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IOT BASED DISASTER ALERTING SYSTEM FOR SMART CITY ENVIRONMENT

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Abstract: Natural Disasters have threatened mankind since history started. Due to geographic application installed on shelter place like school, college temple. The system can registerthe receivers such that rescue team to send the notification for help. By sending the current position obtained by GPS and including shortest path of shelter or safe zone on the map of the application. Disaster recovery operations are extremely challenging and place significantdemands on multiple resources, including local and international location and environment change, there are many vulnerable countries to natural disasters. The countries also lack effective disaster preparedness system to confront natural disasters. In addition, the peoples face difficulties in finding safe area or shelter place prior to the occurrence of natural disasters. For this reason, To have proposed a disaster management system and evacuation system for people using IOT device. The system is implemented on black box module because of the burgeoning growth of smart city. The black box device withour emergency response personnel, non-governmental organizations, and the military. In the immediate aftermath ofa disaster, one of the most pressing requirements is for situational awareness (SA) so that resources, including personnel and supplies, may be prioritized to have the most impact andhelp those in the most need. As the recovery operations continue, the SA needs to be continuously updated based on changing conditions in the affected areas. There are many sources of information to provide SA, including reporting by the victims of the disaster as well as observations made by responding personnel. In this context, SA can be significantlyenhanced via information obtained from Internet of Things (IoT) devices, especially in a smart city environment. This paper explores the potential to exploit Smart City IoT capabilities to help with disaster recovery operations.

Index Terms **- Internet of Things, Accelerometer sensor, Vibration sensor, Disaster Management, Alerting System, Smart city.**

1.Introduction

Internet-of-Things (IoT) technologies in the past decade have matured both in the hardware and software aspects for large-scale deployment. Amongst IoT, the Smart Cities Concept is also taking shape. Pilot s and implementations in multiple cities are trying to findout the feasibility and applicability of Smart City Information and Communications Technology (ICT). IoT assets along with the legacy assets are essential for Smart City ICT implementations. With the evolution of Smart Cities and concentration of people in the cities,it becomes necessary to be ready for future Humanitarian Assistance and Disaster Recovery(HADR) operations. But the huge void in heterogeneous IoT and legacy technologies createa big hurdle in establishing and handling the HADR operations. This aim of this PhD is to investigate the interoperability aspects amongst the various IoT technologies and Smart Cityconcepts. The goal is to create a framework and an architecture for allowing the interoperableoperation of ICT assets in a Smart City environment.

In this paper[1], situational awareness can be significantly enhanced via information obtained from Internet of Things (IoT) devices, especially in a smart city environment. This paper explores the potential to exploit Smart City IoT capabilities to help with disaster recovery operations. Disaster mitigation is very important in order to reduce the number of victims of both life and material. Alertness in disaster mitigation is urgently needed in every area in allcountries of the world, especially in Indonesia. Embedded device technology specifically designed and programmed to detect disasters such as earthquakes, tsunamis, floods and landslides, storms and hurricanes. The sensors are used according to the type of disaster willbe detected. The system will be built this serves as an early warning system that will provideearly warning against floods and landslides were predicted would happen. The system can detect floods and landslides in accordance with a sensor mounted on a disaster-prone locations. Device technology development mitigation sensors embedded as floods andlandslides integrate hardware and software and Internet networks. With the development of technology these devices could be detected early disaster. For Embedded system could be produced more cheaply with a local content of 60%.

[2]In this paper a system provides interconnected smart modules as a way to enable centralized data acquisition by sensing and communication technologies of Internet Of Things (IOT) and Wireless Sensor Networks (WSN) to coordinate disaster management at the national and local levels in coordination with relevant agencies, and raise awareness on disaster risks in real time. This system can be controlled and monitored from remote location and delivering real time notifications based on information analysis and processing without human intervention. The data stored can be utilized for prediction of risks in future. The natural disasters like earthquake, tsunami and landslide as the occurrence of these disasters is a big loss for human life and property. Natural causes cannot be stopped but using this technique can alert people before it occurs. In this design, five sensors are used,those are angle or tilt sensor which gives the readings of slope angle if there is any movement due to the landslides. Internet of Things' based device which is capable of analyzing the sensed informationand then transmitting it to the user.

In this paper[3] a combination of Hadoop environment is used in disaster reliant smart cities. IoT is used as a front end for collecting real time data sets and Big data analysis for data pre-processing and aggregation. This work evaluates the threshold capacity of each data which is collected for these disasters using Z-score normalization and if collected parameter exceed above the threshold value, then alert message is sent to public service sector such as fire station, police station and hospital. Different challenges faced by this evaluation are discussed in this manuscript. Many of the bridges last over decades and centuries, these brides are never looked over when it comes to their condition monitoring and maintenance. This stands as the primary cause for bridge disasters which leads into heavy death toll. This death toll increases all the more as there is no proper communication between social organizations such as Policestations, Fire Brigade stations, Zonal authorities and Hospitals.

