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FLOOD MANAGEMENT SYSTEM USING CLOUD COMPUTING AND INTERNET OF THINGS

[1] Mr.C.MD ASLAM, M.Tech,(Ph.D), MISTE, IETE, Associate Professor,
[2] P. Sowmya, [3] S. Karishma, [4] V. Rajavardhan Reddy, [5] S. Abhirami, [6] S. Divya,
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
VIDYA NAGAR, PALLAVOLU (V), PRODDATUR-516360, Y.S.R (Dt.), AP

ABSTRACT

Flood management is a critical issue that requires real-time monitoring and quick response to minimize damage and save lives. This project proposes a flood management system leveraging cloud computing and IoT technologies. The system includes a network of sensors placed in flood- prone areas to collect data on water levels, rainfall, and other environmental parameters. This data is transmitted to a cloud-based platform for analysis and visualization. The system provides real- time alerts and predictions to authorities and the public, enabling timely and informed decision- making. The integration of cloud computing ensures scalable data storage and processing, while IOT devices facilitate continuous monitoring and data collection

Keywords: Arduino UNO, Flow Sensor, Rain fall Sensor, LCD, Buzzer etc.

I. INTRODUCTION

1.1 INTRODUCTION

Microcontroller are widely used in Embedded Systems products. An Embedded product uses the microprocessor (or microcontroller) to do one task & one task only. A printer is an example of Embedded system since the processor inside it perform one task only namely getting the data and printing it. Although microcontroller is preferred choice for many Embedded systems, there are times that a microcontroller is inadequate for the task. For this reason, in recent years many manufactures of general-purpose microprocessors such as INTEL, Motorola, AMD & Cyrix have targeted their microprocessors for the high end of Embedded market. One of the most critical needs of the embedded system is to decrease power consumptions and space. This can be achieved by integrating more functions into the CPU chips. All the embedded processors have low power consumptions in additions to some forms of I/O, ROM all on a single chip. In higher performance Embedded system, the trend is to integrate more & more function on the CPU chip & let the designer decide which feature he/she wants to use.

1.2 EMBEDDED SYSTEM

Physically, embedded systems range from portable devices such as digital watches and MP3 players to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected. Embedded systems span all aspects of modern life and there are many examples of their use. Telecommunications systems employ numerous embedded systems from telephone switches for the network to mobile phones at the end-user. Computer networking uses dedicated routers and network bridges to route data.

EXAMPLES OF EMBEDDED SYSTEM:

Automated teller. machines (ATMS). Integrated system in aircraft and missile. Cellular telephones and telephonic switches. Computer network equipment, including routers timeservers and firewalls. Computer printers, Copiers. Disk drives (floppy disk drive and hard disk drive). Engine controllers and antilock brake controllers for automobiles. Home automation products like thermostat, air conditioners sprinkles and security monitoring system. House hold appliances including microwave ovens, washing machines, TV sets DVD layers/recorders. Medical equipment. Measurement equipment such as digital storage oscilloscopes, logic analysers and spectrum analysers. Multimedia appliances: internet radio receivers, TV set top boxes.Small hand-held computer with P1M5 and other applications. Programmable logic controllers (PLC's) for industrial automation and monitoring. Stationary video game controllers.

1.3 CHARACTERISTICS:

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The software written for embedded systems is often called firmware, and is usually

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stored in read- only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

1.4 MICROPROCESSOR (MP):

A microprocessor is a general-purpose digital computer central processing unit (CPU). Although popularly known as a "computer on a chip" is in no sense a complete digital computer. The block diagram of a microprocessor CPU is shown, which contains an arithmetic and logical unit (ALU), a program counter (PC), a stack pointer (SP), some working registers, a clock timing circuit, and interrupt circuits.

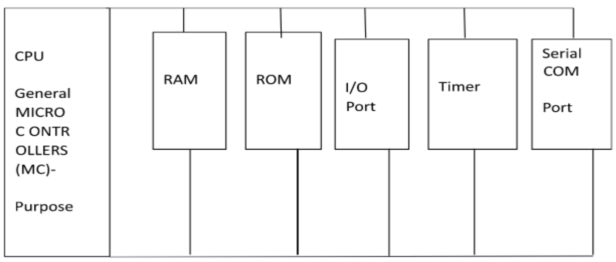

Fig 1.1 Block diagram of microprocessor

1.5 MICROCONTROLLER (MC):

Figure shows the block diagram of a typical microcontroller. The design incorporates all of the features found in micro-processor CPU: ALU, PC, SP, and registers. It also added the other features needed to make a complete computer: ROM, RAM, parallel I/O, serial I/O, counters, and clock circuit.

