INTEGRATED DETECTION OF OPEN DRAINAGE AND OVERFLOW, CURRENT LEAKAGE AND RBAGE MONITORING IN IOT ENVIRONMENT

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Abstract: During rainy seasons, roads are usually flooded with sewage wastes and overflowing of garbage cans. People will also suffer from frequent power cuts and voltage fluctuation problems. The objective of this project is to discover these problems before they create a nuisance to the public. In the existing model, there is no mechanism to detect the power failure or to monitor the overflow of drainage automatically. The traditional method of testing only includes ultrasonic sensors to detect the varying levels of waste in the sewers. In the proposed system, we introduce the concept of integrating the information obtained from the Flow sensor, Level sensor and Current sensor using microcontroller PIC18f4550 associated with the ZigBee module. The gathered data is transferred by the ZigBee module to the central server. This information can be used to notify the Corporation authorities using GSM services. Our paper proposes a less expensive system for real time monitoring of drainage, transformers and dustbins.

IndexTerms - Internet of Things, ZigBee, Flow sensor, GSM services, SMS, Current sensor, Level sensor, Ultrasonic sensor.

I. INTRODUCTION

IoT (Internet of Things) can be described as the networking of physical objects with the use of embedded sensors. These sensors collect information about the objects, their surroundings and communicate this information to other stations, linked through wired or wireless networks. The use of IoT started the era of device controlling and making objects speak to one another. Now, the objective is to make such objects intelligent.

In Indian cities, waste management is mainly carried out by Municipal Corporations/Committees. Many of them often suffer from resource deficiency in terms of men and machinery. Moreover, the general public is not willing to share the costs in this process. Seasonal as well as daily variations in waste generation add up to the problem. This results in a much lesser waste collection capacity compared to the waste generation capacity, which is visible in form of open trash dumps and overflowing solid waste containers. These issues have thus resulted in increased collection costs and environmental damage.

In the case of sewage management, heavy flooding may appear in urban areas, and some serious sanitary problems may occur due to the improper management of wastewater that comes out of the network canals and into the streets.

In power systems, a distribution transformer provides the final voltage transformation in the electric power distribution side, stepping down the voltage used in the distribution lines to the level used by the customers. Operation of distribution transformer is monitored in order to detect any leakage in power.

Many researches into waste management have been conducted, IoT based systems are one such proposition. This paper proposes an IoT based solution for effective and efficient waste collection. The solution has main focus on the optimal use of sensors and Zigbee module to notify the appropriate corporation managers upon filling of bins, drain overflows and current leakage.

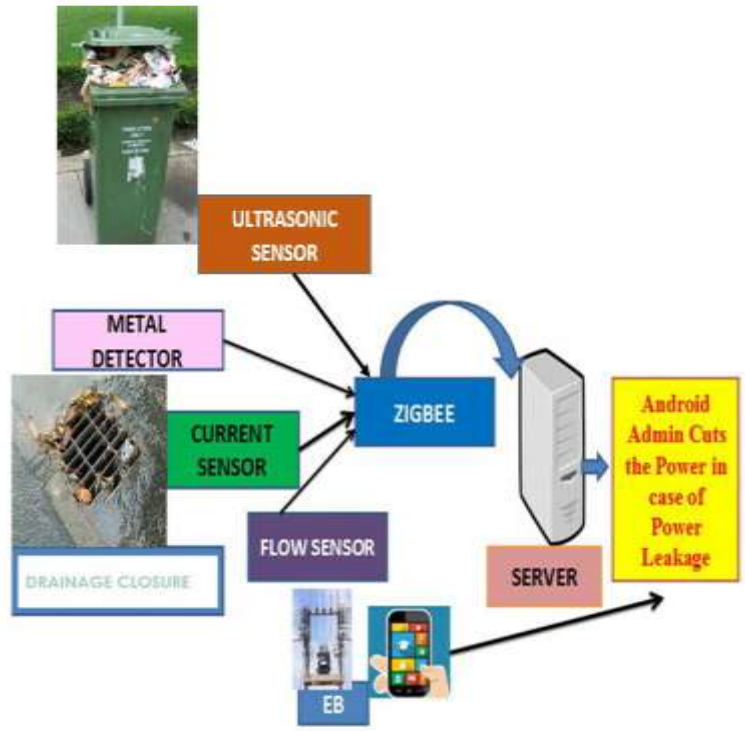


Fig.1 System Architecture

II. BACKGROUND WORK

A. EMBEDDED SYSTEMS

FLOW SENSOR: Ultrasonic flow meters in the sensor can effectively measure the flow rates for a wide variety of fluids, as long as the speed of sound through that fluid is known. They are designed for versatility and performance.

LEVEL SENSOR: Ultrasonic level sensors are used for non-contact level sensing of highly viscous liquids, as well as bulk solids. They are also widely used in water treatment applications for pump control and open channel flow measurement. The sensors emit high frequency acoustic waves that are reflected back to and detected by the emitting transducer. Ultrasonic level sensors are also affected by the changing speed of sound due to moisture, temperature, and pressures. Correction factors can be applied to the level measurement to improve the accuracy of measurement.

