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ADVANCED IOT BASED REAL-TIME EARTHQUAKE ETECTOR

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ABSTRACT:

The early seismic warning system detects the first tremor of a larger earthquake and triggers the warning system before the most severe tremor. The proposed global warning system uses a network of digital seismographs distributed throughout the state to alert densely populated areas up to 1 minute in advance (depending on the location of the epicenter). Warnings will give businesses, residents, and authorities time to prepare. The purpose of the study is to focus on sensor data to determine if an earthquake will occur. Finally, experimental results are provided showing that the system supports the expected performance of the sensor data. A possible extension of this approach could be the implementation of a wireless sensor network using Thing-peak for data acquisition.

Keywords: THINGSPEAK, IoT Platform, sensor, microcontroller, rectifier.

[1] INTRODUCTION

In the event of a natural disaster such as a major earthquake, it is first necessary to understand the extent and degree of bending of the disaster area and use it for rescue activities. Aerial photography helps to collect information about the affected area comprehensively and quickly. Previous studies [l] have proposed methods for detecting pre- and post-earthquake damaged areas. This method manually registers the two images, making it cumbersome to recognize damaged areas taken from different locations. Many detection methods do not automatically register damaged areas. This article proposes a new way to automatically detect damaged areas. Damaged areas are automatically detected and displayed graphically on the Thing speak website in the recommended way. The combination of sensor accelerometers, gyroscopes, GPS and a variety of connectivity options allows you to have a well-equipped IoT device at hand to

automatically monitor movement, location and training throughout the day. In addition, it could be the key to solving problems in other areas, such as transportation, medicine, meteorology, social issues, and seismology, which our research focuses on. Join the new topic Smart Cities [1]. It is true that the quality of microelectromechanical system (MEMS) sensors, and the sensors built into the SPs, is lower than the quality of certain seismic devices, but consider that data acquisition from a large number of SPs is known. That is also important. b. With mobile cloud sensing, it is possible to acquire a huge low-cost network by utilizing the functions of individual sensor SPs. Although earthquakes are completely unpredictable, this study provides timely and economic measures against this natural disaster. Through opportunistic applications and online services, SP monitors the entire area, learns about its physical characteristics, and most importantly, detects seismic movements to trigger early warnings and add for better decisions. You can get the time. The risk of its occurrence is also interesting as a result, just to mention that seismic activity is increasing. Therefore, in April 2014, there was a world record for a major earthquake exceeding 6.5.

[2] METHODOLOGY EXISTING SYSTEM

As soon as an earthquake is detected, the microcontroller activates a relay that shuts off the power. It also sends a pulse to the servo motor attached to the gas valve. The servo motor rotates to turn off the gas valve and cut off the gas supply. If a gas leak is detected without an earthquake, the microcontroller platform simply shuts off the gas supply [2]. The system also activates a series of alphanumerical emergency displays that display "EXIT" to mark the user's evacuation route when an earthquake is triggered. The alarm circuit consists of a DC buzzer and LEDs to alert the user of the possibility of an earthquake with light and sound.

DISADVANTAGES

Low efficient, Not reliable, Low communication, Low coverage area, More manual work

PROPOSED SYSTEM

Rapid earthquake detection and reporting can help minimize injuries and deaths and prevent disasters. Seismic accelerometers do not require high frequency response, but they do require both high sensitivity and a wide measurement range. Micro accelerometers have been developed based on various principles. In conventional accelerometers, there is a trade-off between the measurement range and the sensitivity, but a servo mechanism [4] is introduced to extend the measurement range without reducing the sensitivity. The trade-off relationship stems from the fact that the displacement sensors used in accelerometers do not meet both high sensitivity and wide range requirements. We found that the MEMS sensor detected the shaking with each earthquake and the data was updated on Thing speak. The sensor has an unlimited measurement range and a high accuracy of 20 nm. This is because the measurement range basically depends only on the actual unlimited scale length and can be determined independently of the sensitivity.

