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An IoT based Drainage Overflow Forecast Monitoring System

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Abstract*: Recent days IoT is emerging as a latest innovative technology. For varies societal applications. In our proposed method we are going to come up with an innovation to identify the drainage overflow in advance. We will consider the drainage manholes as nodes, and all these nodes are connected to the main server (or) root node with a suitable network topology. We will keep the water level sensors at respected nodes. These sensors are embedded with a tiny microcontroller with some DC voltage. All these nodes with microcontrollers are connected to the main server. All these sensors are set up with a uniform water level measure. Whenever there is a slight abnormality (lower/higher) in water levels, then this nodes with microcontroller sends a message to the main server and the identity of this nodes is recorded in the server along with its water level in the mobile app/dashboard. With the help of this mobile app we can do the remedial action immediately so that we can avoid overflow in advance.

Key words: IoT, Drainage, manhole, Microcontroller.

I. INTRODUCTION

Now a day's almost all cities, town's villages are equipped with underground drainage system. Water used for house hold purpose and rainfall water will flow through this underground drainage system. All these underground pipelines are connected to a major drainage line and then to a large tank where the motors will dump all the drainage water to those large tanks. Whenever there is a heavy rainfall (or) a blockage in the pipeline then there is a problem of drainage overflow on roads. To come out of this problem we have to wait one or two days as the concern persons have to solve this problem in some priority based order. If we able to identify the problem in advance then we can avoid overflow in underground drainage systems.

II. EXPERIMENTAL SETUP

The whole process of drainage system can be monitor on the dashboard. The dash board/mobile app will gives us the status of water flow inside the drainage system. The microcontroller will sense the water level with the sensor connected to it. Whenever there is an abnormality in the water level then these sensors will send the signal to the main server. This main server is equipped with a dashboard. We can also view the status of various manholes on mobile through the designed mobile app.

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By viewing this dashboard/app one can get the status of water in advance so that we can avoid the drainage overflow (or) any blockage between the nodes or manholes. We used Wifi to send the signals/message from nodes to main server. With this innovation we can avoid drainage overflow in advance in all cities/towns and villages. General architecture is shown in the following graphical figure 1.

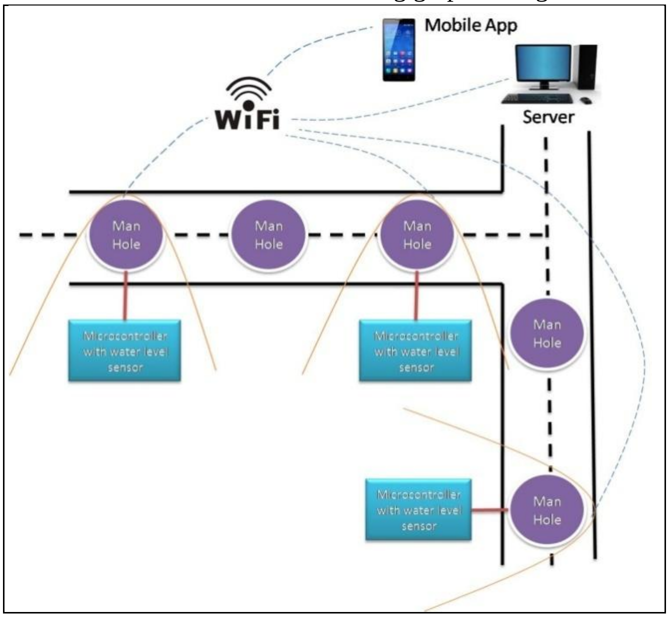

Fig. 1: Genral architecture of overall system

III. METHODOLOGY

To implement the system we took raspberry pi, water level sensors. Initially raspberry pi is programmed with python programming language. Those programs are able to capture level of water in a pipeline using water level sensors. Those sensors will send the signals to the microcontrollers. These microcontrollers are none other than raspberry pi. These IoT based raspberry pi will send level to the dashboard using wifi signals to the central servers. These central servers are send information to the mobile apps. In this process we are going to detect the level of water in three levels: upto-50% (Underflow), 50%-75% (Normal), above 75% (Overflow).

IV. DEPLOYMENT

We have categorised the whole deployments model into 2 modules. They are water level indicator module, assembled module.
The experimental setup is shown for both the modules in the following fig.2 and fig. 3.

