possible in such big disasters.Due to the fact of fast reclining the chance of survival for those trapped in collapsed houses and that the areas affected by the earthquake are usually large, the few rescue workers that get there first need to cover a lot of ground fast. This means that the rescue workers have very little time to linger around a house to search for survivors. Therefore trappedvictims that are unable to respond are likely to be missed during the search.

VI. Aim of the study:

5 things to know about earthquake search and rescue operations

5.1. Coordination: The first step is to mobilize search and rescue crews, who are frequently highly skilled

volunteers, with at least two-year training processes.

5.2. Analyzing and looking for voids: As soon as the rescue team arrives on the scene of the accident, the first thing they do is to assess the situation, evaluate the building, its history whether it is old or new, and try to figure out where in the building people are most likely to be.Rescue workers look for voids, such as under desks, in bathtubs, or in stairwells where victims of wall collapse might become trapped or may have taken shelter.It is also crucial to assess the extent of a building's damage and whether it is likely to fall again, endangering survivors and rescue workers.It is also crucial to assess the extent of a building's damage and whether it is likely to fall again, endangering survivors and rescue workers.Similarly, rescue workers should look for dangers like downed power lines, gas leaks, flooding, and other hazardous items. Special suits, gloves, masks, and oxygen and carbon air quality monitoring devices are all examples of protective equipment.

5.3. Paying attention to faintest noises: The smallest noises can be located within a few meters with the use of specialized sound equipment. The site must remain silent while a rescue team member hammers three times in the hopes of getting a reaction. Carbon dioxide detectors can be used to locate unconscious survivors. They function best in small areas where there is a higher concentration of CO2 from people who are still breathing because of this.The thermal image camera system, which shows areas of body heat, and trained sniffer dogs are among the research tools.

5.4.Debris removal and victim extrication: The situation must be stabilized before pulling survivors out of debris. This is done by building a rectangular wooden framework known as "box crib" and placing it underneath the debris.Rescuers use a variety of heavy equipment to move rubble, including hydraulic jacks and diggers. Once an entry is secured, paralyzed victims are lifted, dragged or carried out of the debris with special safety equipment.The workers can view any trapped individuals inside by using diggers to rip apart large concrete slabs on a building's exterior. To cut through the wreckage, chainsaws and other power tools are also carried.Other tools might include "shoring" equipment, which provides stable and secure pathways, and flat bags that are placed below large objects and inflated with an air pump.As survivors are extracted, their health status is assessed; individuals are prioritized using triage, which is dependent on how serious their conditions are. The most urgent medical procedures usually start on the site.

5.5. Deciding when to end: The tough choice of when to stop searching for the few trapped individuals is made by the coordinating agency and state. Although humans have been found to survive for up to 13 days if they had access to water, the average period for this changeover is between five and seven days.

VII. Current methods for finding Earthquake victims

There are mainly three different methods that are used when trying to find possible trapped victims in the rubble of houses after a big earthquake. These methods are; using sound to determine where the trapped victims are, using specialized dogs able to find the scent of humans under the rubble and asking neighbors or relatives. The pros and cons of these methods will be discussed shortly.

7.1 Using sound

The most common method used for finding survivors is yelling and listening for any response from the collapsed houses. But even though it is the most used method it can miss people that are unconscious or otherwise unable to respond. But by using different specialized devices, even faint sounds can reveal if there is someone under the rubble. The operator calls out for someone above the rubble and bangs some pipes or another medium that sound easily travels through. Then using a microphone and vibration sensors try to listen to any replies from possible survivors. If the victim is unconscious this method does not work so well. Even though faint sounds such as the unconscious person's breathing might be caught and revealed, the location where he lies as the surrounding area might be noisy due to lots of heavy machinery and a big worried crowd of onlookers and relatives. A more controversial method that is in development is attaching a chip on the back of a cockroach and then sending them into the houses looking for sounds. Using cockroaches equipped with three low-quality unidirectional microphones in an array to localize the source of the sound and some with one higher quality omnidirectional microphone that is used for audio recording and streaming. Being connected wireless allows individually collected sound data from one cockroach in the swarm to be sent to others in the swarm and help the swarm to find the source faster. In a testing environment this method proved quite effective, but as there might be a lot more noise in a real situation, there is no way to tell how effective this method is in a real scenario. Furthermore, the cockroaches are quite slow, the tests showed that it took over a minute to traverse 3m of flat flooring . The final nail in the coffin for this method might be the general disgust regarding cockroaches. If a survivor is found using this method it means that the person is surrounded by bugs whilst trapped in a dark place. This might cause the trapped person to panic andmake the person's current predicament worse.

7.2 Specialized dogs

Using dogs that have been trained to find the scent of humans under rubble can be a big help in the process of finding and locating where the victims are. Judging on the scent alone the dogs can determine whether the person below is alive, unconscious or dead. This makes it easier for the rescue forces to prioritize which victims to dig out first. Using this method saves a lot of time as the dogs can search a bigger area at once. The biggest downside with using dogs is that they need specialized training meaning the dogs and their operators are few and are rarely in the area when needed and has to be transported there which takes vital time. But when on spot the dogs can move around the destroyed buildings much faster than a human can safely, so they usually makeup for the time it takes transporting them there.

7.3 Asking bystanders and neighbors

The people living around in the neighborhood usually know more than the rescue forces about who lives where and how the houses are constructed. Therefore asking bystanders can give great input for search teams for helping them find buried people faster. The bystanders might also have been there at the time of the earthquake and have heard screaming from persons under the rubble. These victims might be unconscious at the time of the rescue forces arrival. It might be dangerous to civilians without knowledge to stand near or enter buildings damaged in an earthquake, as aftershocks might topple these houses in an unpredictable manner. So to avoid further casualties civilians should relocate to safer areas, furthermore having people standing around makes it harder to find possible survivors when using methods including sound.

7.4 Thermal Vision Camera

A thermographic camera (also called an infrared camera or thermal imaging camera, thermal camera or thermal imager) is a device that creates an image using Infrared (IR) radiation, similar to a normal camera that forms an image visible using Instead of the 400–700 nanometre (nm) range of the visible light camera, infrared cameras are sensitive to wavelengths, from about 1,000 nm (1 micrometer µm) to about 14,000 nm (14 µm). The practice of capturing and analyzing the data they provide is called thermography.The thermal camera can confirm the correct position of the victim. Moreover, it is believed that the use of microphones in connection with other sensors would be of great benefit for the detection of casualties.

VIII Conclusion

This report has described the process of designing and developing a system for finding victims in toppled houses due to an earthquake.It shows how easily we can locate the victims and help them in their bad situation during earthquakes.It helps in rescue operations.

IXResult

This report will describe the process of designing and developing a system for finding victims in trapped houses due to an earthquake.So that we can save victims trapped under the rubbles it will be used to determine the victims easily using this equipment rescuers can find the victims where every one can't reach under the ruins.

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Anton Schillén 43

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