EARLY FLOOD DETECTION AND AVOIDANCE SYSTEM

INTRODUCTION

Flooding is one of the globe‟s most common natural disasters. Although wecan estimate rainfall or track cyclone paths with great precision using satellite images, having real-time monitored data such as flow, precipitation level, or water level is critical for making smart decisions regarding the actions that must be taken to prevent flooding. Flood damage costs are highly correlated with the amount

of warning time provided prior to a flood event, making flood monitoring and forecasting vital to limiting flood damagecosts.

While the number of rainy days has reduced, intense rain events involving flash floods have become more common. Wireless sensor networks (WSNs) are a new type of highly dynamic condition that may be used for a variety of purposes, including military frameworks, living space inspection, precision horticulture, and building monitoring.

To display and assess the surge over a stream, the Time Flood Monitoring System (RTFMS) is employed. The fundamental cause of flood is the hydrological condition of heavy rain fall and enormous water flow. A contributing reason is the metrological situation, which includes poor drainage, excessive siltation in rivers, embankment breaching, and floodwater spilling over them. Flooding conditions are influenced by geographical factors such as water flows from neighboring states, river flows across states, and topographical conditions to some extent. Because of the availability of emergency systems in modern countries such as the United States and Japan, flooding is considerably reduced and has little impact.

The "Early Flood Detection & Avoidance System" is a smart system that monitors a variety of natural occurrences in order to predict floods and prepare for them caution and reduce flood damage. Natural disasters such as flooding and other natural disasters can be severe, causing property damage and even death. The system identifies floods by analysing a variety of natural parameters in order to eliminate or mitigate the flood's impacts. The obtained data may be accessed by government officials from anywhere using IoT because the system is Wi-Fi enabled. The system monitors a variety of natural elements, including rainfall, water level, and flow rate, to detect a flood. The system is made up of numerous sensors that collect data on individual characteristics in order to collect data on the natural components

described above. Water level and water flow sensors are installed at various sites across the river and dam, collecting data on water level and water flow from the dam and rivers. The occurrence of floods is predicted based on this information. The main purpose of this project is to develop and build a flood monitoring and detection system based on the internet of things. The project's goal is to create an early flood detection system that will automatically identify floods and provide data to the Local Government Unit and citizens. The precise goals of the project include detecting the current level of water in rivers at various locations, predicting river water levels, warning residents about floods, and updating government officials about the situation of the floods, and informing government officials about the situation.

ABSTRACT:

Among the most common impact towards mankind, flooding is the most common natural disaster. Floods have been known to do significant damage. There are many sophisticated system widely in practice by the organizations and responsible authorities in monitoring the flood level in flood prone regions. Most of these devices are very costly to be used and maintained. In the proposed system using N-mote and N-gateway, the information collected by the sensors such as temperature and water level by ultrasonic sensor can be sent to cloud by using IOT device and if threshold

values of the environmental conditions increases, the warning message will be sent to responsible authorities and in turn will be intimated to the people living in the flood prone region. Such a system enables both private and government organizations to work on their emergency evacuation and mitigation plans for a safer move before the flood situation get worse.

SWOT ANALYSIS:

Strength	Weakness	Opportunities	Threat
• Early warning to those at risk • Multi agencies approaches • Various methods used	• Funding resources • Knowledge and training in using all equipment related to the early warning system • Lack of human resources • Lack of coordination and communication between agencies • Dissemination of information	• Learnt lesson from other countries • Collaboration in developing the more effective warning system	• Community capacity building • Ineffective Flood Forecasting and Warning Systems (FFWS) and delayed evacuation response • Damage to the system provider • Media

4W's & 1H:

Who: Automatically identify floods and provide data to the Local Government Unit and citizens.

What: Able to check water level on a remote place autonomously.

When: Emergency evacuation and mitigation plans for a safer move before the flood situation get worse

Where: Predicting river water levels, warning residents about floods, and updating government.

