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Smart Drainage Monitoring and Clog Removal Using IOT

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ABSTRACT

Monitoring and eradicating of sewage outlet system is very difficult in recent times. The presence of clog in sewage system will lead to overflow in streets which in turn causes severe dangerous diseases. In recent survey it is found that hundreds of people died every year due to manual cleaning of drainage system. The purpose of our project is to monitor and eradicate the clog in the sewage system with minimum human effort. Our project utilizes a water level sensor to identify the clog in the pipe. Once the clog is detected, the notification is sent to both server and client using IOT. Once the notification is received, the clog is cleared before the water overflow. The various sensors and driver circuits are placed in different sections in the drainage network and the information is collected by using IOT. Therefore the project provides a smarter sewage management system.
Keywords : Drainage, Monitoring, Levels of indication, Server, Client, Clog, Eradication, Pressure pumps, sensor.

I. INTRODUCTION

Cities that installed their sewage collection systems before the 1930s typically used single piping systems to transports both urban runoff and sewage. This type of collection system is referred to as a combined sewer system (CSS).

In order to eradicate the toughness of lifestyle from various diseases, the drainage system should be maintained properly and to dispose the sewage in correct way.

Drainage is the natural or artificial removal of water surface and subsurface water from an area. The internal drainage of most agricultural soils prevent severe water logging (anaerobic conditions that harm root growth), but many soils need artificial drainage to improve production or to Manage water supplies .In previous years, there are two types of drainage monitoring systems. They are - Surface drainage and Subsurface drainage.

Below are 4 common types of drainage patterns:

- ✓ Dendritic. A dendritic drainage pattern is the most common form and looks like the branching pattern of tree roots
- ✓ Deranged. Drainage patterns are found in areas recently disturbed by events like glacial activity or volcanic deposition.
- ✓ Centripetal
- ✓ Trellised

As per the survey of World Health Organizations (WHO), the problems caused by poor drainage - Removing storm water and household wastewater (sometimes called “sullage”) is an important environmental health intervention for reducing disease. Poorly drained storm water forms stagnant

pools that provide breeding sites for disease vectors.

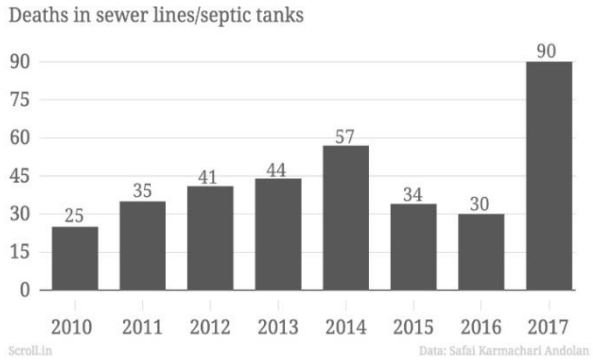

Figure 1

Because of this, some diseases are more common in the wet season than the dry season. Household wastewater may also contain pathogens that can pollute groundwater sources, increasing the risk of diseases such as lymphatic filariasis. Poor drainage can lead to flooding, resulting in property loss, and people may even be forced to move to escape floodwaters. Flooding may also damage water supply infrastructure and contaminate domestic water sources.

The common methods for improving drainage are as follows:

- ✓ Storm water drains
- ✓ Sullage disposal methods
- ✓ Combined drains
- ✓ Buried drains and combined sewers

The project proposes the mechanism of smart monitoring of drainage system and clog removal using Internet of Things (IOT). Our project proposes a novel system which automatically detect the sewage clogs using water level sensors and IOT module in order to avoid unclean environment , save government time and revenue being spent on clog identification and removal to avoid human labour in removing the clog occurred area and the sewage system is monitored at regular intervals.

Required changes in the system :

Detect the location and immediate information of the blockage. Then the eradication of clog occurred in the sewage.The usage of raspberry pi 3 and Arduino instead of ADC's. Thus, the System governing the flow of sewage from the pipes is done. The use of water level sensors to detect the variations in the flow and pressure pumps and acids to clear the clogs blocking the drainage systems.

II. METHODALOGY

The objective of our project is to detect the water level using water level sensors and eradicate the clog using pressurized motors with IOT module in order to avoid unclean environment, save the government time and revenue being spent on manual intervention

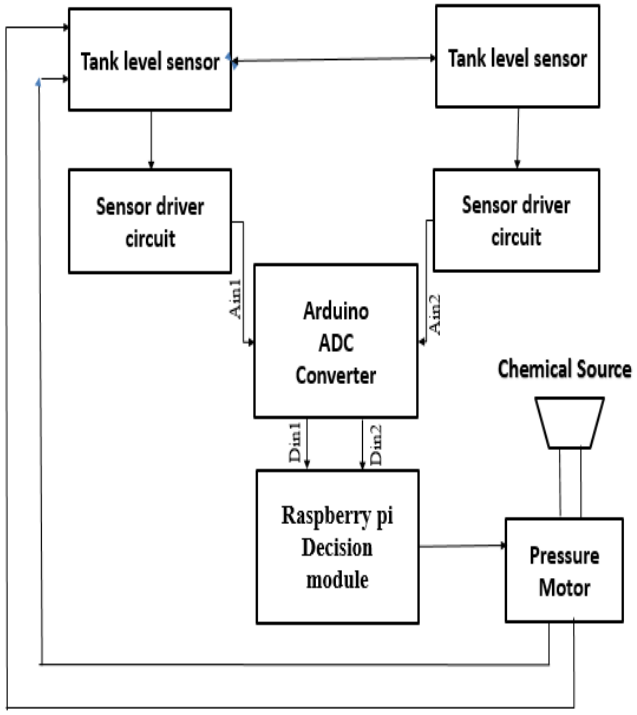

Figure 2

The block diagram consists of water level sensors,raspberry pi module power suppply, ardiuno uno, IOT module,sensor driver cirucuits,pressurized motor. The water level sensor detect the flow of water in three levels which depends on the clog in the drainage system. The levels of idenfication can be classified as first level,second level,third level.

