Disaster Management using Arduino, GSM module and IoT

Zahaid Sirkazi
Electronics and Telecommunication
Shree L.R. Tiwari Colege Of Engineering
Mumbai Unversity
zahaidsirkazi@gmail.com

Deepali Yadav
Electronics and Telecommunication
Shree L.R. Tiwari Colege Of Engineering
Mumbai Unversity
deeey97@gmail.com

Vinay Yadav
Electronics and Telecommunication
Shree L.R. Tiwari Colege Of Engineering
Mumbai Unversity
yvinay4298@gmail.com

Akash Singh
Electronics and Telecommunication
Shree L.R. Tiwari Colege Of Engineering
Mumbai Unversity
singhakash8898@gmail.com

***Abstract*— This paper has proposed GSM and IoT based disaster warning and monitoring system for industries, dams, forest, home appliances etc. History is riddled with natural and their staggering death tolls. Many are killed by collapsing/flooding/fire. Even a 60 second prior warning can save many thousands of lives. Whenever any disaster is detected, The GSM will warn the local relief team by sending SMS and IoT is used for the graphical interface representing the pressure, temperature, humidity, gas in the environment.**

Keywords—Global system for mobile(GSM), Internet of Things(IoT), Short message service(SMS)

I. INTRODUCTION

Any Disaster is an unavoidable and unpredictable natural phenomenon that often causes damage to lives and property. We cannot fight it but we can stay alert. Floods are one of the leading causes of death from natural disasters in the World. Over 200 flood-related fatalities are reported each year. Fire outbreak is common issue damage caused by fire incidents is tremendous toward nature and human interest. Fire fighter services are provided in most developed areas to extinguish or contain uncontrolled fires. Earthquake is a trembling of earth's surface when seismic waves pass through earth rocks. About 50,000 earthquakes large enough to be noticed without the aid of instruments occur annually over the entire Earth. Of these, approximately 100 are of sufficient size to produce substantial damage if their centres are near areas of habitation. Very great earthquakes occur on average about once per year. Over the centuries they have been responsible for millions of deaths and an incalculable amount of damage to property. The aim of this project is to come up with a safer and secure environment.

II. SCOPE OF PROJECT

Disaster management system have a wide scope in hospitals, industries, offices, society's, and private houses. In a near future we can able to detect every disaster before it happen and also we can be capable to avoid such disaster which can cause millions of life. We can detect almost every disaster phenomenon and can be able to stop or avoid it. The can be monitored in real-time an act on such things before it happen. Millions of life can be saved and damage can be minimized by this project. With every sensor senses the disaster and these sensor can be joined with micro controller and micro processor and enhance the detection of disaster and manage it very well.

III. PROPOSED DESIGN

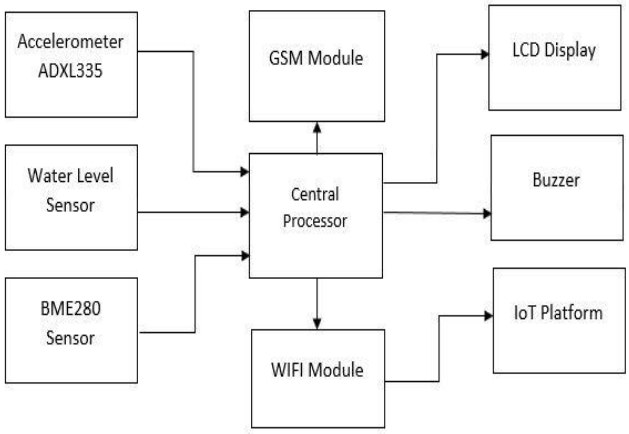

Figure: 1: Block Diagram of Disaster Management System

The conventional detection and monitoring system comprises of 4 subsystem. (1) Central processor which is basically the Arduino Uno system that is responsible for all decision making process along with that (2) all the disaster detecting sensors sense the physical quantities to identify the disaster followed by the (3) GSM module which will send the SMS to the local relief team.

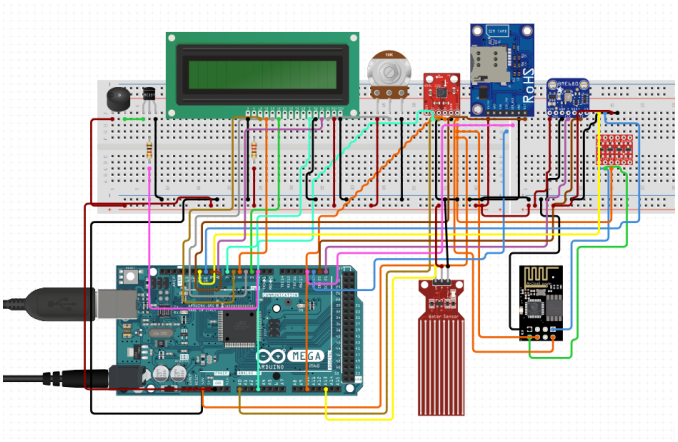

Figure 2: Circuit Diagram of Disaster Management System

IV. COMPONETS LIST

Components	Quantity	Justification
Arduino uno	1	
GSM module	1	
Accelerometer ADXL335	1	Sensor
Buzzer	1	
BC337 Transistor	1	For interfacing LED
Water Sensor	1	Sensor
BME280	1	Sensor
ESP8266 Wi-Fi	1	Wi-Fi module
1k, 220 Resistor, 10K Pot	1 each	
LED		

