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VIRTUAL ASSISTANCE IN STREET WATER LOGGING

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***Abstract*:** Street water logging is a major urban problem in metropolitan environments, especially after periods of high rainfall or flooding. In order to improve accessibility and guarantee resident safety, smart city efforts are increasingly concentrating on resolving this issue. Municipalities are using creative solutions for efficient monitoring and handling of street water logging situations by utilizing Internet of Things (IoT) technologies. The integration of sensors and GSM connections with IoT-enabled devices is essential for early detection and warning systems related to street water logging. These systems use sensors to identify rising water levels, sending real-time data to centralized monitoring stations over GSM networks. Furthermore, ESP32 boards improve communication and data processing even further, enabling quick reactions. Authorities can take preventive action by proactively identifying at-risk sites through continuous monitoring of water levels and drainage conditions. In addition, prompt notifications provided to inhabitants enable them to undertake essential safety measures, promoting communal security and adaptability. These developments provide smart cities with increased capacity to lessen the effects of roadway water logging and improve urban livability.

Key words: Street water logging, ESP32 , Internet of Things , GSM.

I. INTRODUCTION.

The development of smart city accessibility for all facilities is one of the government's main plans for the modern world. While there are many options available globally, IoT can be a key substitute for creating these smart urban zones. Environmental monitoring, in particular catastrophe management, early warning systems, and natural information analysis, is one of the areas where the Internet of Things is having a rapid influence. Water level monitoring and manageability are two important aspects of environmental observation. Monitoring and safeguarding water supplies is an important utility service that is often challenging. For example, because of the floods, a water monitoring system is essential because it can provide early notice to nearby residents so they can take action, such as planning to leave or making other arrangements. The modern world is constantly filled with excellent smart gadgets.

II. LITERATURE SURVEY

The increased accessibility of facilities is emphasized by the global push for the development of smart cities. IoT technology is essential for early warning systems, disaster management, and environmental monitoring. Controlling levels and conserving water are essential. By utilizing premium smart equipment, IoT-based water monitoring helps with emergency preparedness, evacuation plans, and advance notifications even in the face of obstacles like floods.[1] Flood forecasting techniques, incorporating real-time estimation and machine learning, offer accurate flood value predictions and enable informed decision-making regarding reservoir operations. Comparison with traditional methods demonstrates the efficacy of machine learning in flood modeling, facilitating improved flood management strategies.[2] IoT technology plays a pivotal role in flood detection and prevention by employing water level sensors and machine learning algorithms. Real-time data transmission to remote databases enables timely alerts to users via mobile apps and websites, enhancing disaster preparedness and response.[3] This paper reviews an enhanced flood detection system leveraging IoT technology, emphasizing aspects such as sensor deployment, data transmission, and system efficiency. Such systems contribute significantly to bolstering flood management capabilities in smart cities.

III. BASIC PRINCIPLE.

The main idea driving research into wireless sensor network (WSN) based landslide detection is developing a reliable system for real-time monitoring of landslide-prone areas. The objective of this study is to leverage the progress made in sensor technology and network connection to create a dependable early warning system that can identify landslide precursors and promptly send out notifications to reduce possible hazards. The idea is to create sensor nodes that are outfitted with a variety of environmental sensors in order to identify changes in variables that could signal an imminent landslide, like temperature, humidity, soil moisture, and slope stability. By placing these sensor nodes in strategic locations throughout high-risk areas, they create a network that continuously collects and sends data to a central monitoring station. The technology gathers and analyzes data to find trends and anomalies indicative of landslide activity. This allows for the proactive implementation of measures aimed at preventing or minimizing damage. The idea also stresses the integration of communication technologies, such as GSM modules, to guarantee the smooth delivery of notifications to authorities and locals in high-risk locations. The overall goal of this field of study is to better prepare for disasters and lessen the negative effects of landslides on infrastructure and communities by utilizing WSN technology to improve landslide detection skills.

IV. COMPONENT SPECIFICATION.

1. Micro Controller NODEMCU ESP-32:

The NodeMCU ESP-32 is a versatile microcontroller featuring built-in Wi-Fi and Bluetooth capabilities. It is based on the ESP32 chip, offering a compact and powerful solution for IoT projects, sensor applications, and wireless communication tasks.

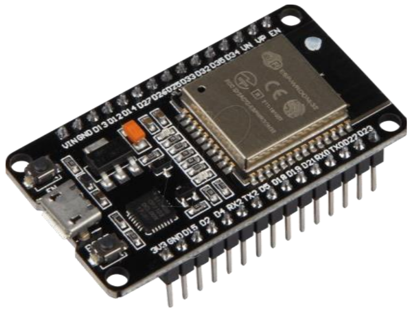

FIG 1: Micro Controller NODEMCU ESP-32.

2. Ultrasonic Sensor:

A gadget known as an ultrasonic sensor uses high-frequency sound waves to monitor how long it takes for the waves to return after colliding with an item. This data is used to calculate distance, detect obstacles, and enable proximity sensing in various applications.

