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Internet of Things in Drainage Management System

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ABSTRACT

This paper describes a smart drainage management system. The drainage system describes the design and mechanism of locating the blockage and removing the same in the drainage system using internet of things. The manholes present in the drainage are having a module which is having microcontroller interfaced with gas sensor, level indicator, RFID. Whenever the level indicator identifies any blockage in between two manholes then it will trigger an alarm and inform the exact location to the user by highlighting different colour depending upon the distance from the blockage.

Keywords: Drainage Management, Internet of Things, Level Indicator, RFID, Gas Sensor, Manholes, Blockage, Alarm

1. INTRODUCTION

The present invention relates to the field of Internet of things (IOT) in Drainage Management System.

The goal of this research is to develop a smart systemfor drainage management.

The recent advancements in the area of IoT has provided solutions to measure the distance and actual estimation of kilometers a vehicle can cover with the quantity of fuel present in the fuel tank. The system also enables fuel consumption in an effective and efficient manner.

Our research team has developed a smart system that challenges the current system and provides the following advantages for estimating the distance a vehicle can travel with the available fuel in the tank.

1. Device having four buttons/options one for each mode and a display screen
2. Device having a fifth button for a hybrid mode
3. Ultrasonic level sensor for measuring the quantity of fuel present inside the tank
4. Graduated fuel cylinder

The implementation and description of the smart drainage system would be discussed in the preceding sections of this paper.

2. DESCRIPTION

The paper discusses in detail on a smart drainage management system that provides low cost method in locating the blockage under the manhole and removing the same by using internet of things.

The present disclosure explains the method of detecting the exact location.There is a module present under each manhole which is having a microcontroller interfaced with gas sensors, level indicator, zigbee protocol and RFID. All the data or any crisis in regards to the blockage will be sent by the microcontroller to the user.

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The manholes present in the drainage are identified with numbers such as 1, 2, and 3 by using the RFID. The RFID tags are attached to every manhole each of which is having an RFID reader to give detailed information of the manholes on the map. Whenever there are any issues regarding the blockage or gas leakage, the RFID will display the exact location of the manhole followed by the level indicator and gas sensor data respectively.

Figure 1, describes the multiple manholes present in the road and the exact detection of the blockage between two manholes. The manholes are named and identified with the help of RFID as mentioned above. The level indicator can identify the blockage 103 between two manholes 102 and it will be helpful for the user to identify the blockage and take necessary action.

As the level indicator to indicate the level of drainage underneath the manhole that is calibrated to two different levels of drainage. The first level is marked under the manhole at h/3 (where 'h' indicates the height of the drainage) which serves as a warning zone indicating the rise of the level. The main control hub room will be notified in case there is an increase in this level. The second level is marked under the manhole at a height of 2h/3 (where 'h' indicates the height of the drainage) to indicate the personnel that further rise in the level indicating the blockage; an alarm will be triggered in case any such situation regarding the emergency/blockage is detected.

Whenever there is blockage in the drainage, the level indicator will send information to the main server with the help of communication module, ZigBee with the status shown as 1 in the map. The user can monitor the exact location of blockage in the map. The manholes will be highlighted in various colours depending upon the distance from the blockage. As shown in the fig. 2, a map of a certain area is taken along with the indication of blockage. The manholes are identified with black dots and the blockage is identified with red dot in the map. If the blockage is under a manhole then the manhole will be highlighted in the map. If the blockage is between the two manholes, as there are multiple manholes present in that location then the exact location of blockage will be highlighted by indicating the manhole identification number with the help of RFID and level indicator.

If the gas sensor detects the leakage of any hazardous gas then it will be highlighted in the map showing the status as 2 along with the manhole number on the map. After getting the information regarding the blockage or any gas leakage, the user can clear the blockage with the help of water jetter or electrical reel.

