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STREET DEWATERING AND CLIMATIC CONDITIONS MONITORING SYSTEM IN CITIES

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Abstract: This system proposes a comprehensive solution for street dewatering and climate conditions monitoring system in cities. Integrating advanced technology and sensors, the system aims to mitigate flooding and enhance urban resilience to extreme weather events. By deploying dewatering pumps and various climate sensors, real-time data on water levels, temperature, humidity, and rainfall can be collected and analyzed. The system focuses on leveraging these insights to develop proactive strategies for flood prevention and climate adaptation in urban environments.

I. INTRODUCTION

Urban areas face increasing challenges due to climate change, with heavy rainfall leading to frequent flooding and infrastructure damage and also climate change is one of the most critical global challenges of our time. To address these issues, there is a pressing need for innovative solutions that combine street dewatering systems with climate monitoring technologies. This project aims to propose a holistic approach to mitigate flooding and monitor climate conditions in cities, ensuring the safety and well-being of urban residents while promoting sustainable urban development.

II. RESEARCH METHODOLOGY

2.1 Block Diagram

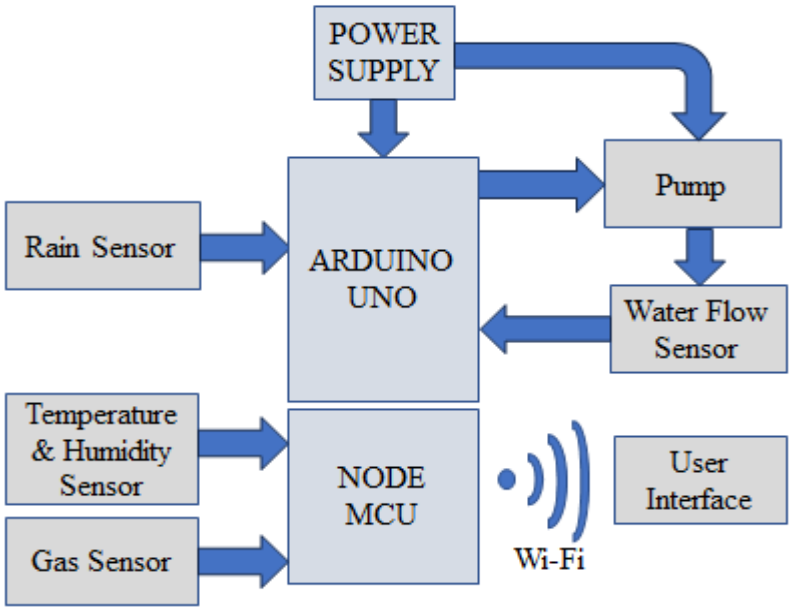


fig: 2.1 block diagram

- When rain is detected by the rain sensor, it signals the microcontroller to activate the relay, initiating the pump to remove excess water from the street. If the pump's outlet has no water flow, the water flow sensor triggers the pump to stop, preventing any further operation until water flow resumes.
- Various environmental conditions such as temperature, humidity, rainfall, and air quality are monitored by sensors including temperature, humidity, rain, and gas sensors. These sensors transmit their readings to the microcontroller, which then utilizes Wi-Fi connectivity to send this data to the user interface for monitoring and analysis.

The main hardware components are:

A .NodeMCU

fig2.2.Nodemcu

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added.

B. RAIN SENSOR

fig.2.3.Rain Sensor

A rain sensor is one kind of switching device which is used to detect the rainfall. It works like a switch and the working principle of this sensor is whenever there is rain, the switch will be normally closed.The primary function of a rain sensor is to detect rainfall and send a signal to a control system or device, which can then trigger certain actions or responses.

C. WATER PUMP

fig.2.4.Water pump

The water pump can be defined as a pump which uses the principles like mechanical as well as hydraulic throughout a piping system and to make sufficient force for its future**.**

D. MQ-135 GAS SENSOR

fig.2.5.Gas Sensor

The MQ-135 gas sensor is a popular electronic component used for detecting and measuring air quality, particularly the presence of hazardous gases. It is commonly used in applications such as air quality monitoring systems, indoor air quality assessment, and gas leakage detection. The MQ-135 gas sensor operates based on the principle of chemi-resistive sensing. It consists of a tin dioxide (SnO2) semiconductor layer that exhibits changes in electrical resistance when exposed to different gases.

E. WATER FLOW SENSOR

fig.2.5.Water flow sensor

Water flow sensor consists of a copper 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. And the hall-effect sensor outputs the corresponding pulse signal.

F. RELAY MODULE

fig.2.6.Relay module

A relay module is an electronic device that acts as an electrically controlled switch. It consists of a coil, an armature, and one or more sets of contacts. The relay module is commonly used in various applications to control high-power or high-voltage circuits using a low-power or low-voltage signal.

G. TEMPERATURE & HUMIDITY SENSOR(DHT-11 SENSOR)

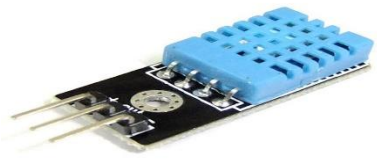


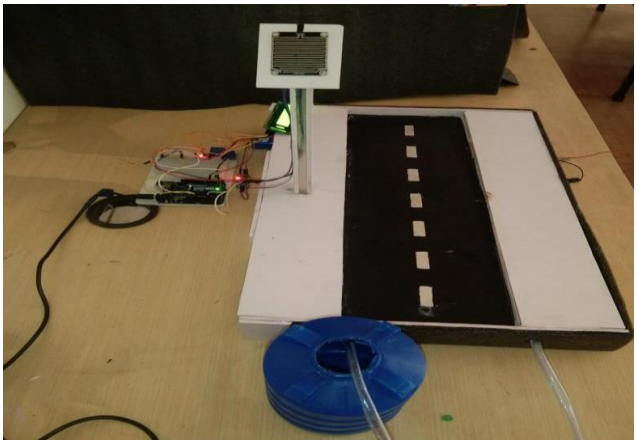
fig.2.7.Temperature & Humidity Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). It’s fairly simple to use, but requires careful timing to grab data.

III. RESULT

3.1 Result

- Implementation of an automated street dewatering system using sensors and pumps, effectively managing water levels during rain events and minimizing flood risks.
- Development of a web-based monitoring platform displaying real-time climatic data, facilitating data-driven decision-making and enhancing urban infrastructure resilience.



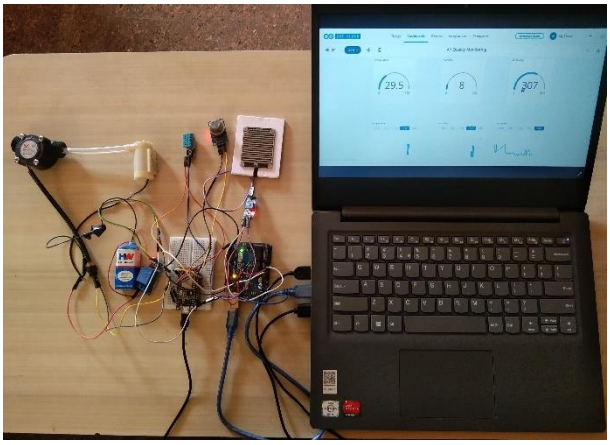


fig.3.1.Result

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