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WIRELESS BASED RAPID FLOOD DETECTION AND WARNING SYSTEM

R.Jayaramachandran, S.Lingamoorthy, S. Ohmshankar
Department of Electronics and Communication Engineering, Agni College of Technology, Chennai
E-Mail : jayaraman251995@gmail.com

Abstract
The objective of this project is to develop wireless based rapid flood detection and warning system. It consists of inexpensive electronic components arranged and programmed scientifically to monitor the increase of water level in remote places or residential areas. The high water detection system divides into two parts: water sensing unit and data display unit. The systems are based on the ATmega 328P microcontroller and they are communicating wirelessly via GSM module. Additionally, several custom-built modules, including water sensors, charging regulator, and status board, are designed to support moisture detection, power management, and information display.

Index terms: GSM Module, Embedded System, Flood detection.

1. Introduction
Due to rapid climate change in recent decades, an increase in the severity of flood-related damages is observed. This causes serious destruction to residential properties and it also threatens public safety, particularly residents in the coastal regions or in the areas with heavy rainfalls. Although several commercial flood warning systems are currently available, many of them are either expensive or unable to identify multiple water levels. In fact, some water detection devices are triggered by a single event and their alerts are broadcasted via a buzzer. However it is often too late for people to protect their belongings and evacuate to safe ground if their flood warning appliance is solely activated by a certain water level without pre-flood warning.
The goal of this design project is to create a low-cost wireless high water detection system that senses rising water in real time and determines any potential flash floods. The current design includes a solar-powered water recognition system wirelessly transmitting sensor data to a receiver system.
This design project is created to reduce flood damages and to combat increasing flood risks in remote areas. The principle of most high water detection systems is similar, which includes moisture sensing and communication. The goal of the project is to devise a wireless flood detection system with low power consumption and simple design as shown in the fig.1.

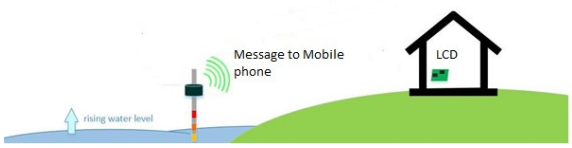

Fig.1 Design overview

The scope of this project entails the design and implementation of a micro controlled flood management system, depending on moisture content. Moisture sensor will be the input of the system and GSM will be the output of the microcontroller.
The advantages of a wsn are taken to benefit weather monitoring stations. Many sensor stations main duty is measure and send parameters through a wireless network server. WSN have been used for flood detection in Honduras, which is affected by heavy and massive rain and hurricanes [2]. Rapid mass movements (RMM) pose a substantial risk to people and infrastructure. Reliable and cost-efficient measures have to be taken to reduce this risk. EWSs have been developed during the past decades and are rapidly increasing [3]. Warning communities of the incoming flood provides an effective solution to this by giving people sufficient time to evacuate and protect their property [4]. National Weather Service(NWS)'s flood warning system manual offered a range of high water notification solution which can be implemented at various locations, including reservoirs, streams, and local communities [5]. A wide selection of commercial water detection products were also obtainable online [6]-[8].

2. Proposed System
The proposed system is different from the existing system by the advanced technology usage of GSM module. In the existing system the RF module only detects and display the water level indication through an LCD display but whereas in the proposed system of mine the alert message is sent to all the nearby network domain with the help of GSM module. In this project the usage of microcontroller i.e the arduino plays the major role which is connected to all the peripherals. The moisture sensor is fiited with the setup and immersed in the water. This moisture sensor helps to get the readings of the water level increase. A suitable power supply is used to operate the setup.

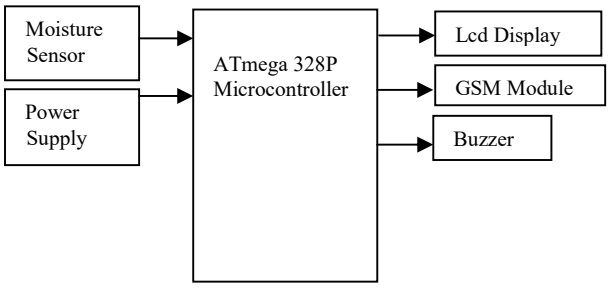

Fig. 2 Block diagram

The GSM(Global System for Mobile Communication) is the advanced technology used in this project with the help of microcontroller . this helps to send the messages to the government officials about the increase in level of the water. This GSM is fiited with a universal number as that it can be able to send the messages for particular raise in water level. The buzzer is used to indicate with a siren as the water level reaches the maximum limit. The block diagram is shown in the fig. 2.

3. Hardware Components

The major components used in the proposed system is discussed briefly.

3.1 Ardunio Uno

This the most common arduino type. Ths arduino type uses ATmega328 AVR microcontroller. ATmega 328 is more preffered due to following features : have three 8-bit bi-directional I/O ports with internal pull-up resistor, it has 32kbyte of flash memory, 2k bytes of RAM, 1k bytes of EEPROM,2 instruction words/vector, 8-channel 10-bit successive approximation ADC, programmable serial USART, 23 programmable serial I/O lines, operating voltage 1.8-5.5Ve.t.c. as shown in the fig. 3.

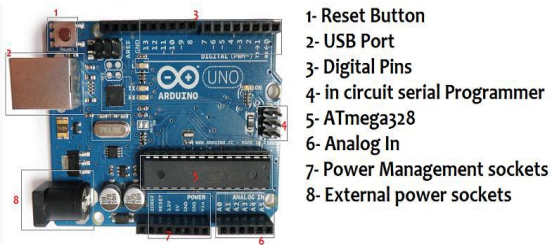

Fig.3 Arduino UNO

3.2 Buzzer

A buzzer is an electronic device that produces sound when one applies a voltage as shown in the fig. 4. Some require a dc voltage, others require an AC voltage. In this project we are using the buzzer for alert system.