How: Sensor networks will be utilized to accurately measure the amount of flooding, and a mobile phone connected to this technology will communicate forecasting information to those impacted, preventing avoidable loss caused by this natural disaster.

REQUIREMENTS:

High level Requirements:

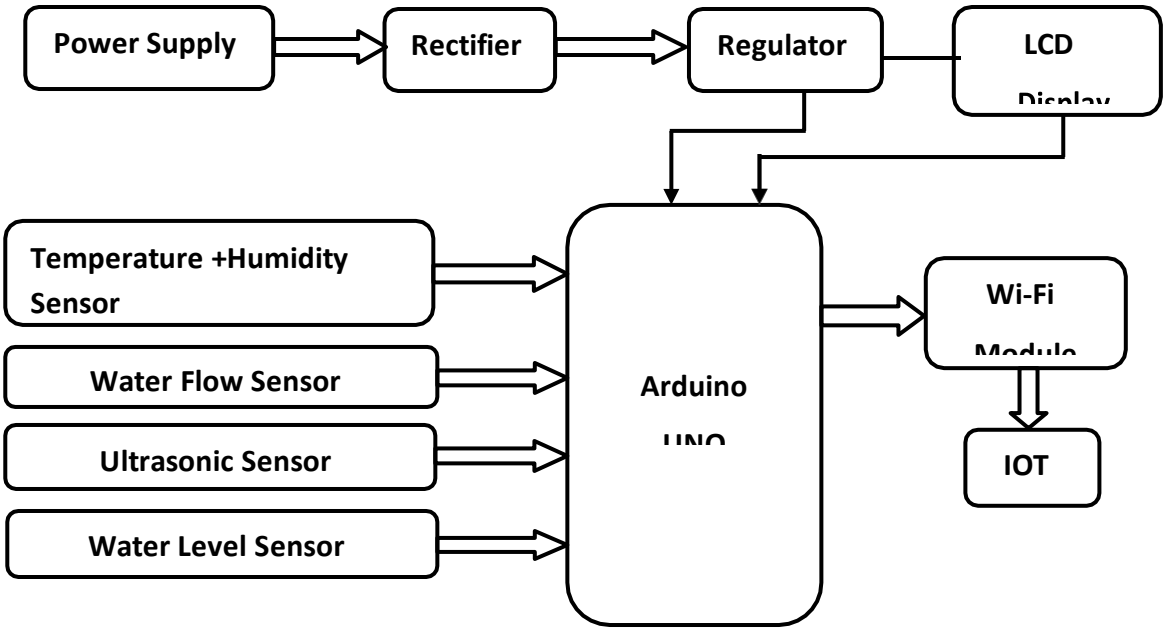
ID	DESCRIPTION
HLR1	Collect data on water level status from all locations and send it to a central server
HLR2	Able to check water level on a remote place autonomously
HLR3	Have a web-based system that users may access 24 hours a day, seven days a week via an internet connection

Low level Requirements:

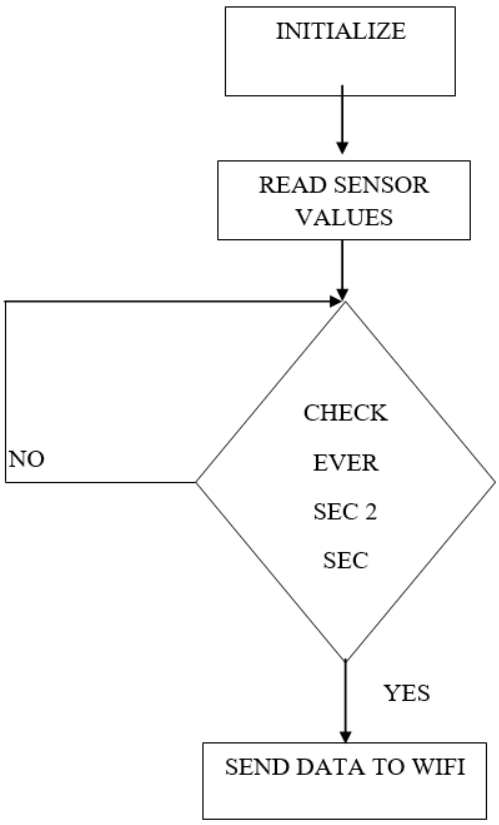
ID	DESCRIPTION
LLR1	Provide a trending function that displays real-time or historical data
LLR2	Use a split screen to compare water movement from four distinct locations at the same time
LLR3	A map of the entire monitoring area that shows the current status of each station