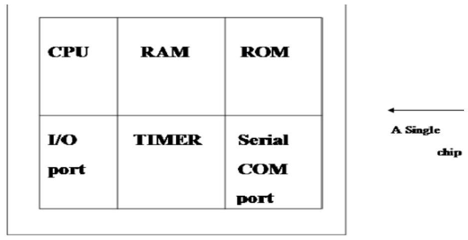

Fig 1.2 Microcontroller

1.6 COMPARISION BETWEEN MICROPROCESSOR AND MICROCONTROLLER

The microprocessor must have many additional parts to be operational as a computer whereas microcontroller requires no additional external digital parts. The prime use of microprocessor is to read data, perform extensive calculations on that data and store them in the mass storage device or display it. The prime functions of microcontroller is to read data, perform limited calculations on it, control its environment based on these data. Thus the microprocessor is said to be general-purpose digital computers whereas the microcontroller are intend to be special purpose digital controller. Microprocessor need many opcodes for moving data from the external memory to the CPU, microcontroller may require just one or two, also microprocessor may have one or two types of bit handling instructions whereas microcontrollers have many.

II. LITERATURE SURVEY

2.1 INTRODUCTION

In common parlance, a naturally occurring catastrophic event results in an adverse effect on human life. Natural calamities like avalanches, landslides, earthquakes, droughts, cloudbursts, Floods, tornadoes, cyclones, and thunderstorms can cause property damage from financial losses to human life (Zhou et al. 2018). Disasters because road accidents, severely damaged roads, collapse of bridges, collapse of large buildings and so on. Recovering from the damages brought due to the disasters is challenging for the administration and government. Flooding is considered among the most severe issues (Mohanty et al. 2020) that many people face worldwide. Flooding happens when the source of water excessively increases, such as snow melts, torrential rain, and excessive water discharge (Bisht et al. 2018). River water levels rise, resulting in flooding and having a negative impact in different places. Although these calamities cannot be prevented, the disastrous damage can be reduced. Disaster management is the primary approach for mitigating the effects of disasters. To save property and protect human life from natural calamities events, disaster management is required, whether it be structural or non-structural. It entails a detailed evaluation of the losses inflicted by the disaster, which includes electric power re-establishment, water intake, rescue and transportation, re-establishment of communication, etc. (Khanna and Kaur 2020). To alert people well in advance is one of the effective non-structural disaster management solutions.

The northern Indian state of Uttarakhand has not been exempt from the consequences of natural calamities. Due to its climatic variations, environmental changes, and distinctive geological formations, this Himalayan terrain is frequently vulnerable to natural disasters, including earthquakes, landslides, and floods. Over 6,000 people lost their lives as a result of floods at Kedarnath, Uttarakhand, in 2013 (Satendra 2015). Over the past few decades, flood calamities have had a highly detrimental impact on the lives of the citizens of Uttarakhand (Bisht et al. 2018). The monsoon season, which lasts from June to September, causes torrential or heavy rain, which is problematic for the people of this state. Flood has thrown life out of gear for the residents of this hill state. Floods also damage public structures, including educational facilities, bridges and highways. Flood damage can be avoided if necessary methods are employed. It is essential to identify flood-affected locations in order to make appropriate strategies.

III. PROBLEM STATEMENT

Manual Monitoring: Traditional flood management relies on manual data collection and monitoring.

Static Sensors: Fixed sensors are used to measure water levels and other parameters.

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Volume 13, Issue 2, 2025

Limited Communication: Data is often communicated through non-digital means, leading to delays.

3.1 DISADVANTAGES OF EXISTING SYSTEM

Delayed Response: Manual data collection and communication result in slow response times.

Limited Coverage: Fixed sensors provide limited coverage and cannot adapt to changing conditions.

Data Inaccuracy: Manual processes are prone to errors and may not provide accurate data..