CURRENT SENSOR: A current sensor is a device that detects electric current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output.

ULTRASONIC SENSOR: An ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

Fig 2. Sensors

B. RELATED WORK

A distributed transformer networks remote monitoring system (DTRMS) is developed and constructed, for monitor and record the parameters like temperature, oil level status, of a distribution transformer.[1]

This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay. The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply.[2]

In existing concepts, the system is dependent on a subscribed mobile network. There is no automatic alert in case of overflow and it is also difficult to monitor the load conditions of the distribution transformers for problems before they occur. [3]

The idea of on-line monitoring system integrates a global service mobile (GSM) Modem, with a standalone single chip microcontroller and different sensors. The obtained parameters are processed and recorded in the system memory.[4]

The faults that are costly to repair, are not prevented and result in a loss of service. The system is expensive in order to construct the communication wires between the monitor and each distribution transformer station.

III. IMPLEMENTATION

The proposed system focuses on integrating the information under a single application. It is less expensive to implement widely. Our system automatically updates the Android application with the help of sensors. The remote electrical parameters like Voltage, Current and Frequency in real-time are acquired. The application periodically sends the data whenever a request is received from monitoring node.The monitoring nodes are verified through secure login credentials.

A. INTEGRATED DETECTION SYSTEM

Our concept is designed to monitor the sewage system in roads during rainy seasons for open drainage, the metal detector system is used to check open lids. Float sensor monitors the over flow of sewage water in cases of flooding.[12]

Current and Voltage is measured by sensors attached to the distribution transformer and it also helps in detecting the disconnection in the electrical power lines. The proposed system which has been designed to monitor the transformers essential parameters continuously throughout its operation. If the microcontroller recognizes any increase in the level of voltage or current, it is immediately reported.

The system will notify the waste managers upon filling up of the bins due to the ultrasonic sensors attached to the trash can lids. The level of garbage in the can is also monitored.[5]

We alert the Corporation Authorities by sending message through GSM Service. The ZigBee module in the lamp post of each street is used to transfer the information to the central controller fixed in the area transformer to intimate the E.B.

In addition to this, the module also intimates the Drainage and Waste collection corporation using the inbuilt database updated with the contacts of managers and superiors.

The authorities can then login to the Android application using verified credentials, in order to track the site location and find out the other details.

