AUTOMATED STREET LIGHT CONTROL AND MANHOLE MONITORING WITH FAULT DETECTION AND REPORTING SYSTEM

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ABSTRACT

Our Project automatically operates the Street Lights by using Sensors in timely. Additionally, the system checks manhole conditions for potential hazard, by reducing accidents and improving maintenance. When an issue is detected, it automatically sends real-time reports to the municipal department. By optimizing energy consumption and reducing response time to faults, this system contributes to sustainability and urban livability. Recently, population is increasing day by day, which gives in lack of public awareness of healthy environment. This has been creating a health issue all over the world. The world is increasingly getting smarter and looking for secure, perception and smart conclusion of resource optimization to increase quality of consumer life. This necessity has led to the development of smart and safe cities connecting the virtual world to the physical bring real-time services that modify real-time situations based on IOT technology. This system uses various sensors for monitoring infrastructural of infrastructural facility in a city. System sensor connected ATmega16 microcontroller using wireless communication technique IOT. We are designing a smart city for better facilities and auto alerting the treat in a community. In this project we Facilitates drainage leakage system, auto intensity control of streetlight for power saving, everything is updated into IoT.

Keywords: Automated street light control, Fault Detection, Reporting system.

1. INTRODUCTION

Drainage is defined as the infrastructure for drying the land from the excess and unutilized water, rainwater, and wastewater. The type of drainage channel can be a natural channel or constructed channel. In urban areas, drainage channels are built to control the surface water due to rain and wastewater, so it does not disturb the activities and the country’s facilities and property in the community. Drainage conditions should be monitored to maintain its proper function. In fact, not all areas have drainage monitoring teams. It leads to irregular monitoring of the drainage condition. The irregular monitoring has contributed to the clogging of the drainage that implies to the siltation which triggers flooding in the neighborhood. Manual monitoring is also inefficient. It needs a lot of dedicated people who are only able to record limited reports with low accuracy. These weaknesses lead to the slow handling of problems in drainage. Wireless Sensor Network (WSN) is a monitoring technology which consists of node sensors that spread and coordinated use of a wireless network system. Each node has data processing (microcontroller), power supply system (battery or solar cell), and involves one or more sensors. WSN systems have a higher level of efficiency than wire line network system in terms of cost, flexibility and reliability and is expected to replace the hybrid technology (wire line and wireless) in the coming years. WSN technology can be applied in many fields that require monitoring data regularly. An example is the environmental experts which monitor the habitat of a region, monitoring the dry fields of fire (fire bug), preventive maintenance on oil tankers using sensor network support, or observation of mountain environments that have the seismic parameters that can remotely monitor the level of activity of the volcano. Urban areas can also utilize this technology as iNews can monitor air pollution, strength building, flood hazards, the level of hilarity (noise) and the video feed, where everything can be observed through IOT. In an urban area, drainage has an important role in the prevention of flood danger. In these studies, emphasize the control simulation of sewerage systems for monitoring sensors and instrumentation drainage conditions. While research related to the implementation of a wireless sensor network (WSN) in the management of the drainage system has not been done. This paper will discuss the design of drainage systems to monitor conditions at some point in drainage by wireless sensor networks. Some node sensors are deployed at some point and will be communicated and will transmit the data about the condition of drainage to server An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