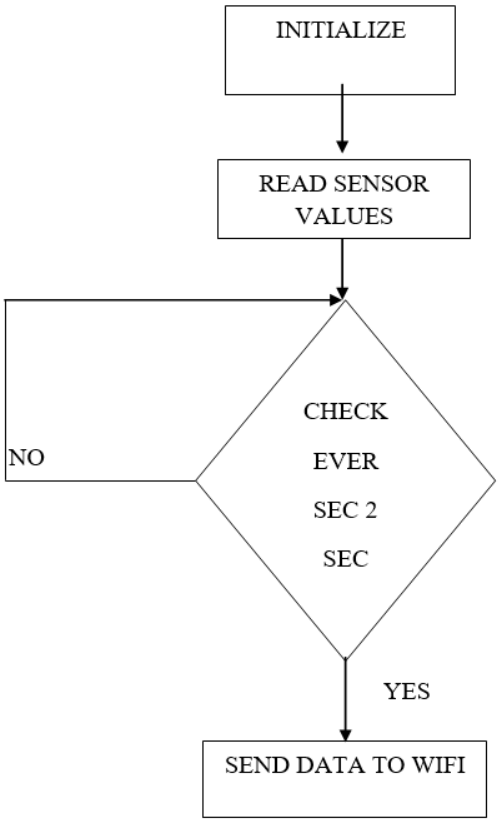
3.ARCHITECTURE:

3.1 Block Diagram:



3.2 Sequential Diagram:





3.3 Components Required

ARDUINOUNO

Arduino is an easy to use and build open-source electrical platform based on the coupling of hardware and software. They're built to read the input – when water reaches a certain level – and turn it into an output - issuing the alert. The Arduino Uno is an ATmega328-based microcontroller board. The kit includes a 16MHz resonator, USB connection, power jack, in-circuit system programming (ICSP) header, and reset button. It has 20 digital input/output pins (of which 6 can a 16MHz resonator, a USB

connection, a power jack, an ICSP header, and a reset button); a 16MHz resonator, A USB port, a power connector, an ICSP header, and a reset button are all included. It includes everything you'll need to get started with the microcontroller, including a USB cable to connect it to a computer and an AC-to-DC adapter or battery to power it. The Uno is unique in that it does not employ the FTDI USB-to-serial driver chip found on previous boards. Instead, it uses an ATmega16U2 that has been designed to function as a USB-to-serial converter. This supplemental microcontroller comes with its own USB boot loader, allowing expert users to programme it. The Arduino is a wonderful introduction platform for embedded electronics since it has a huge support community and a big collection of support libraries and hardware add-onshields.

WI-FI MODULE –ESP8266

The ESP8266 Wi-Fi Module is a self-contained SOC with an integrated TCP/IP protocol stack that can provide access to your Wi-Fi network to any microcontroller. The ESP8266 may either host an application or allow another application processor to flood all Wi-Fi networking functionalities. Each ESP8266 module comes pre-programmed with AT command set software, allowing you to connect it to your Arduino device and gain about as much Wi-Fi functionality as a Wi-Fi Shield (right out of the box). The ESP8266 module is a low-cost board with a large, and rapidly increasing,

community. The ESP8266 Module does not support 5-3V logic shifting, hence an additional Logic Level Converter is required. Please do not use your 5V dev board to power it. The flash disc size on this latest version of the ESP8266 Wi-Fi Module has been increased from 512k to1MB.