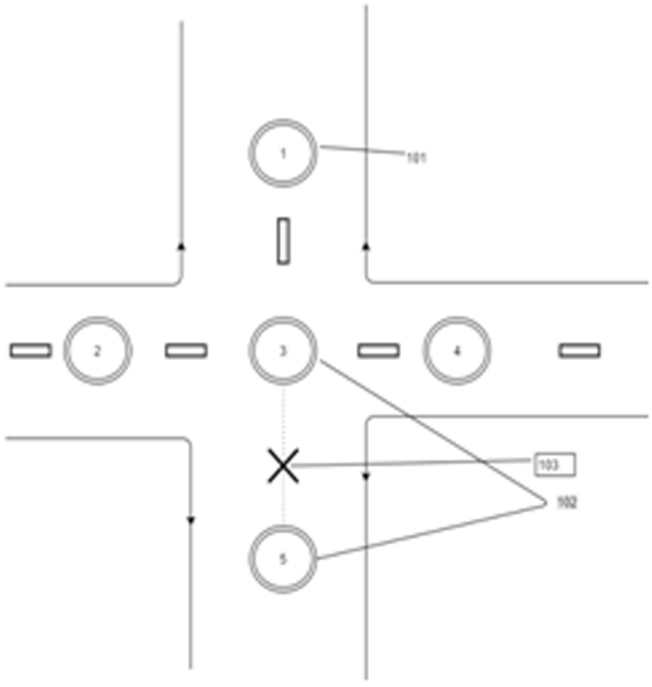

Figure 1: Multiple Manholes

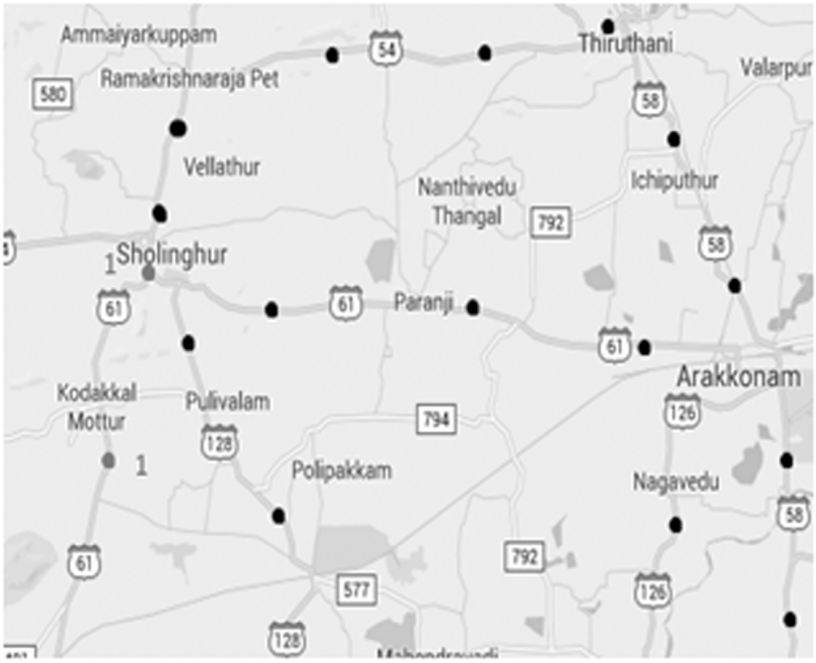

Figure 2: Map of a Certain Area

The sensors fixed with each manhole, that measure temperature, pressure, presence of any dangerous gases using the respective sensors. Respective sensors in sense, the use of temperature sensor for measuring temperature, pressure sensor for measuring the pressure that builds under the manhole, gas sensor to detect the presence of harmful gases under the manhole. The sensors are smart enough to detect the hazardous gases including the concentration. The temperature and pressure sensors also give update regarding the temperature and pressure in the drainage in every five minutes. Whenever a gas sensor detects the hazardous gas, it will send information to the user through microcontroller with status showing as 2 in the map. The number shown on the map indicates the blockages, hazardous gases, the concentration of the gases as status 1, 2 and 3 respectively.

The hazardous gasses may emerge in the drainage system due to the disintegration of organic matters or hazardous gases like methane, carbon monoxide, carbon dioxide, hydrogen sulphide. These gases are dangerous

