FLOOD DETECTION SYSTEM

Project-2

Final Report

Submitted in Partial Fulfillment of the Requirements for the Award of Degree of

Bachelor in Technology

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CERTIFICATE

This is to certify that the work presented in this Project entitled "FLOOD DETECTION "is a Bonafede record of the work done during the period from Aug–Jan 2022 at Chandigarh Engineering College Landran, Mohali, Punjab by

Rahul Verma, Priyanshu Kumar, Rhythem Sethi, Sachin Kushwaha.

The project work is an authentic record of my own work and is carried out under the supervision and guidance of Guide Ms Ekta Jarangal ECE Department. The matter presented in the report has not been submitted elsewhere, wholly or in part, for the award of any other degree or diploma.

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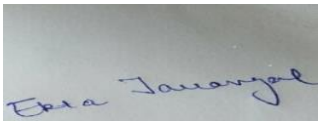
This is to certify that the above statement made by the candidate is correct to the best of my knowledge.



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ABSTRACT

The system of awareness of the overflow of river water that causes flooding cannot work automatically and in real time in providing a warning about the elevation of river surface that potentially flood. It's caused residents who live around the river area do not know the situation when the river overflow.

There are several alternatives to detect river overflow, one of them is by using micro-controller ultrasonic sensor based. The research aims to design prototype decision support system based on the ultrasonic sensor for flood detection that works automatically detects the river overflow.

The software development model used is Prototype Model. The result of this research is a prototype in the form of micro-controller ultrasonic sensor based which can be used as flood detection decision support system that will know the height of river surface designed to detect certain level about flood potency with a low-level error.

Table of Contents

CHAPTER 1 – INTRODUCTION

Flood Detection & Avoidance System is an intelligent system which keeps close watch over various natural factors to predict a flood, so we can embrace ourselves for caution, to minimize the damage caused by the flood.

Natural disasters like a flood can be devastating leading to property damage and loss of lives.

To eliminate or lessen the impacts of the flood, the system uses various natural factors to detect flood. The system has a Wi-Fi connectivity; thus, its collected data can be accessed from anywhere quite easily using IoT.

To detect a flood the system observes various natural factors, which includes humidity, temperature, water level and flow level. To collect data of mentioned natural factors the system consists of different sensors which collects data for individual parameters.

Temperature Humidity Sensor is a advanced sensor module with consists of resistive humidity and temperature detection components.

The water level is always under observation by a float sensor, which work by opening and closing circuits water levels rise and fall. It normally rests in the closed position, meaning the circuit is incomplete and no electricity is passing through the wires yet.

Once the water level drops below a predetermined point, the circuit completes itself and sends electricity through the completed circuit to trigger an alarm.

The flow sensor on the system keeps eye on the flow of water. The water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow.

All the sensors are connected to Arduino UNO, which processes and saves data. The system has Wi-Fi feature, which is useful to access the system and its data over IoT.

A wireless sensor network (WSN) has several features like a group of low cost, multifunctional, low power and small size wireless sensor nodes that cooperate together to sense the environment, process the data and communicate wirelessly over a short distance.

The sensors are commonly used to monitor physical or environmental conditions, such as temperature, sound, water level, pressure, motion or pollutants, at areas of interest. In this project, we used water level sensor for monitoring and detection in disaster areas...

Wireless telecommunications, is the transfer of information between two or more points that are physically not connected. Distances can be short or long according to the capability of the device. There are two types of wireless device which have been chosen to send the signal from high-risk flood area to the common people.

The first device is Global System for Mobile Communications (GSM) supports roaming service to the people around the world that allows a user of GSM network send a short message service (SMS) to the receive mobile telephony service when the person communication with network. the second device which used to send the signal wirelessly from area flood to the flood control center is Radio frequency (RF).

Radio frequency is one of the varieties of electromagnetic waves with a frequency or wavelength convenient for utilization in radio communication.