ADVANTAGES

- High reliability, More efficiency

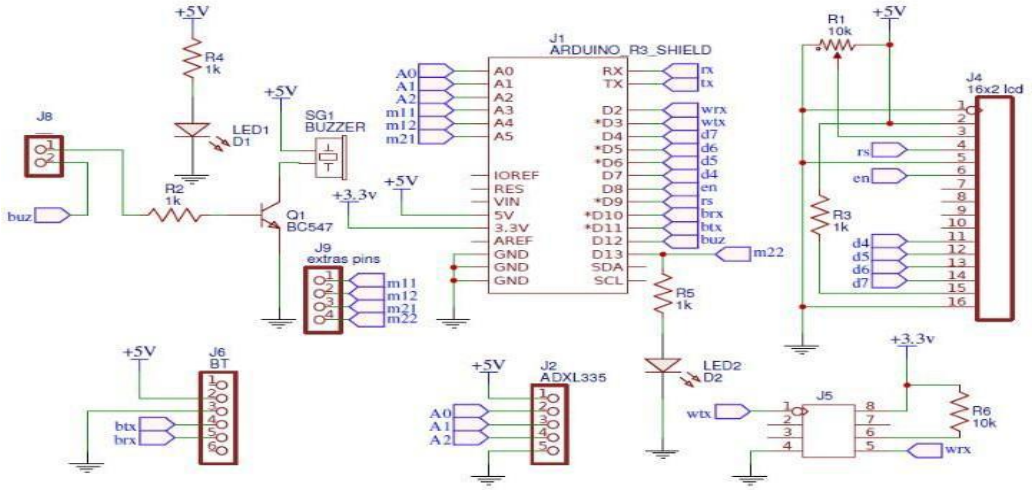
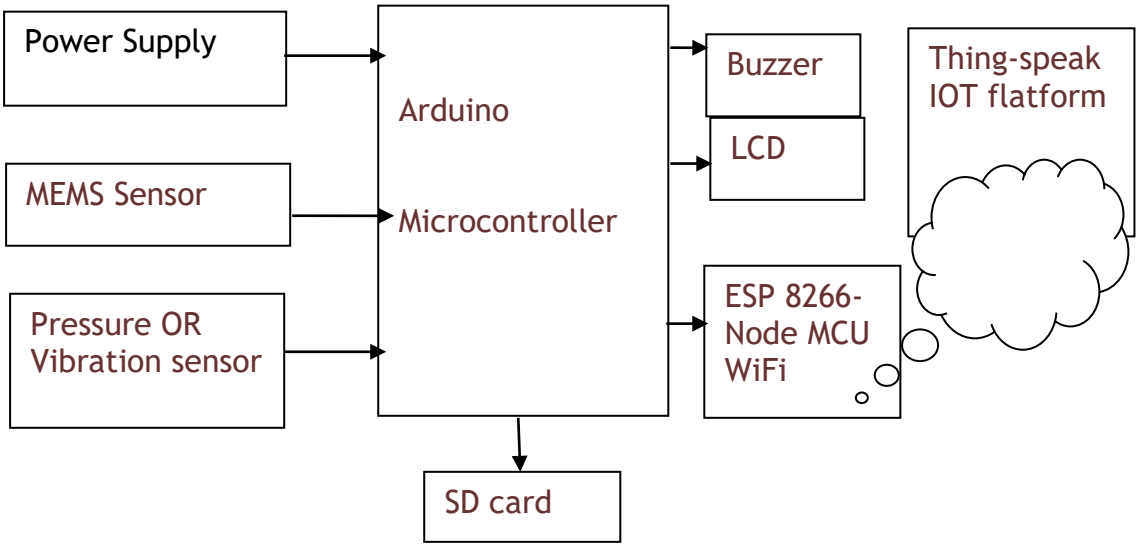


Figure: 4. circuit diagram

SYSTEM ARCHITECTURE:

Figure: 5. Block diagram



MICROCONTROLLER

Arduino Uno is a microcontroller board based on ATmega328P (data sheet). It has 14 digital input / output pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53R0), a USB connector, a power jack, an ICSP header, and a reset button. It contains everything you need to support a microcontroller. Connect to your computer with a USB cable, or power on with an AC to DC adapter or battery to get started. You can tinker with your Uno and start over without worrying too much about turning it into the wrong dollar.

THIGSPEAK WEBPAGE

Thing Speak is an open source "Internet of Things" application and API for storing and retrieving data on things using HTTP over the Internet or local networks. ThingSpeak allows you to create sensor logging applications, location tracking applications, and social networks with updated status. https://github.com/iobridge/ThingSpeak This repository contains Python modules that help you communicate with the ThingSpeak API.

MEMS SENSOR:

Microelectromechanical Systems (MEMS), also known as micro electromechanics, micro electromechanics, or microelectronics and microelectromechanical systems and related micromechanics, are technologies for microscopic devices, especially devices with moving parts. It merges with nanoelectromechanical systems (NEMS) and nanotechnology on a nanoscale [3]. MEMS is also known as micromachines in Japan and Microsystem Technology (MST) in Europe.