This paper[4] deals the advanced technology of Internet of Things (IoT) visualizes a worldwide, that is, internally connected, networks of smart physical entities. IoT is a promising technology used in several applications including disaster management. In disaster management, the role of IoT is so important and ubiquitous and could be life-saving. *is article describes the role of IoT in disaster management. The naturaldisasters at a particular place and make the information visible anywhere in the world. The technology behind this is Internet of Things (IoT), which is an advanced and efficient solution for connecting the things to the internet and to connect the entire world of things ina network. Here things might be whatever like electronic gadgets, sensors and automotive electronic equipment. The tsunami waves cause considerable destruction and kills people.

The main focus of this paper[5] to sense various hazardous gases with the help of arduino. This work changes the presently available system that are set industrial areas and this system can also be used in houses and at work place. The primary aim of the work is to design arduino based hazardous gas detecting system using gas sensors. The toxic gases like butane (also known as LPG), methane and carbon monoxide are sensed and displayed on the LCD display. The concentration of the gases will be shown in the form of percentage by LCD display. The device created is a disaster management device that consists of temperature, soil drift, accelerometer, tilt, and rain sensor. A hardware prototype model wasdeveloped. It is operated through microcontroller Arduino and implemented using the C language. The effectiveness is verified by experimental studies. If a sensor is activated, it willsend data to the selected receiver, which is a mobile phone. Acquired data were provided inthis article. Results reveal the effectiveness and efficacy of the proposed system. An expressive future directive has been incorporated at the end of this paper.

2.EXISTING METHOD

In this paper the incidents have been showing off own mastery, situations have gone beyond the control of human resistive mechanisms far ago. Natural disasters like landslide, earthquake, floods, and debris flows can result in enormous property damage and human causalities in mountainous regions, Landslide are gravitational movement of soil or rock down slopes that can cause serious damage to civil infrastructure. Numerous facility and structural failure caused by landslide have been reported over year. Therefore effort to measure and monitor potential landslide are essential to ensure human safety.The disaster management system prototype using Internet of Things (IoT) proposed is capable of sensing atmospheric changes and upload the data obtained to the cloud server i.e., Thing Speak server. On the occurrence of disastrous events, alerts are given via Gmail and Telegram application using IFTTT SaaS. Actuators like Fan and Sprinklers are used to control disasters like fire and extreme temperature. Smart cities mission is an urban renewal and retrofitting program by the Government of India with a mission to develop 100 cities all over the country making them citizen friendly and sustainable. Addressing to the disasters that may occur naturally or man-made disasters involves widespread human, material, economic or environmental impacts. This proposed system provides interconnected smart modules as a way to enable centralized data acquisition by sensing and communication technologies of Internet Of Things (IOT) and Wireless Sensor Networks (WSN) to coordinate disaster management at the national and local levels in coordination with relevant agencies, and raise awareness on disaster risks in real time. This system can be controlled and monitored from remote location and delivering real time notifications based on information analysis and processing without human intervention. The data stored can be utilized for prediction of risks in future.

Components

Vibration sensor, Accelerometer sensor, Thing Speak, GPS Module, Internet of Things, Node MCU, Buzzer, Liquid Crystal Display(LCD), Motor, Smoke sensor.

Node MCU

The Node MCU (Node Micro Controller Unit) is an opensource software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by express if Systems, contains all crucial elements of the modern computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for IoT projects of all kinds.

GPS Module

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high performance u-block 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints.The IOT device has 3 connections, one with the module, one with the GPS module and one with the GPS module.

Vibration Sensor

Two main groups of materials are used for piezoelectric sensors: piezoelectric ceramics and single crystal materials. The ceramic materials (such as PZT ceramic) have a piezoelectric constant / sensitivity that is roughly two orders of magnitude higher than those of single crystal materials and can be produced by inexpensive sintering processes. The piezo effect in piezoceramics is "trained", so unfortunately their high sensitivity degrades over time. The degradation is highly correlated with temperature. The less sensitive crystal materials (gallium phosphate, quartz, tourmaline) have a much higher – when carefully handled, almost infinite – long term stability.

Thing Speak

Thing Speak provides instant visualizations of data posted by the devices to Thing Speak. With the ability to execute MATLAB code in Thing Speak we can perform online analysis and processing of the data as it comes in. Thing Speak is often used for prototyping and proof of concept IoT systems that require analytics.

Accelerometer Sensor

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.

3.PROPOSED SYSTEM

3.1 Concept

This In addition, the peoples face difficulties in finding safe area or shelter place prior to the occurrence of natural disasters. The entire system mainly uses two methods to work. That means emergency situations are handle by using registered IoT module placed in the buildings as well as mobile application. User can send request through single button click. They can send alerts to user through alarm embedded in IoT module. Each request is send over mobile application with the help of internet connections. By using careful planning and taking emergency steps and making the people into the safer region with the use of IOT module device.The IOT module gets the information from the two sensors namely vibration sensor and the accelerometer sensor.

3.2 Hardware Requirements

Arduino UNO microcontroller Atmega328P, Accelerometer sensor, Vibration sensor, Alarm circuit(Buzzer), LCD Display.