There are two kinds of frequency that applied in radio communication, which are carrier frequency and modulated frequency. The duty of carrier frequency waves is serving as a carrier of the lower frequency audio waves and others are modulated by two things video or digital information.

Nowadays, the technology which has been used for flood detection system is much more precise than the devices of the last decade.

Unfortunately, there are still some lacks in the significant of an early warning system is difficult to alert the whole people in the area.

Consequently, we are developing the system which is suitable to give continuous alert information to the people by SMS and social network especially at the critical situation.

The majority of people who lost their lives by flood are not received any alert from the flood control center about the increasing water level caused by continuous rainfall and overflow of river.

Floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway. Floods often cause damage to homes and businesses if they are in the natural flood plains of rivers.

While riverine flood damage can be eliminated by moving away from rivers and other bodies of water, people have traditionally lived and worked by rivers because the land is usually flat and fertile and because rivers provide easy travel and access to commerce and industry.

This system is to detect a flood the system observes various natural factors, which includes humidity, temperature, water level and flow level. To collect data of mentioned natural factors the system consists of different sensors which collects data for individual parameters.

The first sensor is ultrasonic sensor which measure the distance to the target by measuring the time between the emission and reception.

The temperature sensor LM35 is used to measure the temperature of the environment accurately. LM35 sensor is an integrated circuit in which the voltage output is directly proportional to the temperature Celsius.

Water flow sensor is used to provide information of water flow stability. A water rotor along with a hall effect sensor is present the sense and measure the water flow. When water flows through the valve it rotates the rotor.

By this, the change can be observed in the speed of the motor. This change is calculated as output as a pulse signal by the hall effect sensor. Thus, the rate of flow of water can be measured

All the values can be collected and sent to the Arduino Uno to process these values and then shown on the screen with the help of WIFI module and with the use of IOT gecko.

CHAPTER 2 – HARDWARE DESIGN

Flood detecting notification by using wireless sensor network is to detect the flood in advance way. In this system, two significant things include hardware design and software development.

The hardware part is very important for the system that can be able to control the whole system and the transmitter and receiver Module that use in the wireless purpose for send and receive the signal.