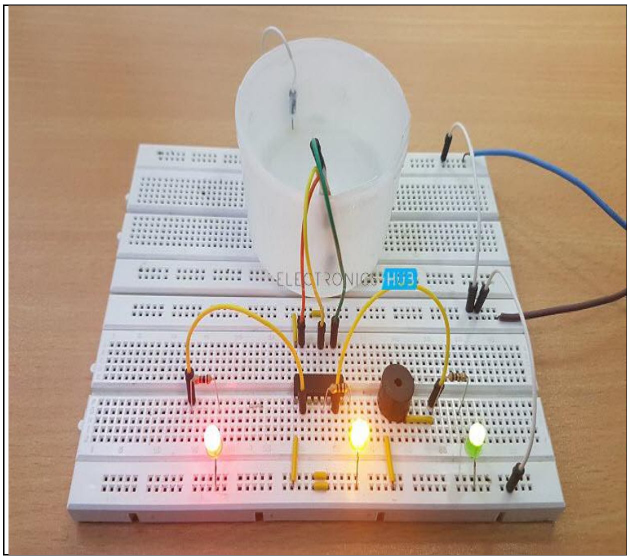

Fig. 2: Water level indication

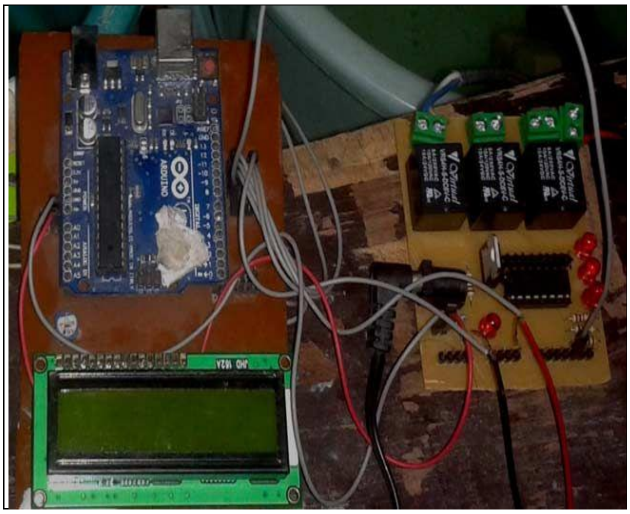

Fig. 3: Assembled module with Raspberry pi and sensors

V. RESULTS

After sensing the water level we find in which level our range fits into. Pragmatic values of the system are shown in the table 1 and the system generated values are shown in fig. 4. We divided the levels into 3 categories are Level 1: Upto 50% (Underflow), Level 2: 50%-75% (Normal), Level 3: Above 75% (Overflow). Based on the value an alert message is sent to the user.

Table 1: Pragmatic values of the system.

Levels	Threshold value	Description	Pragmatic value
Level 1	50%	Underflow	45%
Level 2	50%-75%	Normal	69%
Level 3	Above 75%	Overflow)	91%

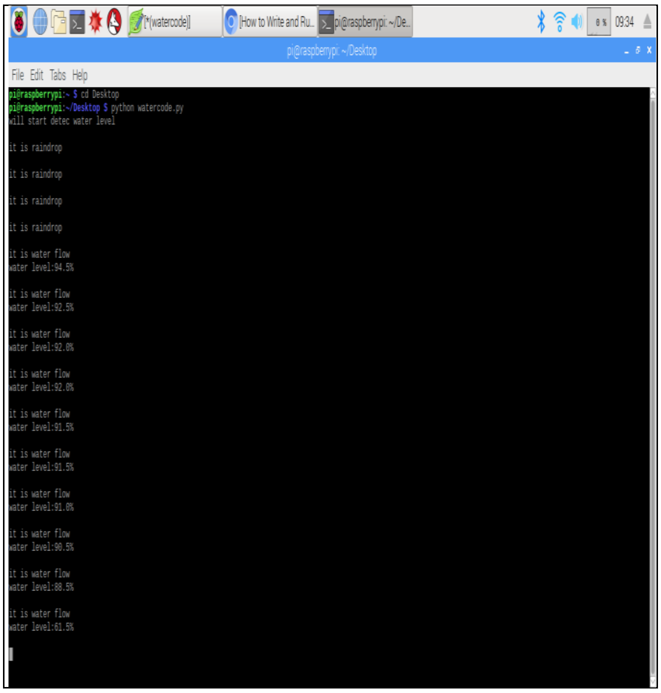

Fig. 4: Real time System generated water levels

VI. CONCLUSION

All modules of the practical development of an Underground Drainage Overflow monitoring System through IoT applications for metropolitan cities may deploy. A real-life, demanding application is selected as reference to guide .Aspects of sensor network platform considered are: platform structure, flexibility and reusability, optimization of the sensor nodes, optimization of the communication, error recovery from communications and node operation, high availability of service at all levels, application server reliability and the interfacing with IoT applications. This paper can be used to guide the specification, optimization and development of sensor network Platforms for other IoT application domains in the areas of drainage overflows.

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