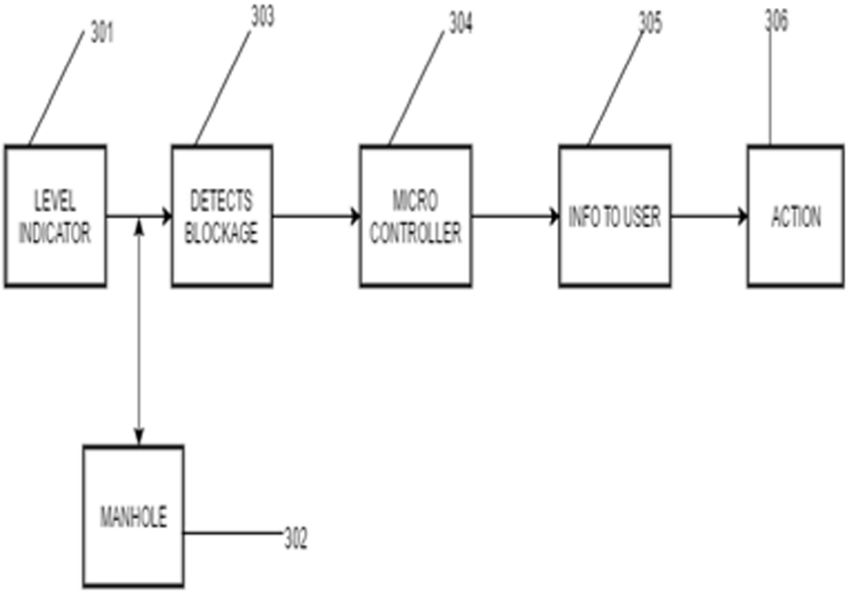

Figure 3: Complete Scenario in the Drainage System

to the human health. So the present gas sensor will inform regarding the hazardous gas with concentration which will avoid any accident and helpful for human safety in case of removal of blockage.

Figure. 3 indicate the block diagram that explains the complete scenario in the drainage system. Whenever a level indicator 301, present inside the manhole 302 detects any blockage 303 then the microcontroller 304 will send information to the user 305 showing the status in the map with numerical representation and highlighting the corresponding manholes. Further action 306 will be taken by the user to clear the blockage.

Additionally, the battery 401 of the manhole is being charged by the solar panel 402 present on the top of the street light 403 by means of wire 404 as shown in fig. 4. The existing prior art explains the use of low powered sensor to save the charge of the battery for longer period. In this present disclosure the use of ZigBee consumes less power while transmit the information. The charging of battery using solar panel enhances the life of battery.

ZigBee is the communication technique used in the present disclosure but the system is not limited to the use of ZigBee only. GPRS, GSM etc. can be used instead of ZigBee.

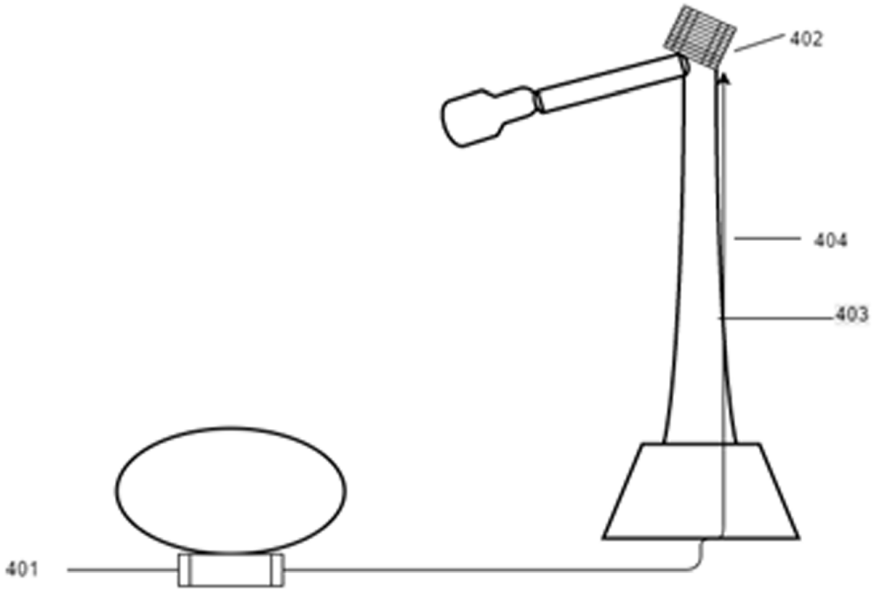

Figure 4: Charged by the Solar Panel

3. IMPLEMENTATION

The present invention and its advantages can be implemented as described below. The manhole has sensors underneath that measures temperature, pressure, presence of any dangerous gases using the respective sensors.

The system has a level indicator underneath the manhole that provides the level of drainage. Further, an alarm is also present that can be raised in case of emergency. Basing upon the level indicator the user can be informed regarding the blockage.

A module is present under each manhole having a microcontroller which is interfaced with RFID, gas sensor, zigbee (wireless protocol) and level indicator which keeps informing the user regarding the status with status number.

To control the power consumption, the battery of the manhole is connected to the solar panel which is placed above the respective nearby public street lights.

4. APPLICATIONS

The invention as described in the drawing finds applications in drainage system.

5. 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 and also controls power consumption by the utilizing solar power.

REFERENCES

[1] J. Sathish Kumar, Dhiren R. Patel, Department of Computer Engineering, SVNIT, "A Survey on Internet of Things: Security and Privacy Issues" Volume 90 – No 11, March 2014.

[2] Víctor-M. Sempere-Payá, , Salvador Santonja-Climent "Integrated sensor and management system for urban waste water networks and prevention of critical situations", Volume 36, Issue 1, January 2012, Pages 65–80.