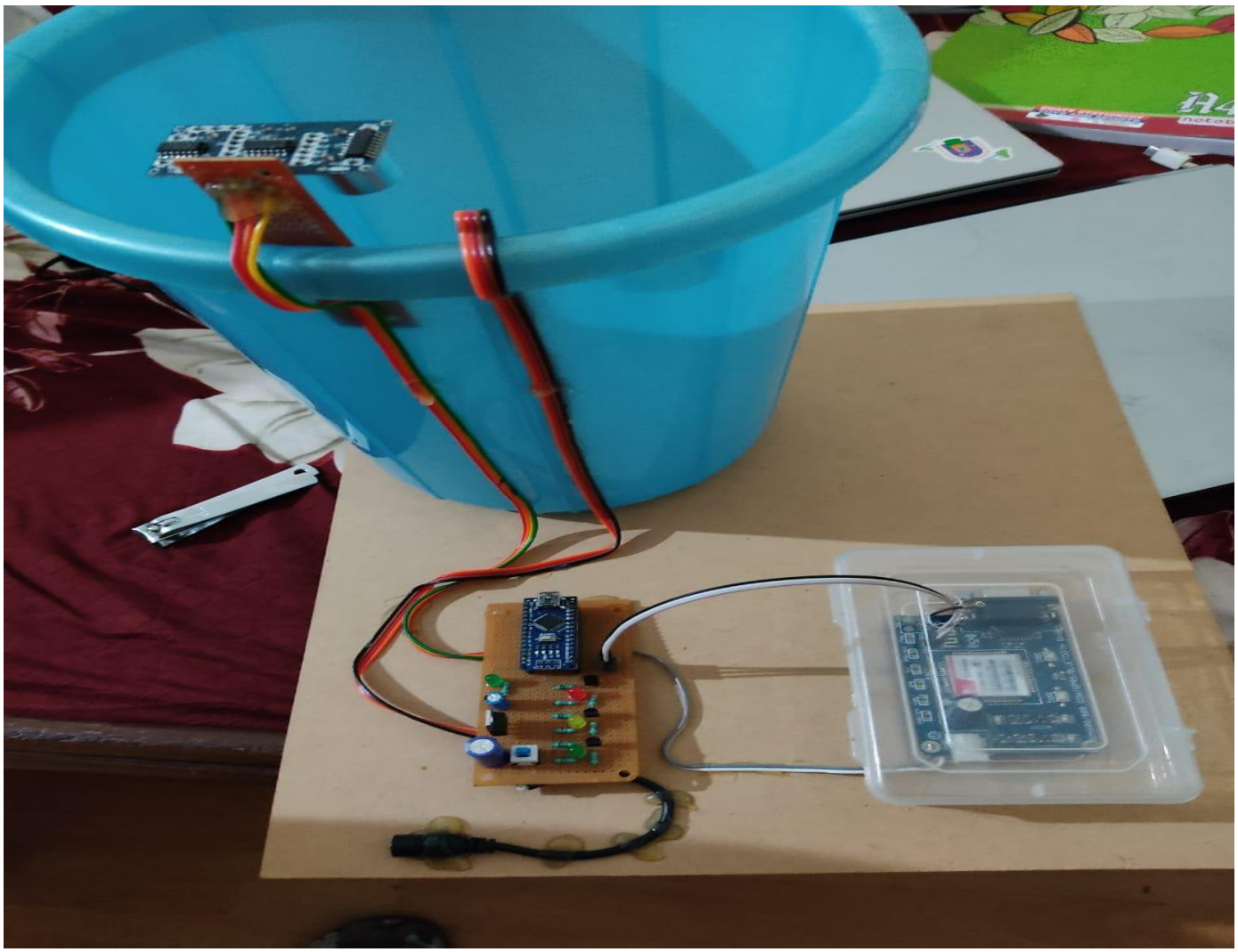


Fig 2.1

HARDWARE SPECIFICATIONS AND IMPLEMENTATIONS

To detect a flood the system observes various natural factors, which includes Humidity, temperature, Water level and Flow level. To collect data of mentioned natural factors the system consists of different sensors which collects data for individual parameters.

For detecting changes in humidity and temperature the system has a DHT11 Digital Temperature Humidity Sensor.

It is an advanced sensor module with consists of resistive humidity and temperature detection components. The water level is always under observation by a float sensor, which work by opening and closing circuits (dry contacts) as water levels rise and fall.

It normally rests in the closed position, meaning the circuit is incomplete and no electricity is passing through the wires yet.

Once the water level drops below a predetermined point, the circuit completes itself and sends electricity through the completed circuit to trigger an alarm.

The flow sensor on the system keeps eye on the flow of water. The water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls.

The system also consists of a HC-SR04 Ultrasonic Range Finder Distance Sensor.
The Ultrasonic sensor works on the principle of SONAR and is designed to measure the distance using ultrasonic wave to determine the distance of an object from the senso

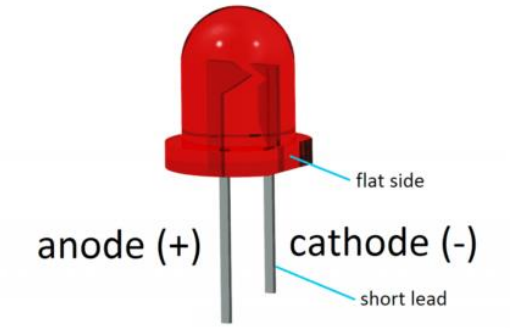
(1) Ultrasonic Sensor HC-SR04

Ultrasonic Sensor HC-SR04, serves to detect the water level of the river, has the accuracy and stability in reading and determining the distance of an object.