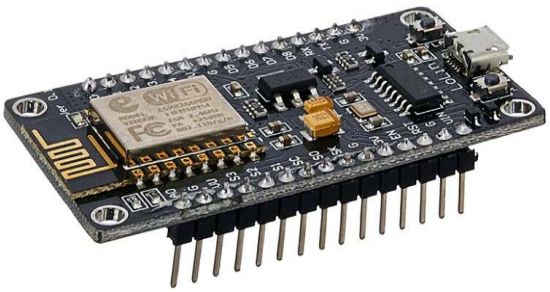
NODE MCU

The Internet of Things (IoT) is an ecosystem of connected physical objects accessible over the Internet. The Internet of Things allows devices built into various systems to connect to the Internet. If you can represent your device / object digitally, you can control it from anywhere [4]. Connectivity allows us to collect more data from more locations, giving us more opportunities to improve efficiency and security.

Popular due to its size and the number of pins brought to the side of the board. Recently, more development boards are available with additional sensors, relays, LEDs, and voltage regulators on board. The ESP8266 operates from 2.8 to 3.5 volts, so you can use two AA batteries. Most of us use a stabilized 3.3-volt power supply [5]. The maximum current consumption is 300mA, so for your safety, use a power supply that can supply 500mA. The more it is, the better. Poor or poor supply quality can cause the board to reset unexpectedly, making troubleshooting difficult.

The Node MCU Development Board has a USB to 3.3V power supply on the board

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.



Specifications and Features of Node MCU:-

Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
Operating Voltage: 3.3V
Input Voltage: 7-12V

Digital I/O Pins (DIO): 16
Analog Input Pins (ADC): 1
UARTs: 1, SPIs: 1, I2Cs: 1
Flash Memory: 4 MB, SRAM: 64 KB
Clock Speed: 80 MHz
USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
PCB Antenna