Once the sensor senses the maximum level , the microcontroller give supply to the buzzer and the buzzer will start giving alert sound. It is connected with the I/O pins, which is interfaced with the controller. The specification are operating voltage 1-25V, rated current is maximum 3ma, weight is 2.5gram, resonantfrequency is 2-6KHz, sound level is 85-120dB.

Fig.4 Buzzer

3.3 Lcd Display

Liquid Crystal Display(LCD) screen is an electronic display module as shown in the fig. 5. An lcd has a wide range of application in electronics. A liquid crystal display is the heart of display which is sandwiched between two glasses. The most basic and commonly used LCD in circuit is the 16x2 display. LCDs are commonly preferred in display because they are cheap, easy to program and can display a wide range of characters and animations.A 16x2 LCD have two display lines each capable of displaying 16 character. This LCD has command register and data register. The command register stores command instruction given to LCD while the data register stores the data to be displayed by the LCD. It is capable to display any character with ASCII values ranging from 0 to 255.

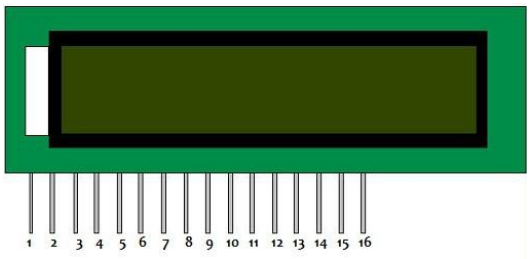

Fig.5 LCD

3.4 Gsm Module

GSM is a mobile communication modem, it stands for Global System for Mobile communication.

It is widely used mobile communication system in the world. It operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitize and reduce data, then sends it down through a channel with two different stream of client data, each in its own particular time slots. The digital system has an ability to carry 64 kpbs to 120Mbps of data rates. There are five different cell sizes in GSM network macro, micro, pico, and umbrella cells. The GSM module is shown in the fig. 6.

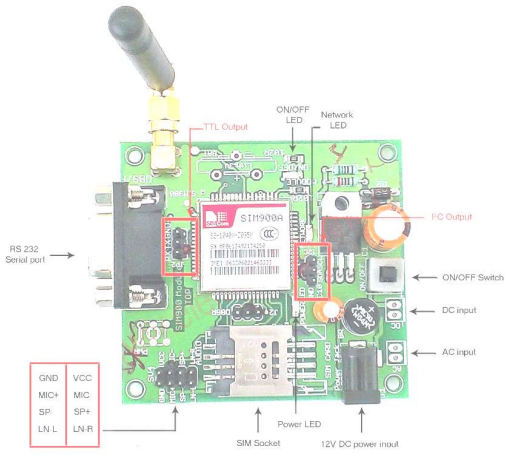

Fig.6 GSM Module

3.5 Moisture Sensor

There are several moisture sensors available. The sensor used in this project is YL-69 as shown in the fig.7. This isan

electrical resistance sensor. The sensor is made up of two electrodes.

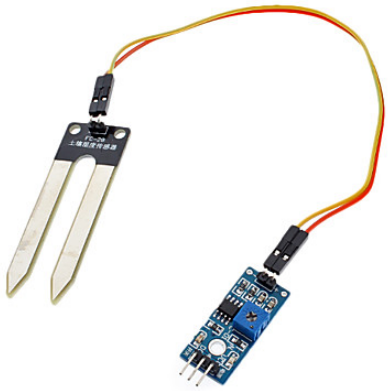

Fig.7. Moisture Sensor Module

A current is passed across the electrode and the resistance to the current determines the moisture. If it has more water resistance and thus more current will pass through. On the other hand when the moisture is low the sensor module outputs a high level of resistance. This sensor has both digital and analog outputs . digital output is simple to use but is not as accurate as the analog output.

4. Result And Discussion

The prototype model for detecting the flood and giving warning to the people is shown in the fig. 8 .

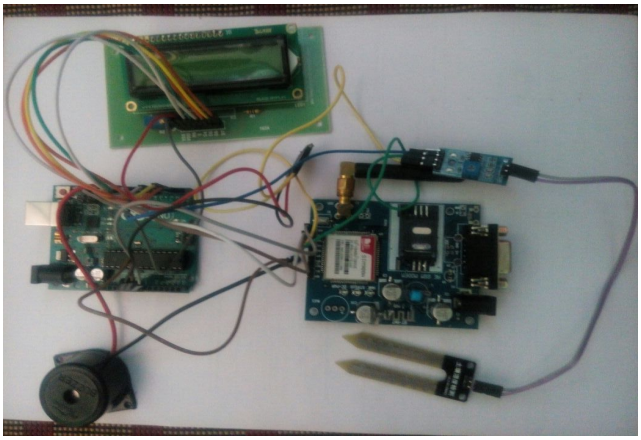

Fig. 8. Image of the prototype

To simplify software debugging, each program action is also described in plain texts and projected on a serial monitor. Fig. 9 is an example of the actions captured on a serial display.

Fig 9 Values in Arduino Serial Monitor

5. Conclusion

The wireless based rapid flood detection and warning system is built to identify rising water levels and to warn any potential flood risk. The transmitter system is able to serve for a long period of time with minimum maintenance. The receiver system's straightforward dashboard design gives user a fast update of current status. This flood detection model is suitable for all outdoor and indoor applications.

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