(2) Arduino R3 Microcontroller

Arduino R3 Microcontroller serves to process the input data from the ultrasonic sensor, and its output will be display on the LCD, warnings on LED lights, an alarm sounds on the buzzer and GSM SIM 800L module that will send a flood warning message to the communities around the watershed.

(3) Light Emitting Diode (LED)



LED lights, serves to warn if the water level rises. Liquid

Crystal Display (LCD)

LCD serves as a display of a microcontroller, to determine the distance of the sensor against the surface of the river water.

Block Diagram

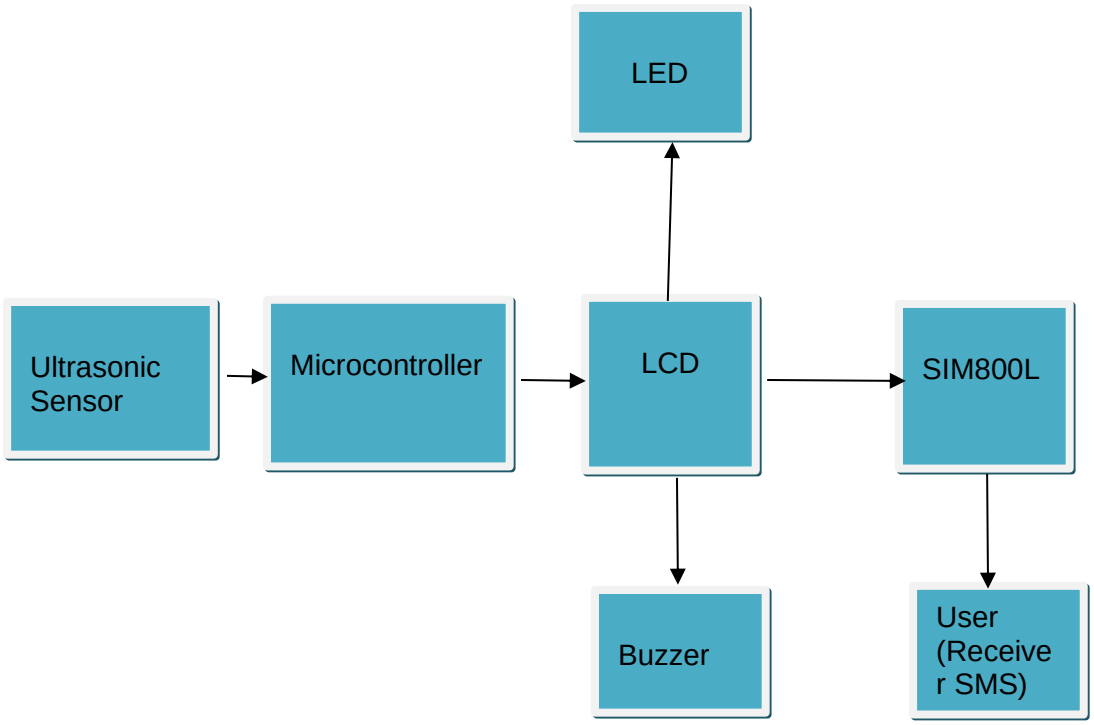


Fig no 2.2

(4) GSM SIM800L Module GSM

SIM800L Module, serves as a tool for disseminating SMS based information, to communities around the watershed, in case of potential flooding.