2. LITERATURE SURVEY

The Internet of Things is an infrastructure that includes physical devices, modern vehicles, buildings, and even essential electrical devices which we use on a consistent basis inter-connected to each other over the internet so that they can accumulate and exchange data amongst themselves. These "Things" have the priority and the ability to self-organize and communicate with other things without human intervention [1]. There are more than six devices connected to the Internet per person [2]. The concept of IoT aims to present the Internet as an even more pervasive and even more immersive. Moreover, by enabling easy access and interaction with an extensive variety of devices such as instance for home appliances, monitoring, surveillance cameras, sensors, displays, actuators, and vehicles. The IoT will improve the development of various applications that make use of the massive amount and diversity of data produced by objects to implement further services to companies, citizens, and public administrations. IoT applications are various and brought to several areas and domains for example: home automation, healthcare via mobile, manufacturing automation, elderly assistance, medical aids, automotive, smart grids and intelligent energy control, traffic management, etc. [3]. The IoT structure is subject to smart and self-configuring objects that are combined into a universal network foundation. That will give an addition to new opportunities for the Information and Communication Technologies (ICT) sector, covering the way to different services and applications able to leverage the interconnection of physical and virtual domains. IoT can be defined as ‘Objects having virtual personalities and identifications in smart areas employing intelligent interfaces to connect and communicate within medical, social, environmental and user’s context [4]. The influence of the IoT on the life of users can be considered as its key feature. This challenge has led to an increase in different and seldom, incompatible projects for the possible recognition of IoT systems. Accordingly, from a system prospect, the awareness of an IoT network, commonly with the required backend network services and devices, still needs an established best practice because of its novelty and complexity. Furthermore, to the technical challenges, the IoT model adoption also limited by the lack of widely and clearly admitted business model that can attract expenses to increase the deployment of these technologies [5]. Smart cities are those that make the use of these smart things to carry out various functions such as lighting, traffic control, connecting multiple cities, energy consumption and pollution control. The main purpose of smart cities can replace the way we look to the things. Regarding many aspects where IoT is set to rule we can say that from the most reliable day to day actions to the most complex human emotions, IoT will affect it all. Commonly, from the smart city applications and the underlying environment the citizens will benefit primarily. Recently the rapid growing of information and assets are essentials of being on top of millions of real-time reacting and communicating devices. Moreover, these are systems depending on the Internet of Things (IoT) technologies which are dedicated to utilizing these assets in substantial resilient and the quintessentially way which authorizes them to reach their full potential. The literature survey starts with an analysis of the various descriptions of a smart city by Fernandez-Anez [7]. Arasteh et al. [8] explain the relationship between the smart city and IoT, while Luong et al. [9] consider the economic and pricing policies and their relationships in communication and data collection also for IoT. Da Silva et al. [10] surveys the architecture for smart cities, Ijaz et al. [11] consider security perspectives of a smart city. El-Baz and Bourgeois [12] propose the architecture of a particular smart city application (Logistic Mobile Application).

3. EXISTING SYSTEM

Existing Street Light are needed to be switched ON and OFF manually as it has high power consumption and Quite Expensive Maintenance. Human presence is required to handle these functions. Manhole detection and repairing of the blockage becomes so time consuming. It is difficult to figure out the exact location of the blockage. In the existing system manhole fill alert will be made through manual human made alert due to that time delay happened. To avoid the limitations of the existing we propose A IOT Based Manhole Monitoring system integrated with Automated Street Lights for enhanced urban infrastructure safety and efficiency.

4. PROPOSED SYSTEM

This proposed system of smart municipal system has the three advanced features smart street light auto power control, smart drainage system, this system everything is updated to IOT module and lcd used for status. This smart city is useful to update us for drainage overflow, power saving. If we find any abnormal changes automatically this system alerts us over the internet of things. A all sensors are integrated to the ARDUINO micro controller. This proposed system will automatically alert the live location through IOT alert when drainage is filled

