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Smart Drainage Solutions for Smart Cities

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Abstract: **This Paper Present smart drainage management system. In big Smart cities due to heavy rain the chamber of the drainage gets blocked and it creates the various problems such as damages of various things. In this Paper we present ideas to make the cities smart and in that we are implementing smart drainage system which gives the solutions to avoid many problems which are beneficial for the society. In this system we used PIC microcontroller to control all system.**

Keywords: **Drainage management system, smart cities, Chamber, PIC microcontroller**

1. Introduction

In 21st century, world is becoming more and more electronics. With the help of EMBEDDED SYSTEMS, we can make so many things easier. We have to reduce the human efforts to greater extent. Almost in all the fields ELECTRONICS & EMBEDDED SYSTEMS has shown its usability & necessity Drainage system monitoring plays an important role to keep city clean. In fact, not all areas have drainage monitoring team. It leads to irregular monitoring of the drainage condition. The irregular monitoring leads to the blocking of the drainage that imply to the salutation which trigger flood. Manual monitoring is also incompetent. It requires professionals but they can only monitor very finite and maintain low accuracy. Also sometimes due to lack of knowledge the worker may meets to an accident as they have no idea that how will be the conditions in those manhole. The system will monitor if the blockage is occurred in between two manholes and giving the information of cracking of chamber to the municipal corporation. The system will able to monitor all these things in real-time scenario which will allow us to take proper actions of the particular problem in drainage system.
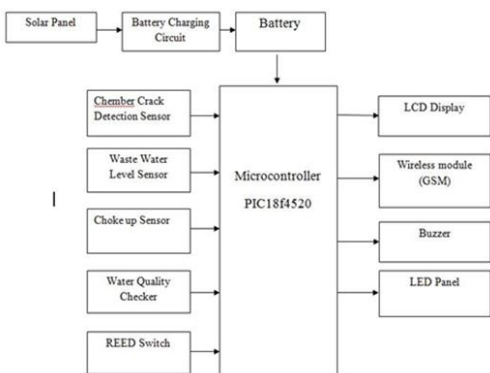

Fig. 1. Block diagram of proposed system

2. Block diagram description

A. Microcontroller

In this system we used PIC Microcontroller to control all operation.
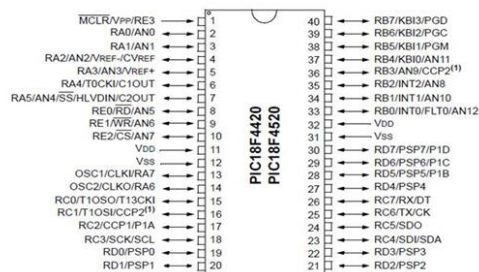

Fig. 2. Pin diagram of microcontroller

B. LCD

Fig. 3. LCD

Most of the projects with the any processor/microcontroller CPU (8085/8051/AVR/ARM) require some form of display. In market, various displays are available like 7-segment 5*7 matrix LED and LCD, bar graph, LCD, etc. It is important for deciding the required display set for our project. Selection of display depends on various factors like power consumption, ambient light conditions, surrounding temperature, visibility from long distance, total information to be display, cost of display, circuit/lines required for display interfacing etc.

C. GSM

Fig. 4. GSM module

GSM is a mobile communication modem; it is stands for global system for mobile communication. A GSM modem is a

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device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection. In proposed system GSM module is used for sending a message to Municipal Corporation regarding the blockage or crack found in drainage.

D. Water level sensor

Water level indicator is widely used in many industries and houses. A Water Level Indicator may be defined as a system by which we can get the information of any water reservoir. Drainage overflow is a common problem in which water level detection is required. The solution given to this problem by using simple transistor base water level indicator circuit. This circuit is very helpful to indicate the water level in the drainage.

E. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. In proposed system buzzer is an output device used for indication of blockage.

Fig. 5. Buzzer module

F. Solar plate

Fig. 6. Solar panel module

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaic (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

G. Battery

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. In proposed system battery is used as a power supply for a whole circuitry. It stores electrical energy received from solar plate or panel.

Fig. 7. Battery

H. Water quality sensor

Smart Water is suitable for potable water monitoring, chemical leakage detection in rivers, remote measurement of swimming pools and spas, and levels of seawater pollution. The water quality parameters measured include pH. It determines the quality of water. In proposed system this sensor is used to check whether the water is recycled or not. By recycling water wastage can be avoided.

I. Chamber crack detection sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. This module contain transmitter and receiver. In proposed system IR transmitter continuously transmits signal through drainage, if crack is detected then IR receiver does not receives the signal.
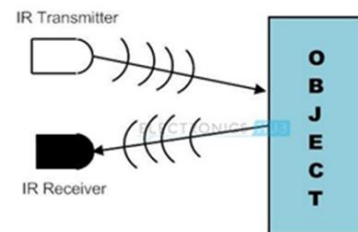

Fig. 8. Crack Detection (IR) Sensor

J. Choke up sensor

Choke up sensor is used to detect any blockage or clog found in system. If water level of drainage suddenly decreased then clog is found. GSM module send message to Municipal Corporation regarding the clog and the appropriate action will be taken.

K. REED switch

A reed switch consists of two ferromagnetic nickel iron wires

and specially shaped contact blades (reeds) positioned in a hermetically sealed glass capsule with a gap between them and in a protective atmosphere. A reed switch is used to detect whether the manholes are open or not.

3. Conclusion

The present invention provides a smart drainage management system that monitors certain parameters under the manhole and removes blockage based on the indication received. By using various sensors such as choke up sensor, cracked sensor, water level as well as blockage detection we can monitor the real time scenario of drainage system for detecting the problems in drainage system. By doing this we can able to take particular action on the problems as we will receive the early alerts of blockage as well as increase.

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