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FIG 2: Ultrasonic Sensor.

3. SIM 900A GSM MODULE:

SIM900A is a dependable and incredibly small wireless module. With its SMT design and very potent single-chip CPU that integrates the AMR926EJ-S core, this complete GSM/GPRS module offers you cost-effective options and modest dimensions.

FIG 3: SIM 900A MODULE.

V. BLOCK DIAGRAM.

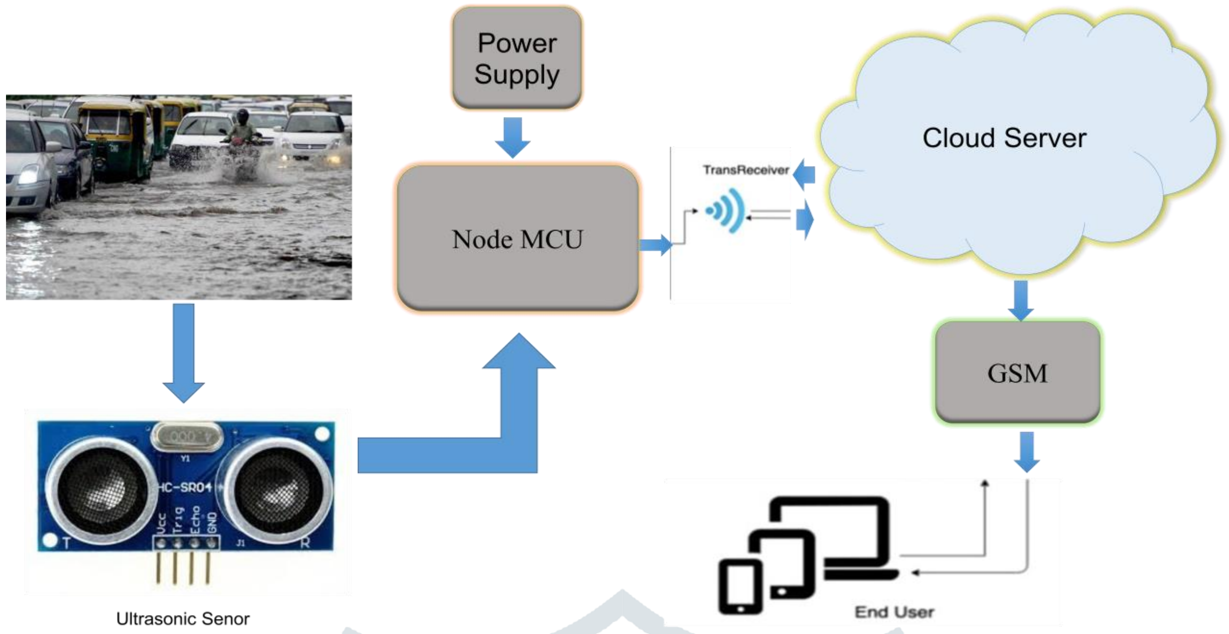

FIG 4: BLOCK DIAGRAM.

VI. PROPOSED METHODOLOGY.

A water level on a road is detected by an ultrasonic sensor that uses sound waves to initiate the system process. A data relay is initiated on an ESP32 board by the sensor upon registering a water level. Initialization of the GSM module and the ultrasonic sensor is done by the ESP32 board, which is coded in C++ using the Arduino IDE. The sensor's data is subsequently processed and compared with thresholds that have been stored. Alarm messages are sent by the ESP32 when the water level rises above a set threshold. You have two options for sending these messages: using Wi-Fi or the GSM module, which communicates with the 3G network. In order to enable quick action to reduce potential threats, the alarm messages inform the appropriate users and authorities about the detected water level.

The ESP32 board's software implementation includes a number of crucial features. In order to initiate communication and collect data, it first initializes the ultrasonic sensor and GSM module. Second, it gathers information from the ultrasonic sensor continually to track the water level in real time. The software then determines whether the water level is higher than acceptable bounds by comparing the collected data with preset thresholds or stored data. The ESP32 sends alert signals to stakeholders when it detects a rising water level. The system has the option to send messages via Wi-Fi, but the GSM module offers a dependable substitute, particularly in places with spotty coverage. To help customers monitor the situation remotely and make educated judgments, the device can also duplicate real-time water level data on a website. Ultimately, effective monitoring and prompt distribution of vital information about water levels on roads are guaranteed by the software implementation on the ESP32 board.

CONCLUSION.

Using Internet of Things technology, the water logging detection and response system represents a significant breakthrough in disaster management and urban resilience. It allows real-time monitoring and response with a mix of sensors, microcontrollers, cloud servers, and GSM modules. Through rapid water level detection and action coordination, the system improves both road safety and urban resilience. For long-term planning, its data analysis features support well-informed decision-making. In the end, by utilizing IoT for proactive disaster management, this project increases the resilience of urban environments by guaranteeing public safety, reducing the negative effects of waterlogging on urban infrastructure, and improving the well-being of people.

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