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Disaster Management (Early Information about the Occurrence of Tsunami)

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Abstract: In these days' natural disasters cause loss in hundreds of thousands of humans, damages to infrastructure, disturbance of financial activity and loss of billions of money worth of material. The purpose of this study is to develop an automated system which is used for tsunami occurrence detection and to send earliest possible information about the occurrences of tsunami to the people living near to coastal area through a SMS and by activating the safety devices implanted in that area to reduce the loss of life and property to certain extent. In this project the occurrence of tsunami can be predicted through wireless manner. The outcome of this study can be utilized by public policy and decision making in developing disaster management strategies.

Keywords: GSM Module, Reverse circuit switch, Hydraulic Lift, Pascal's Law

I. INTRODUCTION

This device is mainly designed to reduce the loss of life and property during the occurrence of tsunami [1]. So, this idea can be brought into existence by a device called vibration detector and transmitter. Tsunami means a huge wave generated by destruction in the sea bed by the earthquake [2], volcanoes and underground landslide etc. The device will be implanted on seabed detects the vibration and sends the signal to tsunami warning centre which is located in coastal area. Our innovation is a modified and an advance version of the present warning technology. Our device is much précised and faster. We have designed a detector which detects the vibration, pressure and other factors causing tsunami, which enable us to monitor these factors in the warning centres and give warning signals to the people out there, during the emergency situations. The detector is equipped with a GSM module [5], so that it could send a SMS and call to the people living in the coastal area when there is a possibility of tsunami. So, in this way we can save many lives. And also, to reduce the loss of property damage during the tsunami, we have designed a safety area to get rid of this problem.

II. SENSORS AND MODULES USED

A. Ardiuno Uno

It is a widely used open-source microcontroller [3] board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analogy input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board features 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

B. SW-420 Vibration Sensor:

This sensor module produce logic states depends on vibration and external force applied on it. When there is no vibration this module gives logic LOW output. When it feels vibration then output of this module goes to logic HIGH. The working bias of this circuit is between 3.3V to 5V DC. The output is directly connected to the microcontroller to detect high and low, thereby detecting the vibration environment, play an alarm role. Usually at any angle switch is ON state, by the vibration or movement, the rollers of the conduction current in the switch will produce a movement or vibration, causing the current through the disconnect or the rise of the resistance and trigger circuit. The characteristics of this switch is usually general in the conduction state briefly disconnected resistant to vibration, so it's high sensitivity settings by IC, customers according to their sensitivity requirements for adjustments.

C. RF Module:

It (radio frequency module) is a (usually) small electronic device [4] used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radiofrequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver. They are of various types and ranges. Some can transmit up to 500 feet. Several carrier frequencies

are commonly used in commercially available RF modules, including those in the industrial, scientific and medical (ISM) radio bands such as 433.92 MHz, 915 MHz, and 2400 MHz These frequencies are used because of national and international regulations governing the use of radio for communication. Short Range Devices may also use frequencies available for unlicensed such as 315 MHz and 868 MHz

III. ABOUT

Materials used are GSM sim900A module, Arduino, sw-420 vibration sensor, hc-05 Bluetooth module, disk motor driver, RF transmitter and receiver, monitor display and laptop.

IV. PRINCIPLE AND WORKING

Our project works on the principal of conversion of VIBRATION INTO ELECTRICAL SIGNAL TO VIBRATION DETECTOR**.** A vibration sensor SW- 420 is connected to the micro controller which is Arduino and a plotting graph and it is connected to a tip122 transistor to a 3V solenoid trigger switch connected to the RF transmitter and through another Arduino the GSM module [5] is connected to send the SMS and make call.

Tsunami [1] means a huge wave generated by destruction in the sea bed by the earthquake, volcanoes and underground landslide etc. The device will be implanted on seabed detects the vibration and send the signal to tsunami warning centre which is located in coastal area. The RF receiver is connected to the warning centre which consists of a warning buzzer, LED etc. The RF receiver is also connected to a delay board of 10 seconds and then it is connected to the disk drive motors, for the house to go down inside the container. An automatic door is done of hard disk by connecting a reverse switch circuit using transistor.