Table 1: Components List

V. METHODOLOGY

Arduino:

Arduino is the hub of the project. All the sensors, LED display and modules are interfaced with the Arduino. It will be programmed in C language. It can be programmed by using the Arduino software. It consists of SRAM memory. It operates on 5V. It has digital and analog I/O pins which can be used for various expansion. All the detected/collected information is fed to the Arduino which process the data and gives the output as selected over on LED display, buzzer or SMS through GSM module

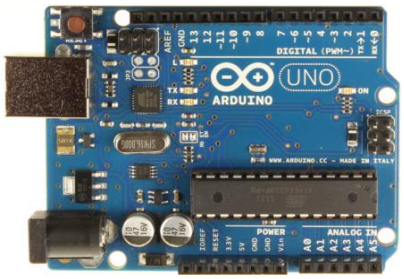

Fig 3: Arduino uno

GSM Module:

GSM stands for global system for mobile communication. GSM is an open and digital cellular technology used for transmitting mobile voice and data services. It operates at the 850Mhz, 900Mhz, 1800Mhz and 1900Mhz frequency bands. In this project will be used. When the detected vibration from the ADXL335 is more than a SMS will be sent to the local relief team

Figure 4: GSM Module

ESP8266:

It is a system on chip which integrates 32-bit tensilica microcontroller with RISC processor. It provides capabilities for 2.4Ghz Wi-fi, general purpose I/O (16 GPIO). Which achieves extra low power consumption and reaches a maximum clock speed of 160Mhz. it is engineered for mobile devices, wearable electronics and IoT application which we will be using.

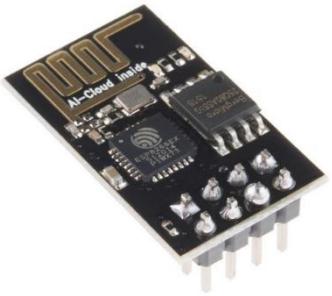

Figure 5: ESP8266 Wi-Fi

ADX335:

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package (LFCSP_LQ).

Figure 6: ADXL335

Water Level Sensor:
Level sensors are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. ... Such measurements can be used to determine the amount of materials within a closed container or the flow of water in open channels.

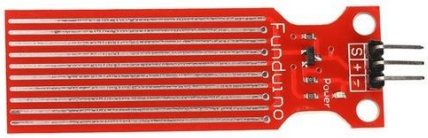

Figure 7: Water Level Sensor

BME280:
The BME280 is an integrated environmental sensor developed specifically for mobile applications where size and low power consumption are key design constraints. The unit combines individual high linearity, high accuracy sensors for pressure, humidity and temperature in an 8-pin metal-lid 2.5 x 2.5 x 0.93 mm³ LGA package, designed for low current consumption (3.6 µA @1Hz), long term stability and high EMC robustness.

Figure 8: BME280

VI. TECHNICAL APPROCH OF THE PROJRCT

In this project we will study how to monitor more then one disaster.
Then, we will plan out the improvement to be made in the design of the system.
After that, we will start design different sections of the system which will detect different disaster.
Once that is done successfully, we will need to program the controller accordingly.
After the design of each section is done we will design the circuits and a layout for the system.
Then we need to acquire the required components and solder them onto the circuit board.

VII. OBJECTIVE

The objective of this project is to create a device which detect multiple disaster and send alert signal before disaster takes place, so that minimum damage can cost by it and no one get harm. Project cost should me less, we have chosen and search various sensor. Measuring the parameters and can be viewed over IoT Platform through internet.

VIII. EXPECTED OUTCOME

This system is deployed wherever it is necessary to identify the environmental changes wherever it may reside for the detection of earthquake sensor ADXL335 which measures 3 axis acceleration of ± 3g minimum, static acceleration of gravity in tilt sensing application as well as dynamic accelerating resulting from motion, shock or vibration. The bandwidth of the accelerometer using the C_x, $C_{y,}$ and C_z can be selected as per the application at the X_{out}, Y_{out}, and Z_{out} pins with a range of 0.5hz to 1600hz for the X and Y axes, and a range of 0.5hz to 550hz for the Z axis the earthquake is detected through the readings on the LED display and a threshold voltage is selected when the voltage is above the threshold the GSM will start sending messages to the local relief team For the fire the BME280 sensor is used it is a digital 4 in 1 sensor with gas, humidity, pressure and temperature. It has operating range of -40-+85 C, 0-100% r.H, 300-1100 hPa. Individual humidity and pressure sensors can be independently enabled or disabled. All the data is input to the Arduino and the data is send to the Arduino and then the Wi-Fi microchip (ESP8266) is used to take the data and use it with the IoT application which will act as a GUI to represent the temperature pressure and humidity in statistical format. For the flood the water level sensor is used which is obtained by having a series of parallel wires exposed traces measured droplets or water when the parallel wires are connected through the water or droplets the circuit is completed and buzzer will alert the system user.

IX. CONCLUSION

The project is going to help humans monitor disaster parameters and help them show early detection. It will detect more then one disaster as mentioned early. It can detect earthquake, flood and fire simultaneously. It can also be set as mini weather station and help to monitor weather condition of the area where device is present. It can monitor sea level and

atmospheric pressure, it can monitor all this thing simultaneously. It will help to cause minimum damage by the disaster. All of this is controlled by a micro-controller which is programmed by c language. The parts were joined using screws and bolts. The system mainly consisted of Arduino, couple of sensors, lcd display, buzzer, gsm module and esp8266.

X. REFRENCES

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