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AN ENHANCED AND RELIABLE IOT BASED EARTHQUAKE DETECTION USING ARDUINO

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ABSTRACT: Today, Earthquake is a very big problem which causes damage to lives and property. Our project is an small step to save these losses by giving information about earthquake before it strikes. An earthquake (also known as a tremor or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. Earthquakes are recorded with a seismometer, also known as a seismograph. The moment magnitude of an earthquake is conventionally reported, or the related and mostly obsolete Richter magnitude, with magnitude 3 or lower earthquakes being mostly imperceptible and magnitude 7 causing serious damage over large areas. Intensity of shaking is measured by movement of earth surface and temperature of earth.

KEYWORDS: *Internet of Things, Blynk-app, Arduino-Uno.*

INTRODUCTION: An earthquake is an unpredictable natural disaster that causes damage to lives and property. It happens suddenly and we cannot stop it but we can be alerted from it. In today's time, there are many technologies which can be used to detect the small shakes and knocks, so that we can take precautions prior to some major vibrations in earth. Here we are using Accelerometer to detect the pre-earthquake vibration. An earthquake is an unavoidable and unpredictable natural phenomenon that sometime's causes damage to lives and property. We cannot stop this phenomenon but we can stay alert and aware using technology. This project is an initiative, to be stay alert and aware before the earthquake come. technology we use in this module is very cheap and handy, all the components are easily available in the market and less power consuming, so that a user do not have any problem to run the device 24*7 for all 365 days . An earthquake is the shaking of the surface of the Earth, resulting from the sudden release of energy in the Earth's lithosphere that creates seismic waves. An earthquake is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter[1]. During earthquake, degree of

the damage caused is depends on the magnitude that indicates the amount of energy released from Earths crust. The magnitude of earthquake which is less than 5 is measured using local magnitude scale called as Richter magnitude scale. Itmeasures the magnitude of earthquake by observing the amplitude on a seismogram.In recent years, a standard magnitude scale is used which represents energy released at the time of earthquake more precisely including large magnitude events. This technique makes use of devices like either seismometer, geophone, accelerometer. Meanwhile before selecting any seismic sensor we need to know that the seismic sensor should provide signals which are unaffected by the sensors inherent characteristics and as closely as possible reflect the true soil response to the seismic source wave traveling through it. In terms of frequency response of the receiver, its output should be constant for all input frequencies. In addition, the phase of the input frequency should be unaffected so that the wave's shape does not change. In general terms, it is desirable to have a seismic sensor with a fast response time and a small settling time [2].When it comes to the selection of a seismic sensor though Geophones have larger peak time and settling time compared to accelerometer but the accelerometer are selected for the seismic activities because of their low noise fast response times, and high bandwidths compared to geophones. Earthquakes are the major natural disaster. Earthquakes are shaking of the Earth's crust caused by immediate release of energy in its interior, most often as a resulting in strains accumulated in rocks, exceeding its elastic limit and causing it to explode. An earthquake is generated when two crust of the earth experience friction against at one another. Thus, detection and prediction of the earthquake phenomenon to different areas could result in lowering the earthquake disaster generated by it.

LITERATURE SURVEY: The Japan meteorological agency has developed an earthquake early warning system to release information in the event of earthquake, and the system used in 2007. Meanwhile, structural health monitoring technology has been attracting attention from those who want to save time in determining the structural health of buildings. Practical application of this technology, have also begun. Seismic isolated buildings have been developed to protect building structures and keep properties safe from earthquakes and this is significantly effective means to protect. The technology is based on past experiences of the great Hanshin Earthquake in 1995. Seismic disaster prevention technologies have been further developed since then against the large scale damage to buildings and losses of human life which could be incurred by earthquakes. This should be a system as safe addition to the current situation and earthquake and earthquake disaster prevention of structure itself. NEIC is the part of USGS established in 1966. It was made part of USGS in1973. • NEIC determines the location and size of all destructive earthquakes that occur worldwide and disseminates the information to the appropriate national or international agencies, government public information channels, news media, scientists and scientific groups, and the general public. • With the advent of the USGS Earthquake Notification Service (ENS), notifications of earthquakes detected by the ANSS/NEIC are provided free to interested parties. Users of the service can specify the