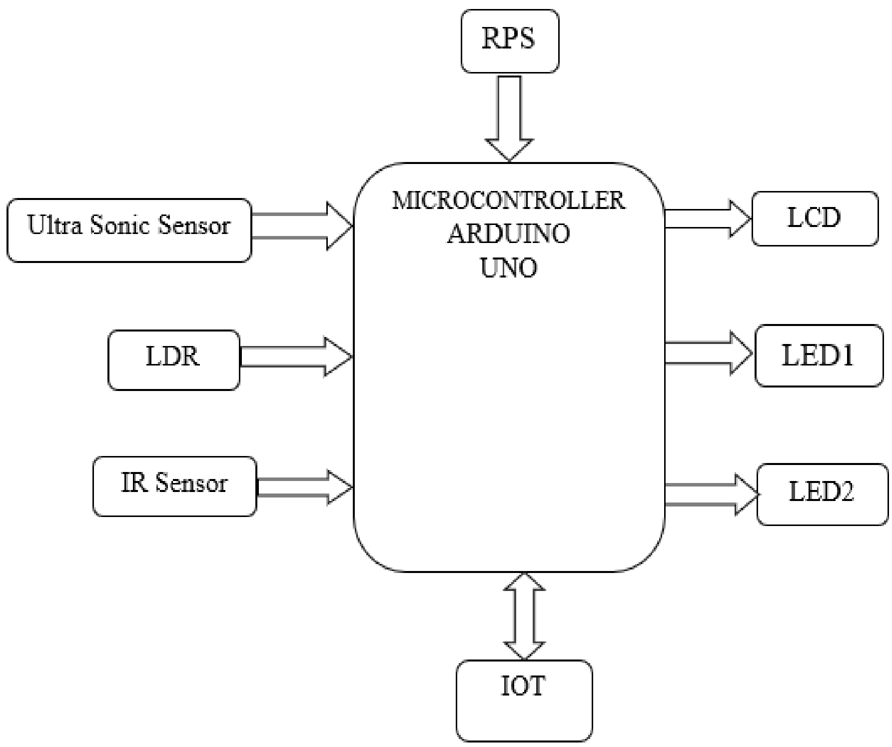

Fig. 1: Block diagram

FLOW DIAGRAM

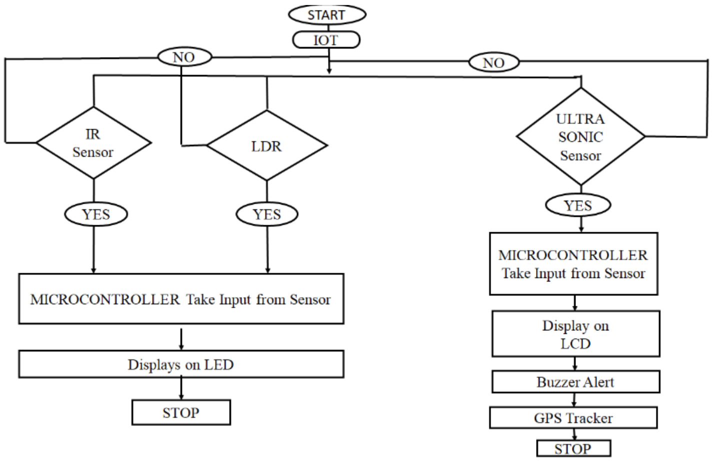

Fig. 2: Flow diagram

Logic Explanation:

- Libraries and Global Variables:
- The code includes the Liquid Crystal library and Software Serial library.
- It declares several global variables, including pins for various sensors, such as an ultrasonic sensor (trig Pin and echo Pin), an LDR (light-dependent resistor), IR sensors (ir1 and ir3), and an LED.
- ultraist () Function:This function is used to measure the distance using an ultrasonic sensor. It sends a pulse, measures the time it takes for the pulse to bounce back, and calculates the distance in millimeters (distance mm).
- beep () Function:This function controls a buzzer to produce a beep sound. It is used to provide audible feedback in certain conditions.
- setup () Function:The setup () function initializes the serial communication for both the primary Serial and a Software Serial (my Serial) instance.
- It sets pin modes for various components, including the ultrasonic sensor, buzzer, IR sensors, LDR, and LED.
- The LCD is initialized and displays a startup message.
- Logic in the loop () Function:The main logic of the code resides in the loop () function.
- It measures the distance using the ultraist () function and stores it in dist1.

SCHEMATIC DIAGRAM

This is the pin diagram where all the hardware components are being connected components. this ARDUINO microcontroller having 28 pins. In which 14 GPIO pins as digital pins and 6 GPIO pins. 16MHz crystal oscillator connected internally. The step-down transformer, Bridge rectifier capacitor with 1000f Resisters and led are connected in Regulated power supply which provides the 5v to the Arduino and all input/output modules.

Schematic:

- 16*2 LCD Monitor has connected with the Digital pins 2, 3, 4,5,6,7.
- IR sensors connected to A0, A1 pins of the Arduino micro controller.
- Ultrasonic sensor connected to A2, A3 pins of the Arduino micro controller.
- IoT Module connected to A4, A5 pins of the Arduino micro controller.