CHAPTER 3 - SOFTWARE DESIGN

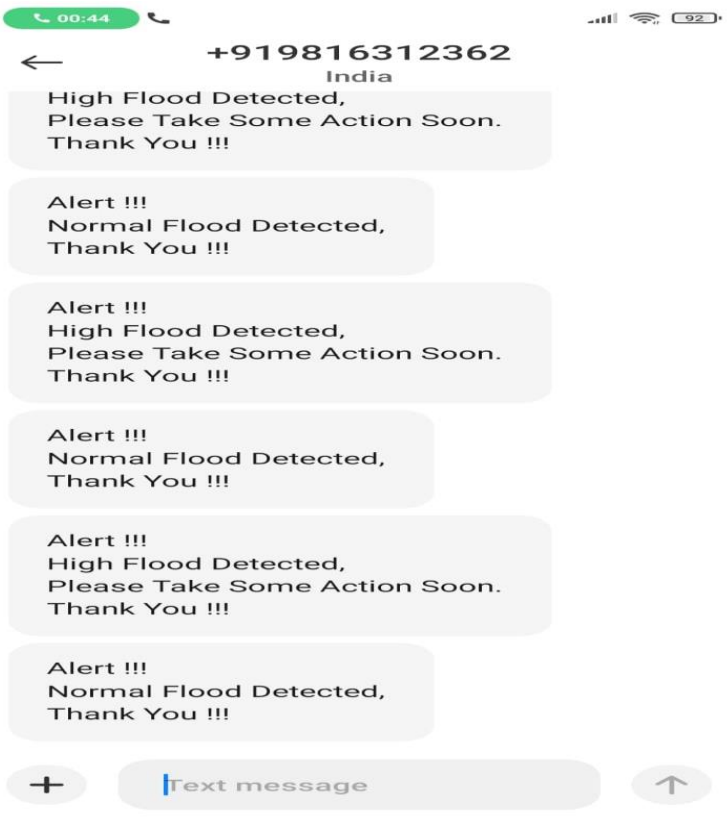
Designing software is a stage end from designing tools that are already created; then in Programming, a flowchart should be designed, after that, programs that will be input into the previous tool is designed.

The second part of this project is software. This part control all the system by the code, which has been programmed the PIC. Since the project is based on PIC, the development of software plays a major role in develop the system.

A PCW language is used in this project. The program is written modularly to list the module functionality.

Each program is written and assembled and then stored into EPROM using EPROM Programmer (EP). Additionally, in this project would be using Ozeki Message Server as a SMS gateway application that able to send SMS from website to the mobile by GSM modem.

In the GSM modem will insert Subscriber Identity Module (SIM card) to send alert messages for the controller that resides in computer when he is not present at flood control center.