[3] FLOWCHART

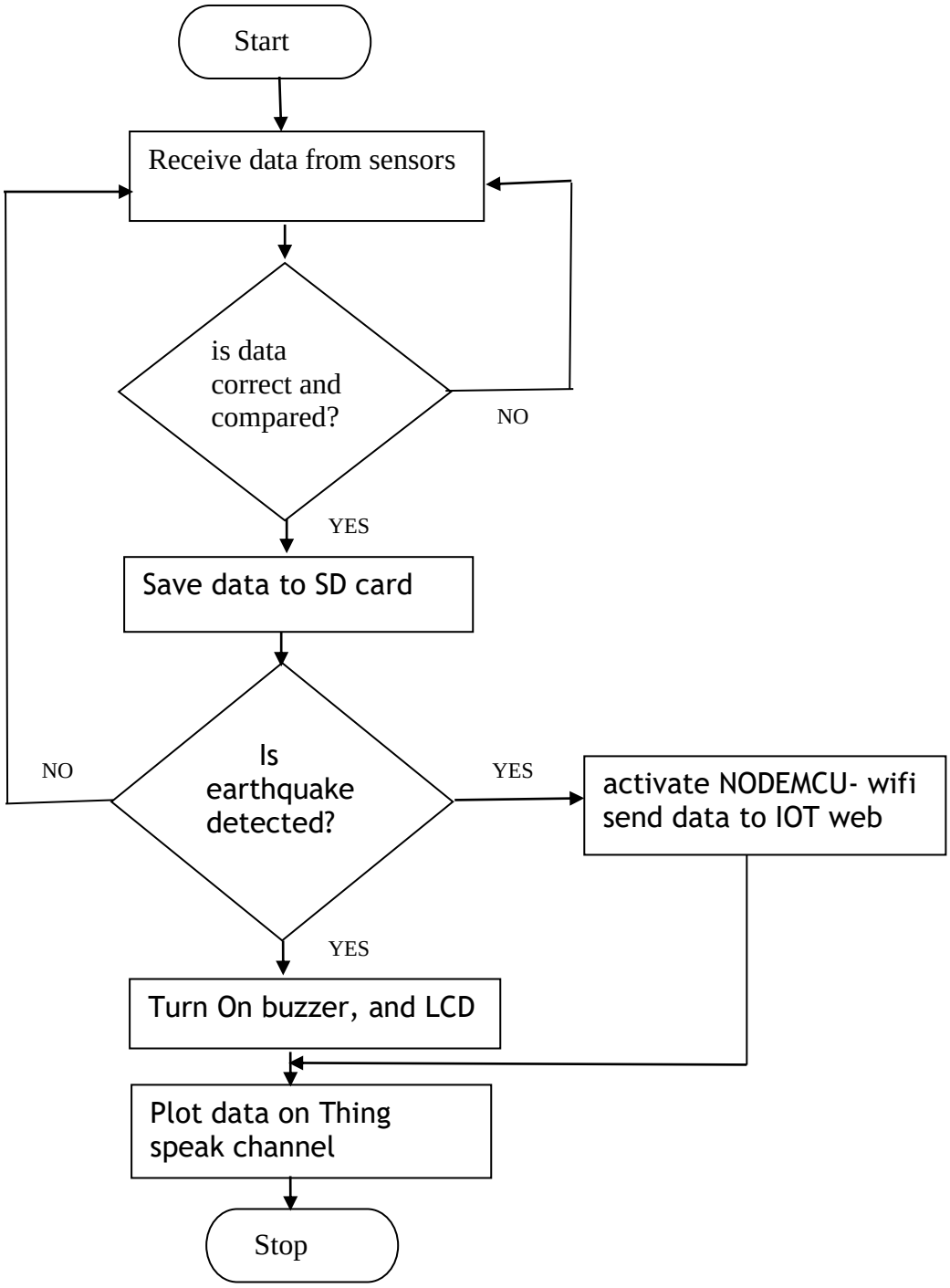
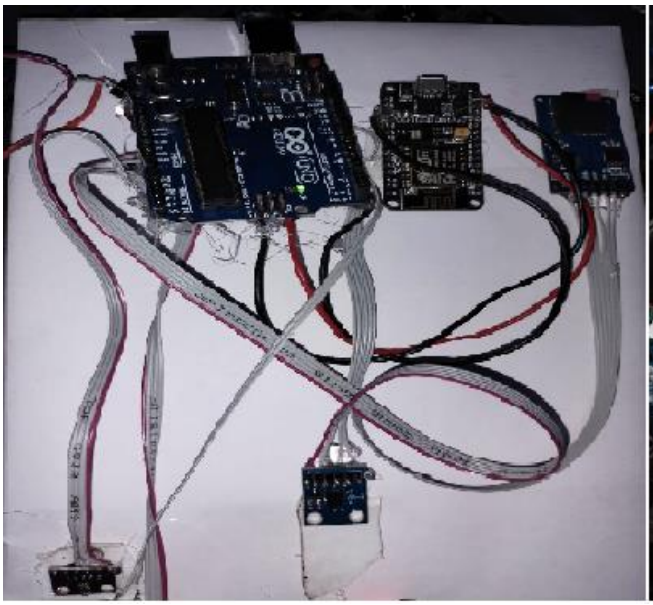
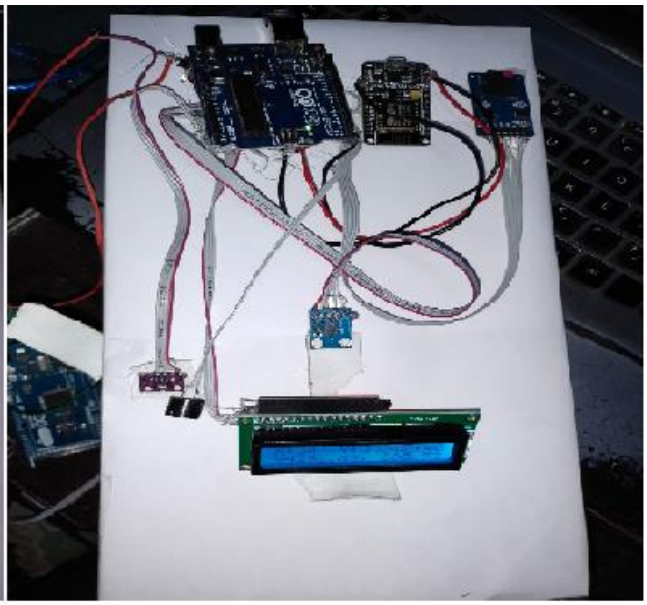
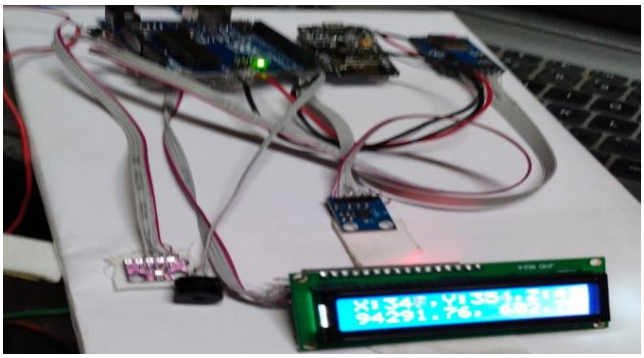