regions of interest establish notification thresholds of earthquake magnitude, designate whether they wish to receive notification of aftershocks, and even set different magnitude thresholds for daytime or night time to trigger a notification. For earthquake outside the United States, the NEIC notifies the state Department operations center and often sends alerts directly to staff at American embassies and consulates in the effective countries, to the international Red Cross, the U.N. Department of humanitarian affairs, and other recipients who have made arrangements to receive alerts UNESCO has been very active in promoting international cooperation, scientific knowledge exchange and capacity building for the development and implementation of geo-hazard Early warning systems, including Earthquake Early Warning Systems (EEWS), Worldwide. The sendai framework for disaster risk reduction 2015-2030 recognizes the need to "substantially increase the availability of, and access to, multi-hazard early warning systems and disaster risk information and assessments to the people by 2030" as one of its global targets while considerable progress has been made in recent decades in the field of early warning Systems for specific hazards and significant challenges remain in advancing the development of Early Warning Systems for specific hazards, particularly for suddenonset hazards such as earthquakes. An earthquake early warning system (EEWS) helps in disseminating timely information about potentially catastrophic earthquake hazards to the public, Emergency managers and private sector to provide enough time to implement automatized emergency measures. At the same time, these helps to reduce considerably the CO2 emissions produced by catastrophic impacts and subsequent effects of earthquakes, such as those generated by fires, collapses, and pollution, as well as those produced in the recovery and reconstruction processes. In addition, EEWS can be better considered in risk management, emergency planning, disaster management, climate change adaption, and risk communication in order to reduce Natech risks.

PROPOSED METHOD:

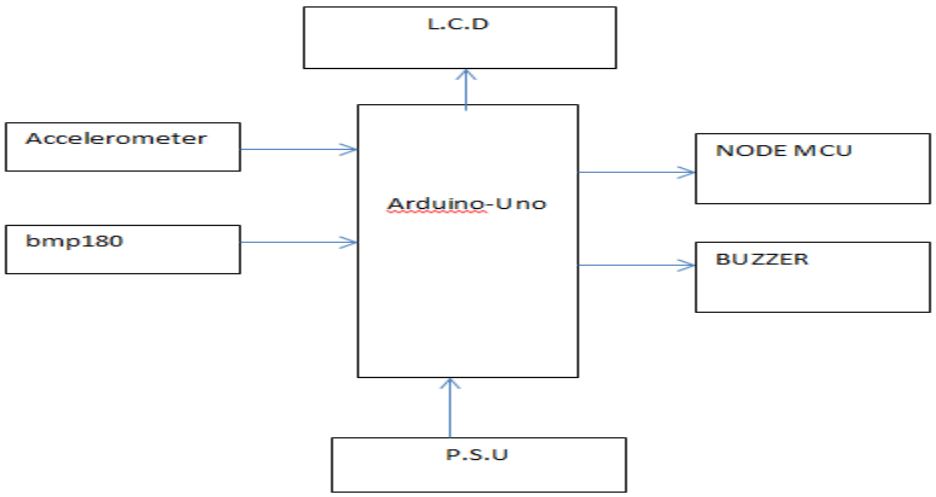
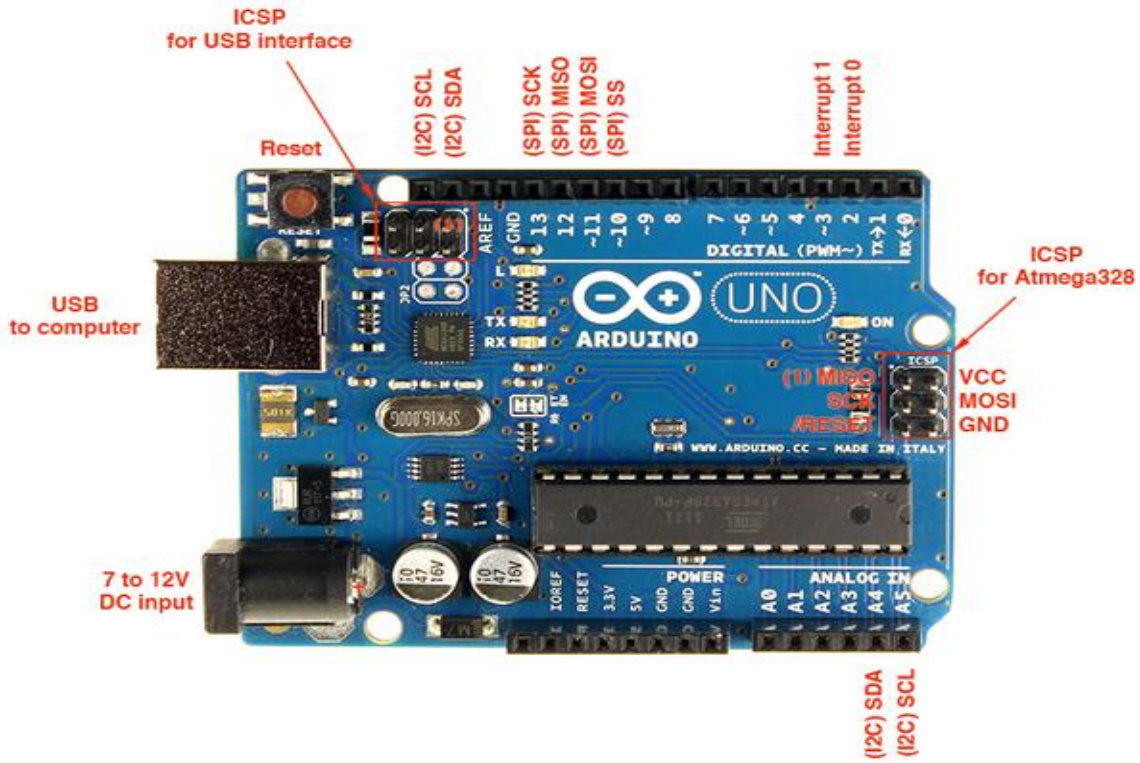