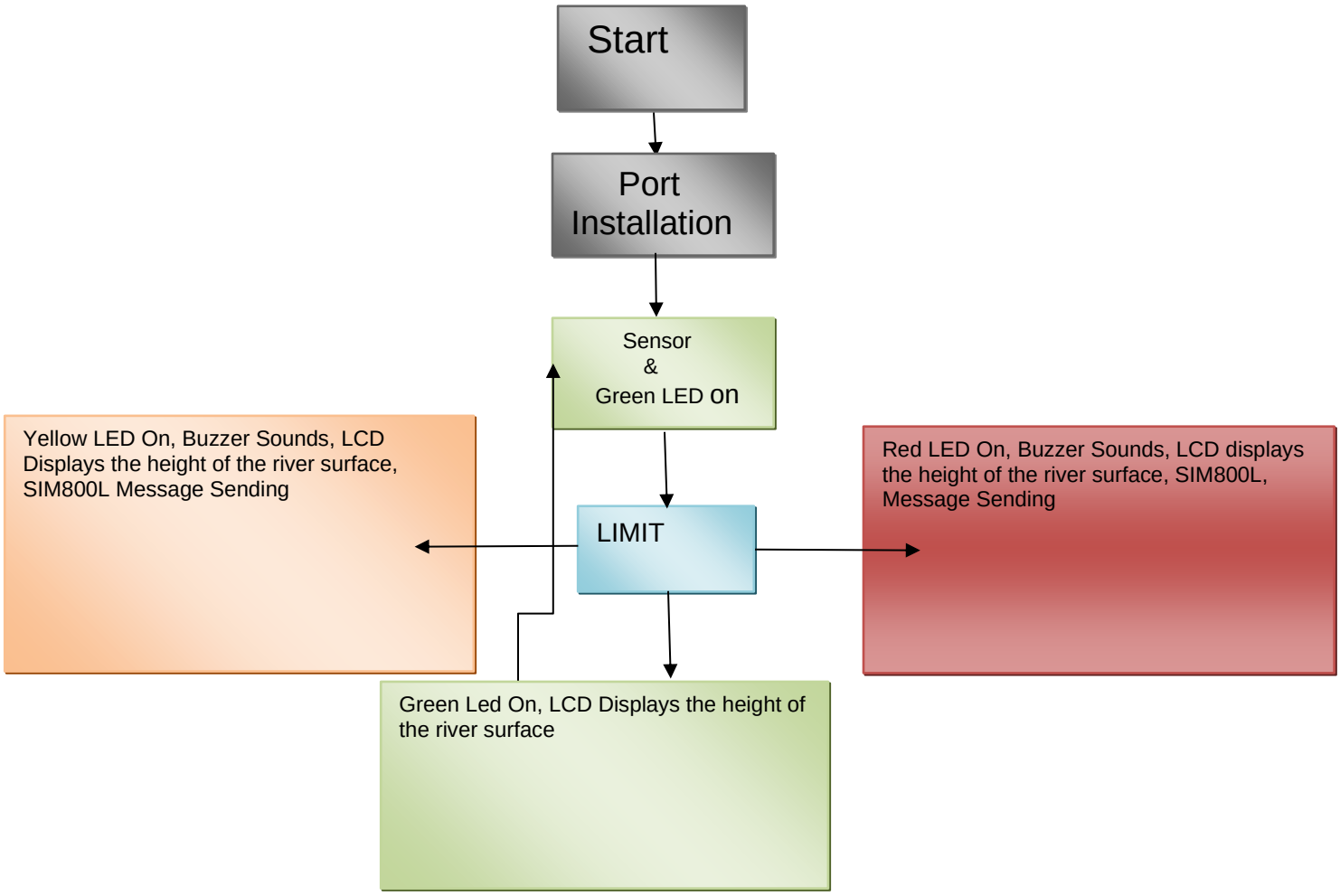

Start
Port Installation
Sensor & Green LED on
LIMIT
Yellow LED On, Buzzer Sounds, LCD Displays the height of the river surface, SIM800L Message Sending
Red LED On, Buzzer Sounds, LCD displays the height of the river surface, SIM800L, Message Sending
Green Led On, LCD Displays the height of the river surface

Fig 3.1

PROGRAM:

```
  #include LiquidCrystal lcd(2,3,4,5,6,7);

float t = 0;
float dist = 0;

void setup()
{
 lcd.begin(16,2);
 pinMode(18,OUTPUT);
 pinMode(19,INPUT);
 pinMode(20,OUTPUT);
 lcd.setCursor(0,1);
 lcd.print(" Water Level Detector");
 delay(2000);
}

void loop()
{
 lcd.clear();
 digitalWrite(20,LOW);
 digitalWrite(18,LOW);
 delayMicroseconds(2);
 digitalWrite(18,HIGH);
 delayMicroseconds(10);
 digitalWrite(18,LOW);
 delayMicroseconds(2);

 t=pulseIn(19,HIGH);
 dist=t*340/20000;

 lcd.clear();
 lcd.setCursor(0,1);
 lcd.print("Distance : ");
 lcd.print(dist/100);
 lcd.print(" m");


 delay(1000);

if(dist<40)
```

```
{
 digitalWrite(20,HIGH);
 lcd.clear();
 lcd.setCursor(0,1);lcd.print("
 Water level is rising. Kindly
 evacuate"); delay(2000);
}
else
{
 digitalWrite(20,LOW);
 delay(2000);
}
}
```

CHAPTER 4– SUMMARY OF RESULTS

Description:

Our project is a software system that will maintain water quality for supply management from natural water sources as well as overhead detection of floods, and provides control operations to issue flood warnings to affected persons. The system is intended to be used by two major user groups: pharmaceutical companies and state water agencies.