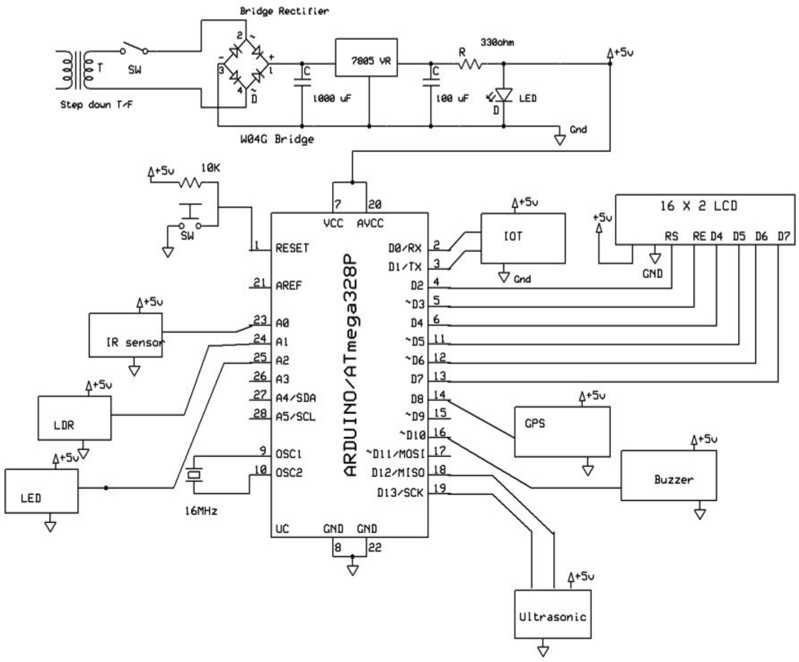

Fig. 3: Schematic diagram

5. HARDWARE IMPLEMENTATION

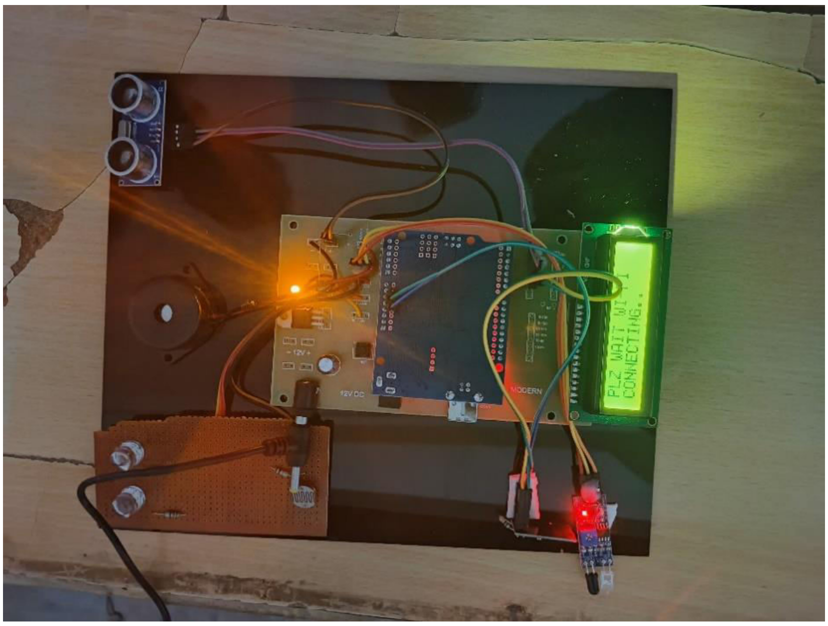

Fig. 4: Connecting To Wi-Fi

When the power supply is given, the model start working and we observe the all the sensors are activated and all the sensors are working as shown in 4 and fig.5