.IV. PROPOSED SYSTEM

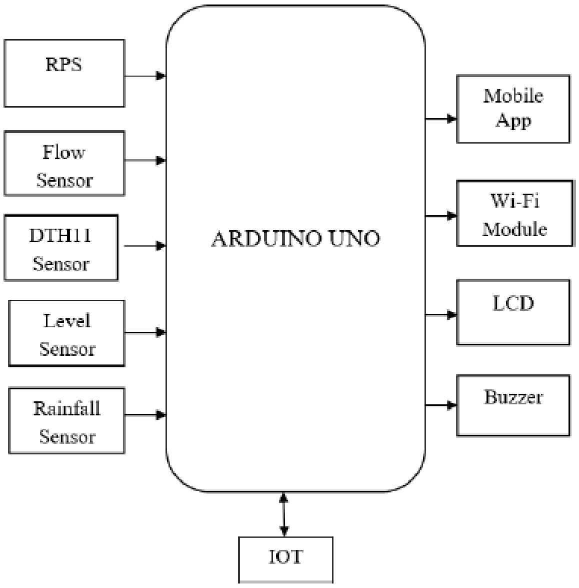
IOT Sensors: Deploy a network of IOT sensors to continuously monitor water levels, rainfall, and other environmental parameters.

Cloud Computing: Use cloud-based platforms for data storage, processing, and analysis.

Real-Time Alerts: Provide real-time alerts and predictions to authorities and the public through mobile apps and web interfaces.

Data Visualization: Use dashboards and visual tools to present data in an easily understandable format

4.1 BLOCK DIAGRAM OF PROPOSED SYSTEM



V. BLOCK DIAGRAM OF PROPOSED SYSTEM

HARDWARE COMPONENTS

The following hardware tools used in the proposed system

Power Supply, Arduino UNO, Flow Sensor, DTH11 Sensor, Level Sensor, Rainfall Sensor, Wi-Fi Module,LCD, Buzzer

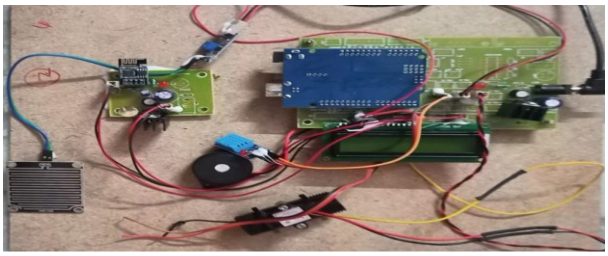
SOFTWARE COMPONENTS

The following software tools used in the proposed system : Arduino IDE, Proteus Design Tool

TECHNOLOGY USED

IOT

VI. RESULT AND DISCUSSION



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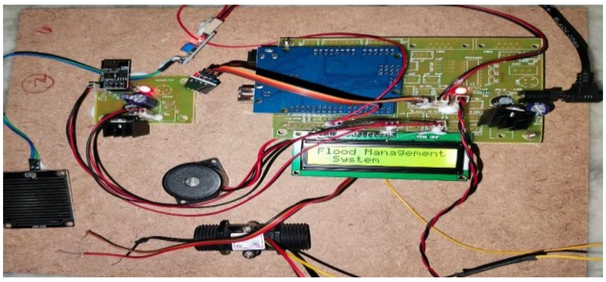
Volume 13, Issue 2, 2025

This is our project, which involves a microcontroller-based system featuring an LCD display, relay module, sensors, and power supply. It is designed for automation and monitoring purposes, possibly in an IoT application



The system monitors water flow, rainfall, temperature and water levels, displaying real-time data on an LCD

The LCD screen in the image displays temperature, humidity, water flow and water level where water level has reached to level-1 when rainfall is present

The LCD screen in the image displays temperature, humidity, water flow and water level where water level is empty when rainfall is absent

The Telnet output displays real-time sensor data for Flood Management system.

VII. CONCLUSION

A real-time mobile sensing unit for the rivers in the hilly region of Uttarakhand, India, has been developed as a part of this research work to provide updated hydro- meteorological data. In addition, the system sends alerts to local authorities and users when sensor values reached specified threshold levels configured in the system. We have the 'FLOODWALL' smartphone application to get data from the Google Cloud Platform and send an alert notification. The objective of this research work is to provide the real-time hydro-meteorological data collected by the mobile sensing unit for predicting future Flood disaster events by using various predictive modelling techniques to warn people in advance.

The sensors have been calibrated in advance, and the data they produce is precise and reliable. In addition, the Alert Module sends alerts to authorities and people when the

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measured value is predicted as Flood event trained by the ML algorithm. The smart phone application has three independent modules: the Burst reports sensor data in real- time; the second sends alerts; and the third provides historical and real-time information on various features. This application solution is designed to acquire information from the data collection unit and store it in the cloud, and issue notifications to the authorities and locals who are impacted by the incident using smartphone application 'FLOODWALL'.

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