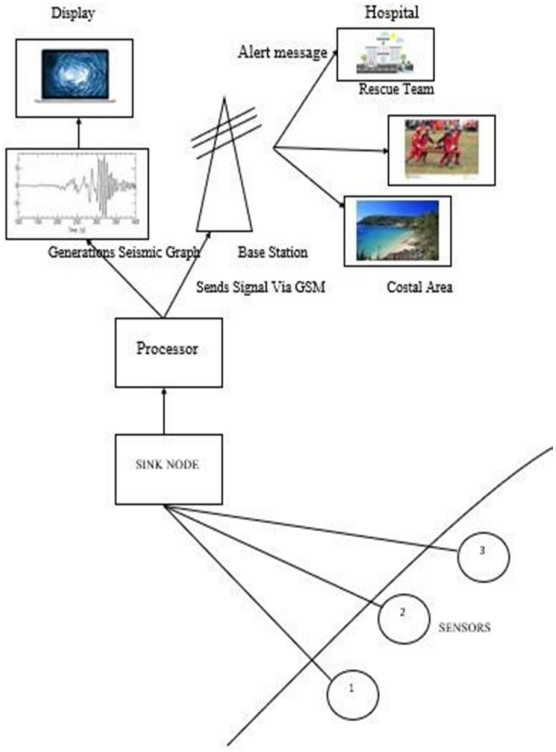


Fig. 1 Architectural Diagram

V. SAFETY HOUSE

The safety house, so basically this house contains two parts. 1st part: The shock proof underground safety container. 2nd part: The safety house, this house is built with light weight and Strong materials and also seen that it fits properly inside the container. Its roof is designed in an Arch shaped so it can withstand pressure of the water and other materials. A pair of hydraulic pistons (for demonstration we are using disk drive motors) are firmly fixed to it and they are Strong enough to withstand the weight of the house. The container is equipped with all the basic facilities like food, water, medical aids, oxygen etc. so the person can live inside it for minimum of 10 days. The power is supplied by the AC generators and batteries present inside the house. The container is made of Strong metals and has shock absorber in all the four sides and by calculating the total weight of

house and container a strong electromagnet is fixed to the base of the container , when the coastal warning centre gets tsunami warning automatically after 20 seconds the house which is above the surface of the ground goes inside the container through the pistons connected to it and the roof gets locked and if there is a chance of earthquake in that area automatically the electromagnets are activated and the electric flux separates the container and the ground. The tsunami which hit's the coast then enter the city since the roofs are locked tightly there's no leakage of water inside the house and container, hence it is safe. So, this type of house could be used to secure the important documents and property like bank's excess. And also, to save the people. So as I mentioned above the house is built of lightweight materials like ceramic coated plastic model walls and roofs. A start-up in Mexico, Eco Donum, is using plastic waste as a raw material for creating low-cost wall and roof panels. The panels, which measure about eight feet long, four feet wide, and one inch thick, are said to be not only durable and impermeable. That works out to some 5.5 tons of plastic waste being converted from trash to building materials every day, just from one small plant. A simple house uses about 80 of these panels, includes about two tons of plastic, and can be built in about a week. The process is rather simple: First, the company collects all kinds of used plastic—from soda bottles to old toys—and separates it to find the types that melt without emitting harmful fumes. Then, they put the plastic into a machine to chop it up. Next, the pieces are placed in an oven that heats up to 350 degrees Celsius (over 600 degrees Fahrenheit), taking approximately half an hour to melt all of the material. Finally, the liquid goes through a hydraulic press, which simultaneously compresses and crystallizes the plastic into the shape of the panels. So, the total estimated cost per each safety house will be around ($15000 US). Only thing is it is little expensive but government can support it, because it is better to invest once and maintain it, rather than losing the property again and again since we can't predict the disaster.

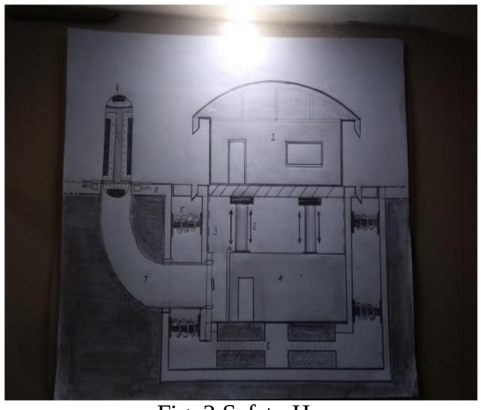


Fig. 2 Safety House

VI. PRINCIPLE OF HOW THE HOUSE GOES DOWN

A Hydraulic **lift** works on the principle of ***Pascal's law*** [6] (the principle of transmission of fluid-pressure) is a principle in fluid mechanics that states that a pressure change occurring anywhere in a confined incompressible fluid is transmitted throughout the fluid such that the same change occurs everywhere. For the demonstration project we are using electrical lift, the principle behind it is the conversion of circular motion into linear motion. For a Delay circuit we have used 555 timer IC, the Operation is simple, initially 555 is in stable state i.e. OUPUT at PIN 3 is low. We know that Non- inverting end of Lower Comparator is at 1/3Vcc, so when we apply negative (< 1/3Vcc) voltage to the Trigger PIN 2 by connecting it to Ground (through a PUSH button switch), two things happens: First is, Lower comparator becomes HIGH and Flip flop gets Set and we get HIGH OUTPUT at1. PIN 3. And second thing is, Transistor Q1 becomes OFF, and Timing capacitor C1 get disconnected2. from the Ground and start charging though the Resistor R1. This state is called the quasi stable state and remains for some time (T). Now when capacitor starts charging and reaches to the voltage slightly greater than 2/3 Vic, voltage at Threshold PIN 6 becomes greater than the voltage at inverting end (2/3Vcc) of Upper comparator, again two things happens: Firstly, Upper comparator becomes HIGH and Flip flop gets Resets and the OUTPUT of the1. chip at PIN 3 becomes LOW. And secondly, Transistor Q2 becomes ON, and capacitor starts discharging to the ground,2. through the Discharge PIN 7. So, 555 IC automatically fall back to the stable state (LOW) after the time determined by the3. RC network.