Requirements:

- System must collect the data from local weather station.
- System must provide water quality report according to the data collection.
- System must detect the flow speed/state of current water stream (rivers, creeks)
- System shall poll the sensors every 10 seconds.
- The water quality sensors must be polled frequently enough to prevent the contaminated water from entering the client factory. Since bad water quality can severely damage the production line, the client company.
- System must maintain the accuracy of the temperature within ±0.2°C.
- The product database shall cater for 20,000 simultaneous public users with read access to the flood warning and water quality summary.
- The system is expected to have over 1000 sensors of different types. Only a small portion of them can fail at the same time.
- The system should be available at all times.
- The sensors and its connected circuit outdoors should be completely waterproof and weatherproof. Test Plans: Features that needed to be tested are sensors, temperature, pH, data delivery, database running, system robustness, changing to new sensors, working on existing OS system.

Design

Our design goals can summarize as follows:

● The sensors should be durable to withstand deployment underwater and extreme weather conditions.

● Sensor readings should be as accurate as possible in order to analyze water quality and to determine if the water is suitable and meets the parameters for production use.

● The system should be tolerant to some extreme error readings.

● The database should cater to as much public users as possible, and at the same time, it should also be secure. Our system architecture will use the Repository and Model View Controller patterns.

ACTUAL IMAGE OF THE PROJECT

Fig 4.1

OBJECTIVE

The objective of this project is to monitor the flood situation & send alert in case of danger in the form of text message. The main objective of this project is to detect rising water level in a river at a reasonable distance from the rail track/ roadways and intimate that to the respective authorities through SMS, to take appropriate action.

Floods lead to a vast loss of life and property in many countries. But in developing countries the lack of proper technology leads to more loss of life and property due to flood. This is due to lack of flood detection systems.

Our project solves problem by implementing an early flood detection mechanism. In this project we will connect electrodes at different levels. Electrodes will be interfaced with µC through comparator.

GSM modem containing a SIM card will be connected to µC. At the other end mobile will be used. Mobile number of users will be stored in µC coding. Whenever water level reaches to electrodes. SMS will be sent to mobile.

Why build the flood detection system

Floods, caused mainly by torrential rains, melting snows, or steady rains accompanied by abundant rainfall, pose a severe danger to both humans and their property.

Regarding the weather vagaries and the sudden and rapid onset and dramatic progress of extreme weather events, the only efficient and sufficiently flexible method of early warning is a warning system based on electronic sirens.

Water Level Sensor

Water level sensor is considered one of the important devices which has been used in the project because from this device can be recognized the current level of water.

The function of this sensor is detecting the rising of water. When the water is rising up will send the signal to the PIC. in this situation needs to accurate sensor to give information to the whole people in the area about level of water.

The type of sensors which has been selected for this project is F11B

(Model Number). This sensor is based on NAND Gate.

The most significant of this sensor are small size, inexpensive, easy

to use and available in the market

IMPACT OF THE SOCIAL NETWORK AND WEB PORTALS

In the last few years, the Internet and especially the Web has prompted and enabled a revolution on how people communicate. Web portals, provide efficient access to information and services online and they provide a central concentrated focal point and an information source that can be personalized.

There are many types of portals and one of them is community portal. Community portals provide improved communication and contact with a community online providing local or community-based information. Social networking portals are now the recent trend.

In a social networking site (SNS), members join the various communities and create a user profile in the site and can connect to one another within the community. Some
example of how huge the following of social networks are: the social networking site

My Space which ranks sixth in overall web traffic, with over 47 million unique US visitors each month (Dwyer et.al., 2007).

The web traffic data for Facebook, a social networking site oriented towards college students, shows 15 million unique US visitors a month (Dwyer et.al., 2007).
These data are of 2007 and the followers of these and other social sites are at the moment still on the increase especially in places outside the US.

Communities can be better informed more quickly through online social networking.
For these reasons it is felt the social network and community portal should also be used for alert systems like the flood detection and notification system so a larger group can be warn of the impending danger.