Fig: Proposed Block Diagram

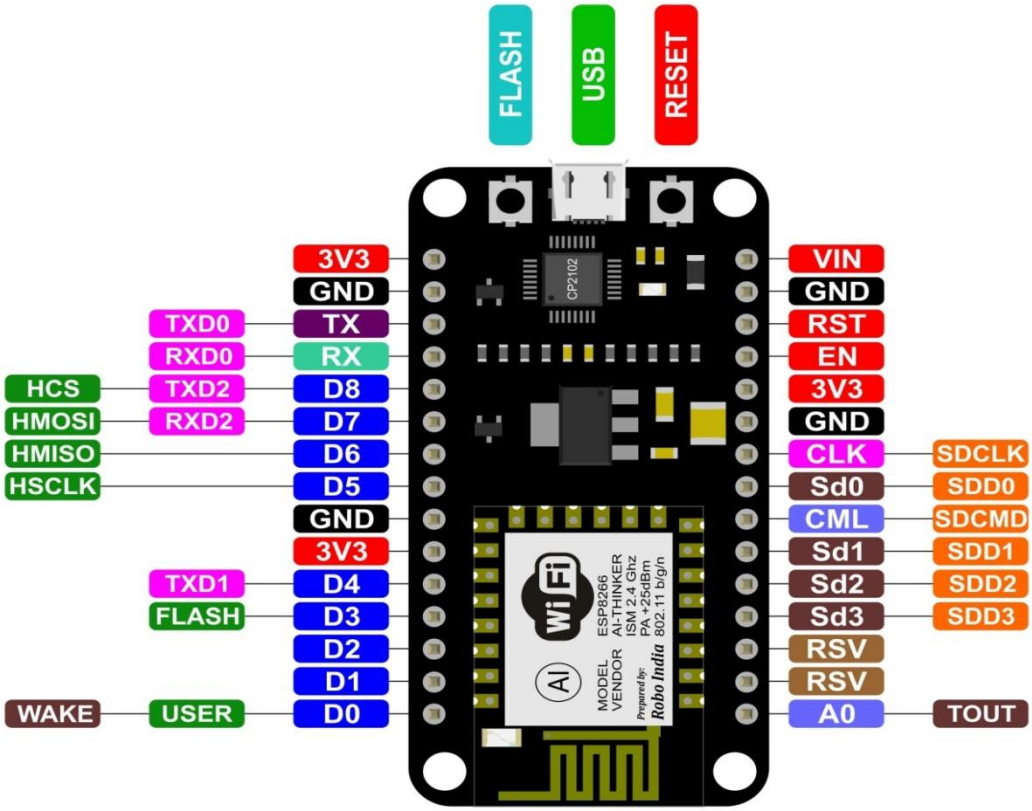
Accelerometer sensor is used to detect the vibrations of earth in to and fro motion. BMP180 sensor is used to measure the earth temperature, pressure. Both of these sensors are connected to analog, digital pins of Arduino-Uno and measured continuously. Here, NODE MCU is used to upload the collected information to Inter net.