3.2.1 Arduino UNO Microcontroller

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

Specification:

- Input voltage - 7-12 V
- Operating voltage - 5V
- Input voltage (limit) - 6-20V.

3.2.2 Accelerometer sensor

An accelerometer is a device that measures proper acceleration, the acceleration experienced relative to freefall. Single- and multi-axis models are available to detect magnitude and direction of the acceleration as a vector quantity, and can be used to sense orientation, acceleration, vibration shock, and falling. Micromachined accelerometers are increasingly present in portable electronic devices and video game controllers, to detect the position of the device or provide for game input.

Features:

- Current consumption- 500microamp
- Voltage operation- 2.2V - 3.6V
- Sensitivity- 800mv/g@1.5g.

3.2.3 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. A standard application (50g range), the sensitivity of a typical vibration sensor is 100mV/g, while in low vibration applications (10g) the sensitivity is 500mV/G. Vibration frequency – Knowing the frequency span you need to measure is as important as knowing the vibration range.

3.2.4 LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid but are grouped together in an ordered form similar to a crystal. The dots format in the LCD display are 16x2 and the viewing area is 64.50x13.70mm.

3.3 Software Requirements

Embedded C for Programming, IOT Module, Arduino Software.

3.3.1 Arduino UNO

Specifications

- Microcontroller - ATmega328P
- Operating Voltage - 5V
- Input Voltage (recommended) – (7-12)V
- Input Voltage (limit) – (6-20)V
- Digital I/O Pins - 14 (of which 6 provide PWM output)
- PWM Digital I/O Pins - 6
- Analog Input Pins - 6
- DC Current per I/O Pin - 20 mA
- DC Current for 3.3V Pin - 50 mA

- Flash Memory - 32 KB (ATmega328P)
- SRAM - 2 KB (ATmega328P)
- EEPROM - 1 KB (ATmega328P)
- Clock Speed - 16 MHz
- Length - 68.6 mm
- Width - 53.4 mm
- Weight - 25 g.

4. Working

We can implement inexpensive wireless sensor network components to detect floods and send alert to the people residing across the coastal line of a country. The project kit and IOT module in smartphones that is effectively used to alert the people before the disasters occurs in smart city and also sends messages to ex-militaries, paramilitary officers and volunteers to prevent the people. The new techniques could reduce the chances of losing human lives as well as damage to largescale infrastructures due to both natural and human-made disasters. The both accelerometer and the vibration sensor shows different angles and the following values are tabulated in the respective columns.

Block diagram

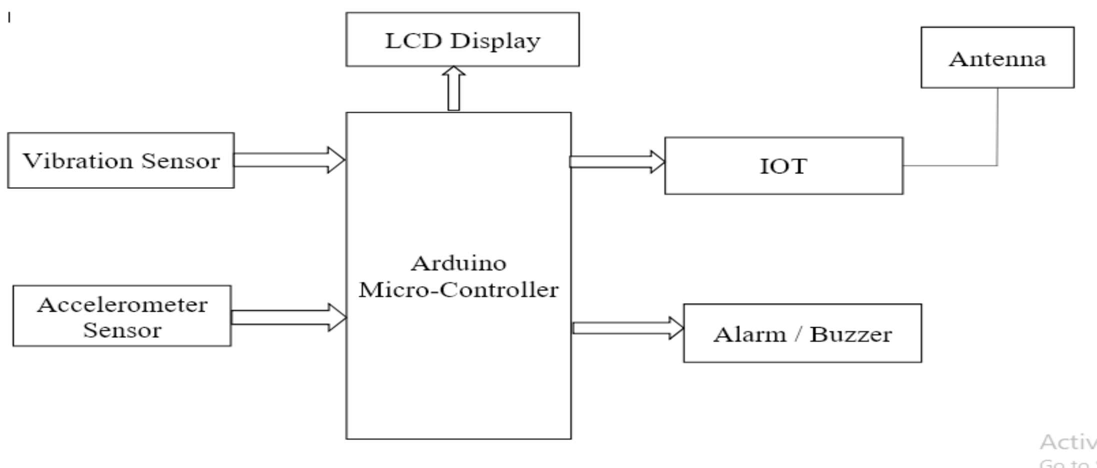

Figure 1: Block Diagram of proposed system

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4. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

S.No	Environments	Vibration	Accelerometer	Status
1	Industrial machine operating	799	138	Occur
2	Object Moving	771	152	Occur
3	Railway track	755	153	Occur
4	Motion of vehicle	723	157	Occur
5	National Highways	699	163	Occur.

Table 1: Angle of Vibration and Accelerometer of proposed system

The different values are taken by testing the system in the simulated environments such as Industrial machine operating, Object moving, Railway track, Motion of vehicle, National highways. These are the different environments where our system was tested and observed. In the Industrial machine operating we observed about 6 values and the average of the six values are shown in the table. Likewise, in all the environments we can observe up to 5-6 values and average of all the observed values are tabulated. From the above experiment, we can observe that the angle is directly proportional to the effect of the disaster. Thus the above table shows different values that we observed from the different environments.

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