2.1 First Level

If the range in water level sensor in between 100 to 200 then it is first level. In this level the clog can be

automatically removed with the help of pressurized pump. The pressure can be applied with some delay inside drainage pipe.

2.2 Second Level

The clog which can't be cleared from the first level will increase the level of water. Then it will reach the second level. If the range in water level sensor in between 200 to 300 then it is second level. It can be removed by two ways. They are auto mode and manual mode. This mode can be selected by peopleworking with it.In the auto mode the clog can be removed by increased pressure or with some chemical acids like sulphuric acid,hydrochloric acid etc.,

2.3 Third Level

Some of the clogs cannot be cleared in auto mode. This means the first level and second level operation cannot be used. If the range in water level sensor is above 300 then it is called as third level. It cannot be cleared by automatic mode. The highest level notification is sent to the authorized person and it should be removed manually.

III. TECHNOLOGY

Our project utlizes the recent technologies namely ATMEGA328P, raspberry pi 3 and pressure booster pump.

3.1 ATMEGA328P:

The high-performance Atmega pico power 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory.

- ✓ 1024B EEPROM
- ✓ 2KB SRAM
- ✓ 23 general purpose I/O lines
- ✓ 32 general purpose working registers
- ✓ The device operates between 1.8-5.5 volts.

3.2 Raspberry pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse.The Raspberry Pi 3 Model B features a quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz. This puts the Pi 3 roughly 50% faster than the Pi 2.Raspberrypicomes preloaded with Python, the official programming language of the Raspberry Pi and IDLE 3, a Python Integrated Development Environment.

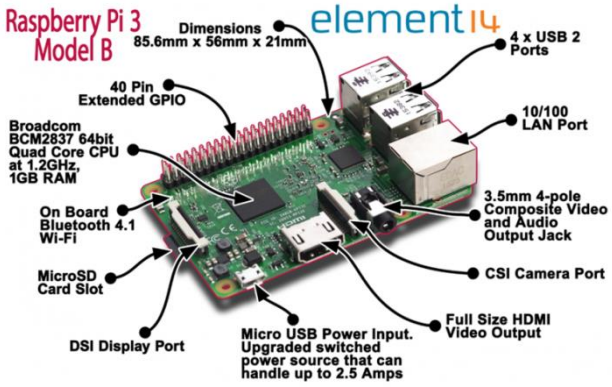

Figure 3

3.3 Pressure Booster Pump

A booster pump is a machine which will increase the pressure of a fluid.When directed at the clog the pressure from the pump will force the water to remove the clog from the system. The amount of pressure depends upon the clog needed to clear from the system. They are of two types-

Centrifugal pumps: Accelerate liquids with a revolving device called an impeller, which pushes liquids out through a valve opening. May be surface-mounted or submersible.

Diaphragm pumps: Type of positive displacement pump that expands and contracts a membrane in a regular rhythm to provide a steady, consistent flow.

IV. SOLUTION

- ✓ To create a smart drainage monitorng system
- ✓ To monitor the clog in the sewage system

- ✓ Immidiate information about the clog will be sent to the concerned offical.
- ✓ To remove the clog from the drainage system using pressurized motor.

V. RESULTS AND DISCUSSION

The analog data from the water level sensor is sent to the ardino module,where the analog data is converrted into digital data.The arduino module is used in the project as Multiple Input and Multiple Output (MIMO) and Analog and Digital Converter (ADC).The digital data is sent to the Raspberry pi module through the ardino module. The Raspberry Pi is a cross between a computer and a microcontroller board like you would find in so many smart devices. In our project the raspberry pi acts as an intermediate between the Arduino and Client. There are three types of notification that are sent to the client based on the level of water measured by water level sensor. Initially the sensor will be an ideal state i.e., zeroth level (no clog is present).If the clog is present in the sewage system there will be increase in water level. The level sensor detects the change in water level and the notification is sent to the server reporting first level warning. The System will try to eradicate the clog with the help of pressurized pump motor. The pressure is applied with some delay specified in the program. As a result the clog can be cleared in this stage. Suppose the clog is not cleared in the first level, then there will be a further increase in water level. This rise in water level is detected by the sensor and the notification is sent to the server. The server passes the information to its clients. This stage is called as second level. In this level the clog can be eradicated in two ways i.e., manual mode and auto mode. In auto mode, high pressure is applied with maximum delay to clear the clog in the drainage system. Certain chemicals like hydrochloric acid, Sulphuric acids can be used to remove the clog by breaking its molecules. If the clog is not cleared in these two levels, then the clog can be cleared by authorized person only. This level is called as third level. This message is passed to the client through the server. The authorized person will clear the clog.

VI. FUTURE SCOPE

Having implemented this project gives the removal of clog from the sewage system. Also, it can be further developed by advanced technologies for better improvements. The eradication of the clog is done by using chemicals in the drainage pipes. In addition to that, the removal of clog can be eradicated using robots. Instead of eradicating manually, the clog can be removed using robots to avoid hazards to humans.

VII. CONCLUSION

Thus our project aims to create a safe and healthy environment by creating a smart drainage monitoring system. The crucial role of our project is to clear the clog automatically with minimum human intervention thereby reducing the mortality rate of people working in the drainage system. This project is one time implementation and there is minimum management, hence the overall time and cost is reduced. The proposed project is to monitor and eradicate the clog automatically.

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