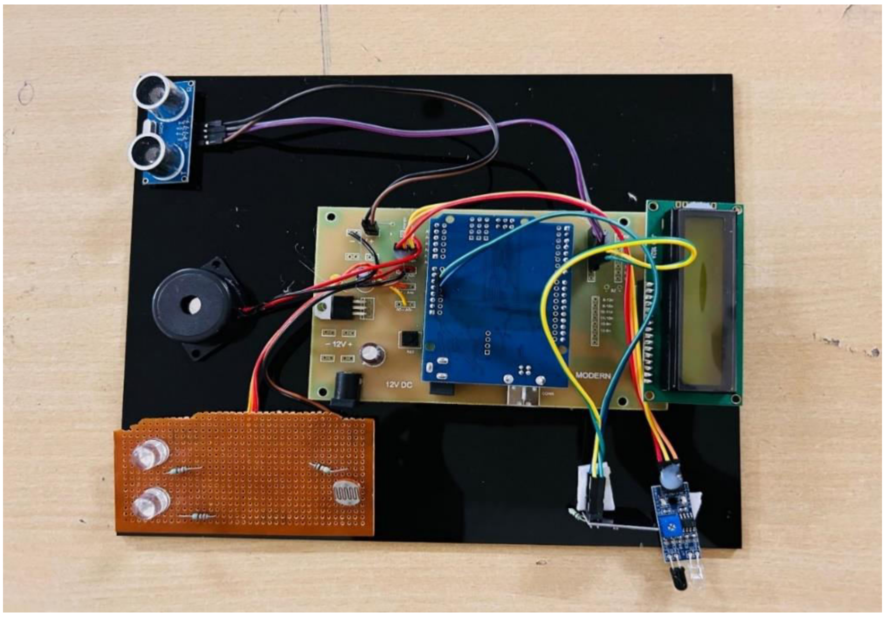

Fig. 5: Motherboard

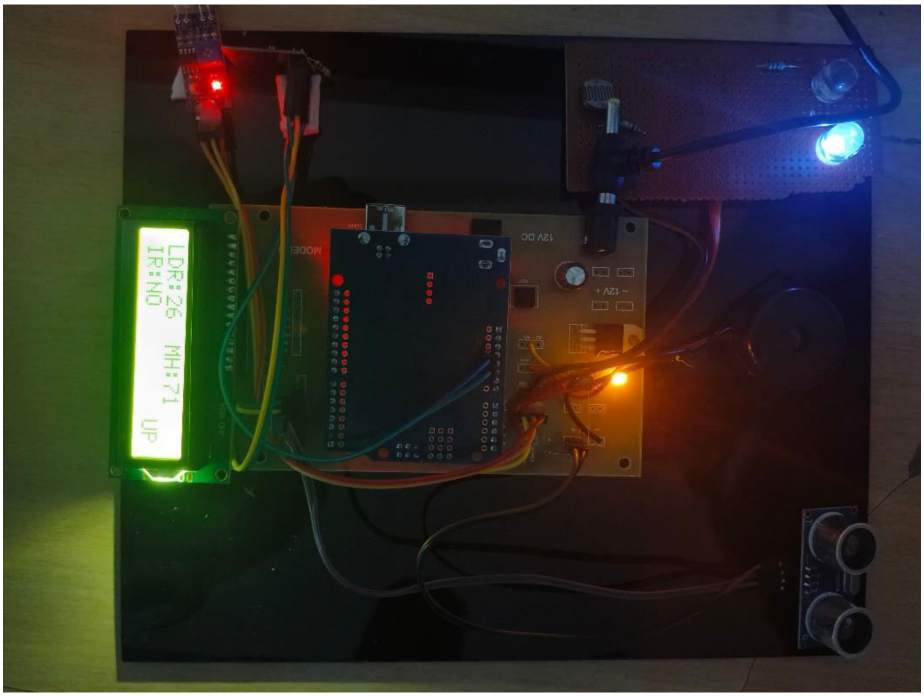

Fig. 6: LCD Display

Displaying the values of sensors

6. CONCLUSION AND FUTURE SCOPE

The project "smart municipality system" is designed such that the all sensors are working automatically and gives alert through IOT. Design and implementation of smart city by using

ARDUINO is done with 2 advanced applications smart drainage overflow, and smart street lighting system. When the drainage system s filled then this system will send the information to IOT. The project has been executed successfully and matched the expected results. The system can be further enhanced by integrating it with Artificial Intelligence (AI) algorithms. The AI algorithms can be used to analyze the collected data, identify patterns, and predict the probability of faults before they occur. Currently, the system uses wired communication for data transmission. Future developments can involve the use of wireless communication technology such as Bluetooth or Wi-Fi to transmit data. The proposed system aims to enhance its predictive capabilities for identifying risks in dark environments by incorporating data from additional sensors, such as accelerometers. This integration is particularly focused on predicting potential hazards like open manholes or unmarked non-standard speed bumps. The author anticipates future work in this direction and plans to present results soon. The engagement of the public is seen as a valuable contribution to data collection in the preliminary study. To broaden the application of the proposed framework, strategies will be explored to involve more participants from diverse areas, facilitating the creation of a city-wide street light illuminance map. As a future enhancement, the author intends to replace the threshold-based classification system with a more robust and concrete classifier.

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