VII. CONCLUSION

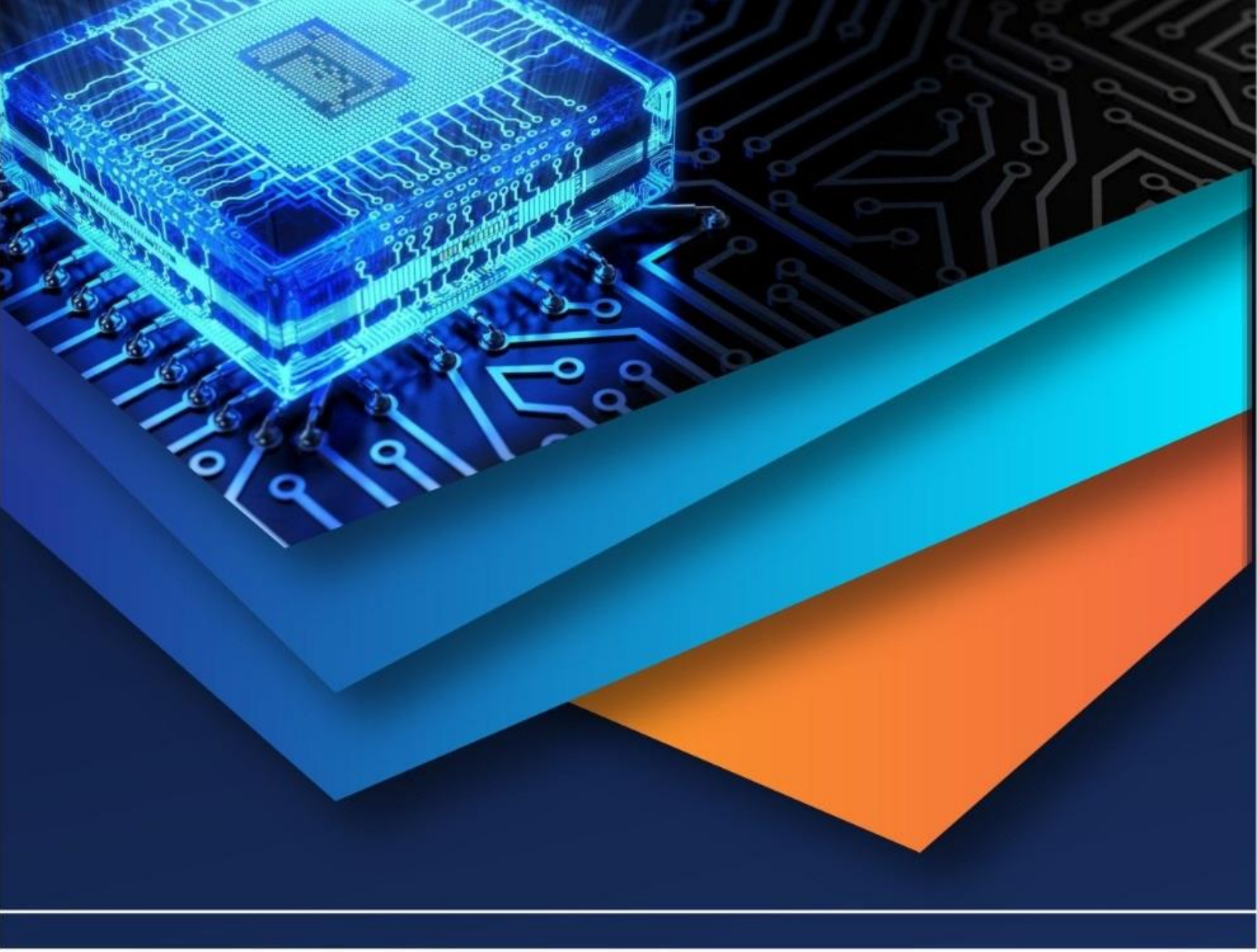
In the paper, we have described how tsunami can be detected automatically. The proposed model in this paper effectively and accurately detects the tsunami occurrence and sends warning messages to coastal guards and people in that area via GSM. Thus the proposed model efficiently prevents the loss of life and damage to the property.

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