FLOOD DETECTION SYSTEM ALERT

In order to construct flood detection system that is useful and efficient by using GSM proposed architecture for an early warning flood system to alert public against flood disaster. The research work proposed an architecture for a cooperative flood detection using GSM via SMS in order to notify communities and hence to develop a prototype application of the system.

The system focuses on monitoring water level remotely using wireless sensor network. Also, utilizes Global System for Mobile communication (GSM) and Short Message Service (SMS) to relay data from sensors to computers or directly alert the respective victims through their mobile phone.

Subramaniam used Flood Observatory System (FOS) as a warning and alert system, to efficiently monitor the critical flood prone areas in real time basis. FOS is designed to be an intelligent gadget which is capable of sending real time water level information from a remote location to a monitoring station which could be at a distance away, regardless of time.

FOS can be linked to a visual and audio unit to display warnings and alerts the users via text displays or traffic light system in an event of flooding. Martinis presented an automatic near-real time (NRT) flood detection system which combines histogram thresholding, and segmentation-based classification, specifically oriented to the analysis of single-polarized very high-resolution Synthetic Aperture Radar (SAR) satellite data.

The challenge of SAR-based flood detection is addressed in a completely unsupervised way, which assumes no training data and therefore no prior information about the class statistics to be available concerning the area of investigation. This is usually the case in NRT-disaster management, where the collection of ground truth information is not feasible due to time-constraints.

They are proposed the development of flood detector system which will determine the current water level that is assumed from the voltage from the detector. The data that has been collected will be analyzed in database to make sure the safety purpose been taken if the water reach to warning level. This project consists of three parts which the first part involved the development of the system that is capable to detect water level.

GLOBAL SYSTEM FOR MOBILE COMMUNICATION

Global System for Mobile Communications (GSM) is a wireless digital network standard designed by standardization committees from the major European telecommunications operators and manufacturers.

The GSM standard provides a common set of compatible and several million customers worldwide.

GSM supports roaming service that allows a user of GSM network A to receive mobile telephony service when the person visits a different GSM network B.

If both GSM networks A and B are within the same country, call setup for a roamer can be done efficiently.

CHAPTER 5 – CONCLUSIONS

Based on the results of research on prototype decision support system for flood detection based on ultrasonic sensor, it can be deduced that the designed decision support system can be used as an alternative to detecting flood, in this case, can measure the river water level automatically, and real time, they can detect if there is potential for flooding.

The results of the test show that if the system detects the potential flood, the system will directly alert the form of alarm and notification in the form of SMS Gateway to the people who live around the river area. Decision support system for flood detection to predict flood potential based on river water level that is detected/read by micro-controller based on ultrasonic sensors, placed on several riverbanks.

The results of this DSS will be a source of information about the warning of the flood that will be sending in broadband via SMS Gateway to the people who live around the river area.
Disasters, as the name suggests, brings about great havoc on lives and property indiscriminately across the globe. Developing countries, however, experience much worse destruction than the developed ones and are as well as less equipped to deal with the aftereffects of these calamities.

Foreknowledge of the disaster could thus help all, especially the developing countries by providing time to secure property and evacuate.
Developing early warning systems may be complicated, with many facets to the system requirements and many additional intricacies, when within a developing country.

This paper has tried to propose a potential and economic solution to the problem of floods. Floods cannot be predicted easily, but we are trying to develop a system which tries to detect flood and give early intimation to nearby people.

The GSM based flood detection and alert system may prove to save the lives of people by reducing the human quick out during emergency situations.
Development of a wireless sensor network has been successfully carried out, with considerations on area of deployment and efficiency.

So far, we have built a micro-model through a prototype; the sensors utilized were fundamental in obtaining the required data necessary for monitoring and detecting flood events, and a live feed has also been actualized for end users. The proposed system can later be used to provide solutions to real-life challenges, thereby bringing relief to people in communities ravaged by persistent flood occurrence.

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