ARDUINO- UNO The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.



NODE MCU:

The Node MCU is an open source firmware and development kit that helps you to prototype your IoT product with ArduinoIDE or in few Lau script lines.
It includes firmware which runs on the ESP8266 Wi-Fi SoC. And hardware which is based on the ESP-12 module. In this tutorial we explain how to use NodeMCU with Arduino IDE.



ACCELEROMETER SENSOR:

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibratingthe accelerometer. An accelerometer is a device that measures the vibration, or acceleration of motion of a structure. The force caused by vibration or a change in motion (acceleration) causes the mass to "squeeze" the piezoelectric material which produces an electrical charge that is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is a constant, then the charge is also proportional to the acceleration.

BMP180:

The BMP180 barometric pressure sensor is a great sensor that can be used to predict the weather, detect altitude, and measure vertical velocity. It's perfect for weather stations, remote controlled vehicles, weather balloons, and lots of other projects. It's an extremely sensitive sensor too. As you'll see in a minute, it can detect changes in altitude of just a few inches.

Barometric pressure (also known as atmospheric pressure), is the pressure caused by the weight of air pressing down on the Earth. Imagine a column of air rising from the Earth's surface to the top of the

atmosphere. The air in the atmosphere has mass, so gravity causes the weight of that column to exert pressure on the surface.

RESULTS:

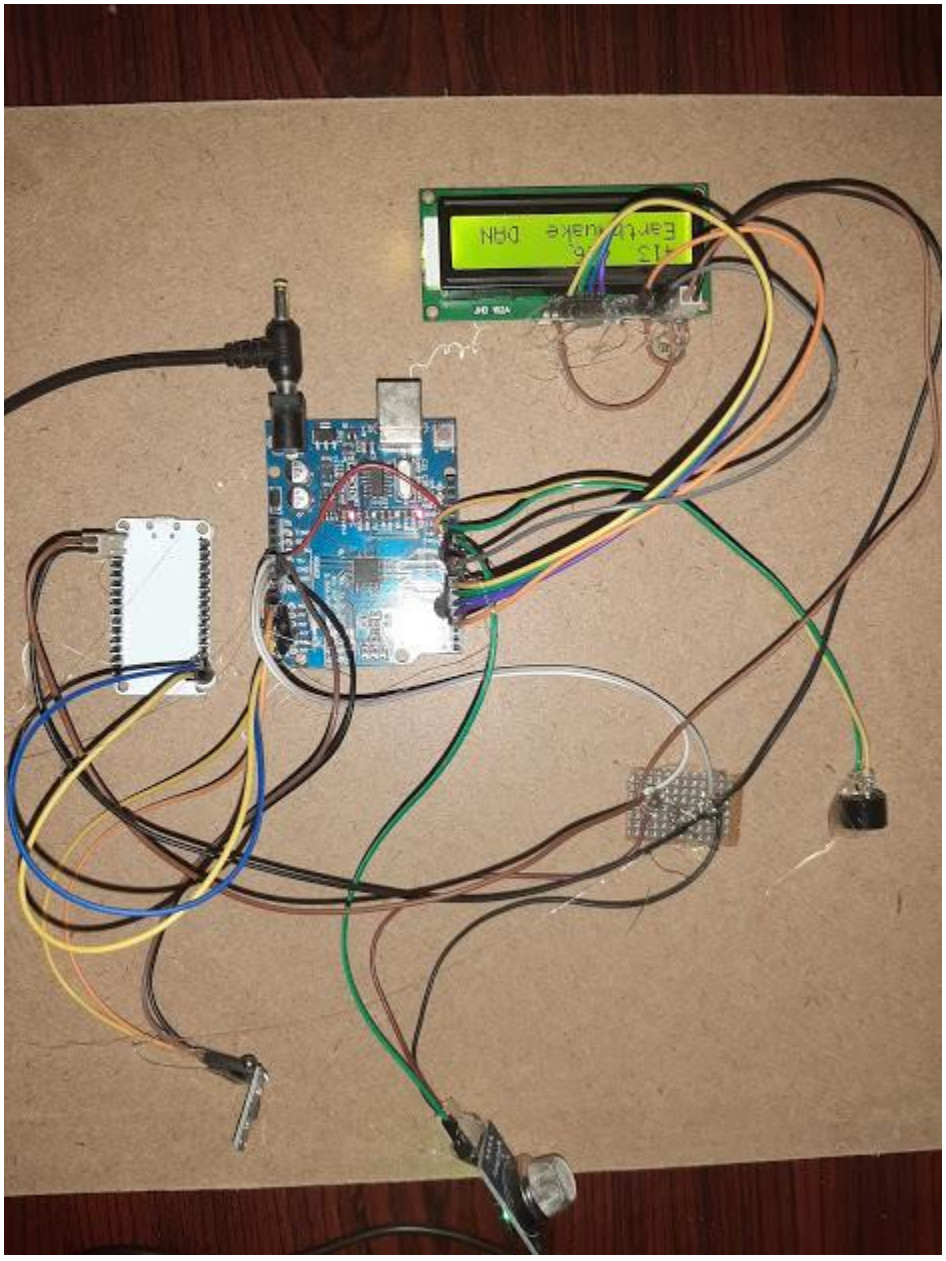


Fig: Hardware kit

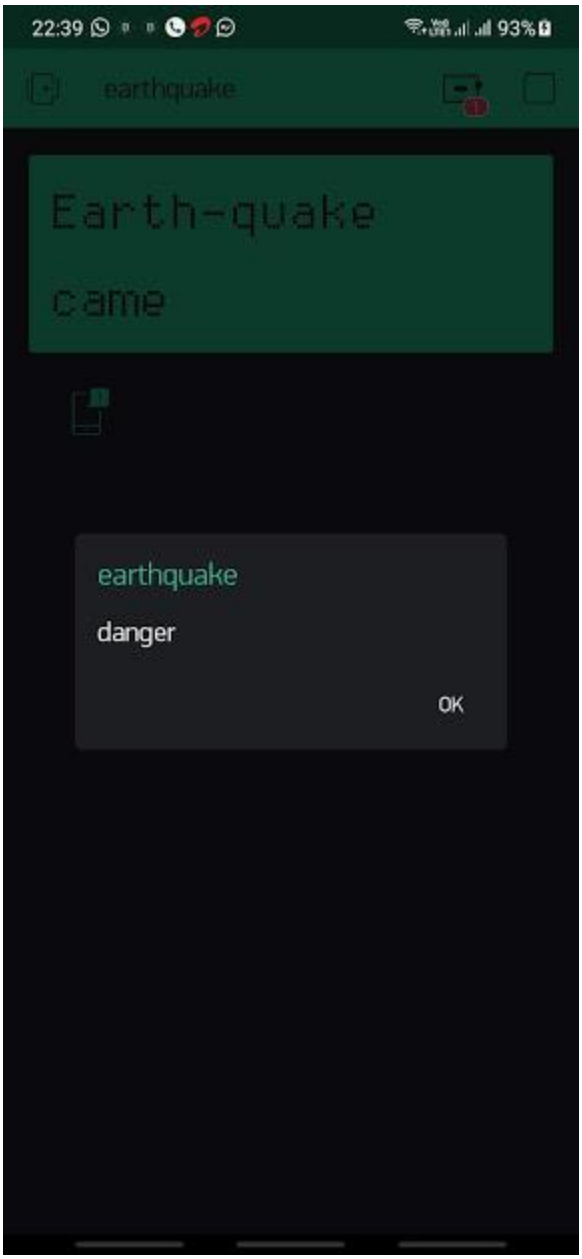


Fig: IOT Upload

CONCLUSION:

Thus to sum-up we have introduced this product with a view to reduce the destruction caused by earthquake, by alerting the people. It is economical and its price is quoted in such a way that it is affordable by every individual.We have presented a novel technique to solve the automatic detection and classification problem of earth tremor in a single step by using arduino based earthquake detection. In our system the majority of cases offers real practical benefits in the event of an earthquake to safeguard lives and resources.

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