Figure: 6. Flow chart diagram

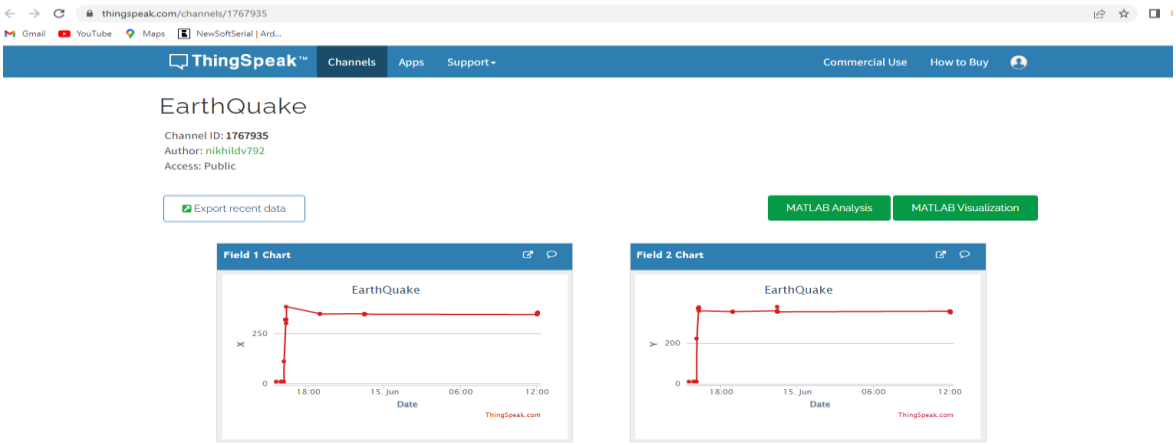
[4] RESULTS AND ANALYSIS







Sensor data on Things speak



We have designed a graph using Processing, for earth quake vibrations, in which we defined the size of the window, units, font size, background, and reading and displaying serial ports, open selected serial port etc. In below function, we have received data from serial port and extract required data and then mapped it with the size of the graph. After this,
we have plotted unit space, max and min limits, values of x, y and z-axis. After this we plot the values over the graph.

The graph shown above indicates the earthquake alert at the X, Y and Z axes. Whenever there is no vibration in the earth, the values are at the zero axes. If the motion is violent enough during an earthquake and crosses a certain threshold i.e., max limit reaches (20) at the x-axis (blue color), LED glows, a buzzer sounds as well as it shows alerting message on LCD. The Arduino based earthquake detector using accelerometer has been tested and it is working satisfactorily. All the components of the system found to be working appropriately. Detection of pre-earthquake using accelerometer and giving alerting massage on predefined time will be achieved successfully. Accelerometer ADXL335 senses pre-earthquake vibrations and gives analogue voltage equivalent to imposed acceleration in X, Y and Z axes.
The three analogue outputs are applied to Arduino Uno ADC pins. Any acceleration caused due to movement in any of the axes is detected by the accelerometer and hence by Arduino ADC. If motion is violent enough during an earthquake and crosses a certain threshold, LED glows, a buzzer sounds as well as it also shows alerting message on LCD and graph can be plotted using software processing IDE.

[5] CONCLUSION

The system is successfully developed and working satisfactory. 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 single step by using Arduino based earthquake detecting device. In our system the majority of cases offer real practical benefits in the event of an earthquake to safeguard lives and resources. We can easily set up this system for household purposes as it consumes less power. The proposed work can be modified and used as a knock-and-shake detector for ATMs, vehicles or door-break alarms. Ultra-Compact High accuracy earthquake detection sensor module can be used for accurately detecting vibration when an earthquake occurs. The project is designed to detect earthquakes I issued an acoustic alarm as a signal. The main output of the device is an audible alarm that sounds when an earthquake is detected. The system has its own power generation system Powers the entire system. Use of ADXL335 Detecting earthquakes with Arduino Mega is easy. now There is a microcontroller-based seismic detector. A power supply is required to operate. We can gain power It is supplied from various power sources, Integrate into the solar panel system as part of the project. Solar panels generate their own electrical energy, Powers the system. this is System before, during, and after a power outage Earthquake because it keeps working.

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