TEMPERATURE AND HUMIDITYSENSOR

The DHT11 is a simple digital temperature and humidity sensor that comes at a reasonable price. It uses a capacitive humidity sensor and a thermostat to detect the ambient air, and then generates a digital signal on the data pin (no analogue input pins needed). It's simple to use, but data collection necessitates careful timing. The only major disadvantage of this sensor is that you can only collect new data from it once every 2 seconds, so sensor values can be up to 2 seconds outdated when using our library.

ULTRASONIC SENSOR

The HC-SR04 Ultrasonic Distance Sensor is made up of two ultrasonic transducers at its core. The one serves as a transmitter, converting electrical signals into ultrasonic sound pulses at a frequency of 40 KHz. The receiver listens for the pulses that have been broadcast.

It receives them and generates an output pulse whose width can be utilised to calculate the pulse's distance travelled. It's as easy as pie. The sensor is compact, easy to utilise in any robotics

project, and provides excellent non-contact range detection with 3mm accuracy between 2 cm and 400 cm (about an inch to 13 feet). It may be immediately connected to an Arduino or any other 5V logic microcontroller because it runs on 5 V.

WATER FLOWSENSOR

A water flow sensor is made up of a plastic valve that allows water to pass through. A water rotor and a Hall Effect sensor are used to observe and measure the water flow.. The rotor revolves as water runs through the valve. The change in the motor's speed can be seen this way. The Hall Effect sensor calculates this change and outputs it as a pulse signal. As a result, the rate of water flow may be determined. The Hall Effect is the basic operating concept behind this sensor's operation. The spinning of the rotor induces a voltage difference in the conductor in this sensor, according to this concept. The induced voltage differential runs in the opposite direction of the electric stream. The rotor revolves when the moving fan turns due to the flow of water, which produces the voltage. The Hall Effect sensor measures the induced voltage and displays it on the LCD display. The water flow sensor can be used in hot, cold, or warm water, as well as clean and unclean water. These flow rate sensors are available in a variety of sizes and flow rate ranges. These sensors are simple to connect to microcontrollers such as Arduino.

WATER LEVELSENSOR

The water level sensor operates in a rather easy manner. The exposed parallel conductors operate as a variable resistor (similar to a potentiometer) whose resistance fluctuates in response to the water level. The change in resistance is proportional to the distance between the sensor's top and the water's surface. The resistance is proportional to the water's height in inverse proportion. The resistance is proportional to the water's height in inverse proportion. The deeper the sensor is submerged in the water, the better the conductivity and the lower the resistance. The less water the sensor is immersed in, the worse the conductivity and the higher the resistance. The sensor generates an output voltage based on the input voltage to detect the water level.

LCD

The LCD (Liquid Crystal Display) screen is a type of electronic display that has a wide range of uses. A 16x2 LCD display is a typical module seen in computers wide range of devices and circuits. Seven-segment and other multi-segment LEDs are favoured over these modules. This is due to the following reasons: LCDs are cheap, easy to programme, and allow for the display of unique and even creative characters (unlike seven segments), animations, and on each of its two lines, a 16x2 LCD can display 16 characters per

line. On this LCD, each character is displayed in a 5x7 pixel matrix. On the LCD, there are two registers: Command andData.

The LCD command instructions are stored in the command register. A command is a collection of instructions given to the Led to perform a certain activity, such as initialising it, cleaning its screen, or changing its settings in the cursor position, controlling displays etc. The data register stores the data and will be displayed on the LCD.The data isthe ASCII values of the character to „br displayed on the LCD.

FUTURESCOPE

The future scope of the proposed design is to predict the risk analysis of the effect over the low-lying areas and adverse effect analysis over that condition.

TestPlan and Output:

Test ID	Warning	Water Level	Result
L_01	Low (24-48 hrs)	RISING	FLOOD
L_02	Low (24-48 hrs)	RISING	FLOOD
L_03	Low to moderate (72 hrs)	FALLING	NO FLOOD
L_04	Low to moderate (24-48 hrs)	RISING	FLOOD