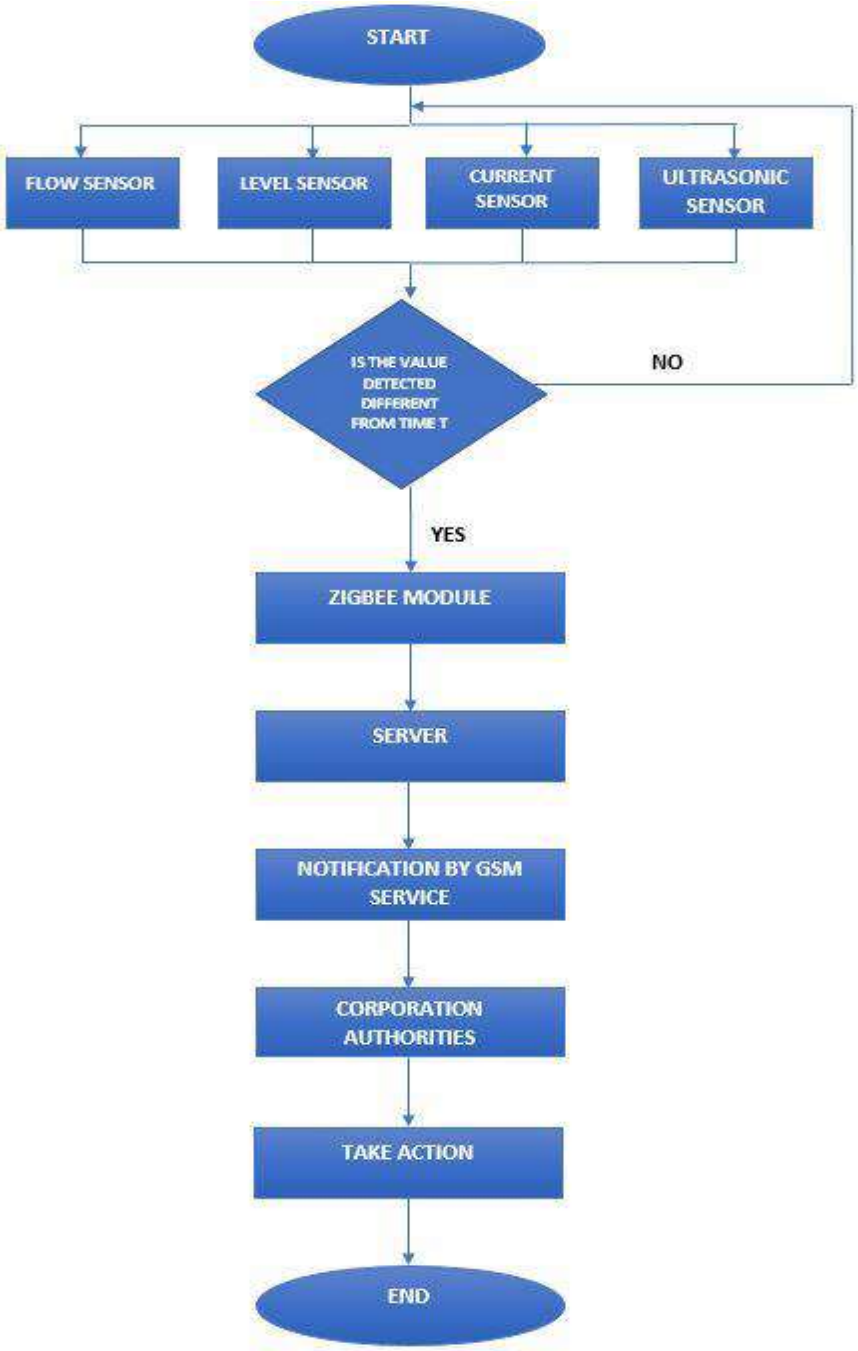


Fig.3 Data Flow Chart

B. TECHNICAL SPECIFICATION

ZIGBEE TECHNOLOGY:

ZigBee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in harsh radio environments and in isolated locations.

Fig.4 ZigBee Module

ZigBee technology builds on IEEE standard 802.15.4 which defines the physical and MAC layers. Above this, ZigBee defines the application and security layer specifications enabling interoperability between products from different manufacturers. In this way ZigBee is a superset of the 802.15.4 specification. With the applications for remote wireless sensing and control growing rapidly it is estimated that the market size could reach hundreds of millions of dollars as early as 2007.

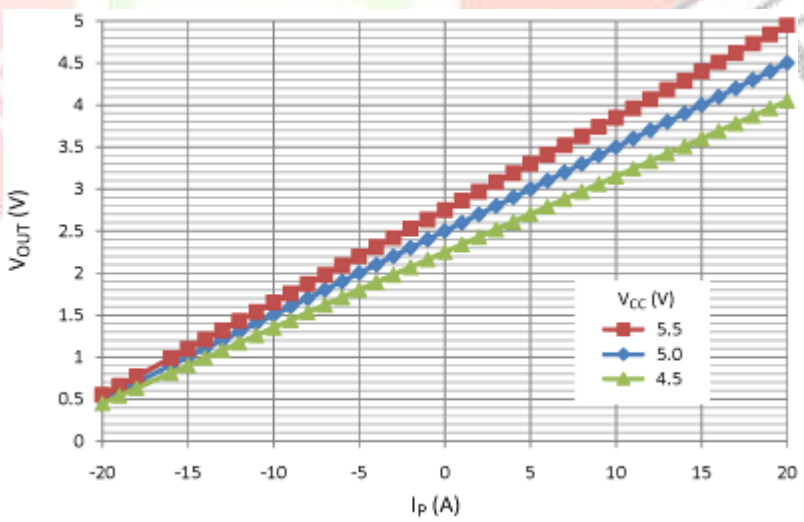
MICROCONTROLLER PIC18F4550:

PIC18F4550 is an 8 bit microcontroller. PIC18F4550 has been implemented with Nano WATT technology hence it requires very low power for its operation. PIC18F4550 has 16 bit Instruction Set Architecture, (ISA) which provides a degree of freedom to programmers with various data types, registers , instructions, memory architecture, addressing modes, interrupt and IO operations. PIC18F4550 also has an Extended Instruction Set as a special feature.

Memory Specifications: A PIC18F4550 has 256 bytes of EEPROM (Electrically Erasable and Programmable Read Only emory), 2KB of SRAM (Static RAM) and 32KB of flash memory which in return proves another degree of freedom to programmers.

Fig.5 PIC18F4550 Microcontroller

Communication Protocol: PIC18F4550 is remarked as advanced, as it uses well sophisticated protocols for communications. The modern protocols like USB, SPI, EUSART, are well supported in PIC18F4550. These technologies integrate with Nano Watt Technology (as mentioned before) to produce PIC18F4550, a wellequipped, low power consuming microcontroller.



IV. RESULT AND FUTURE WORK

The proposed IoT based methodology can easily serve the purpose for all type of bins (with or without lids). The technology is robust, cheaper and easy to use due to the low cost of the sensors used, its advanced utility in both lid and lidless situations. The suggested method was accomplished by designing an interface circuit and a software program. The system is designed based on a PIC 18F4550 microcontroller which acts as a data acquisition, processing and transmission system. The ZigBee module enables effortless wireless communication between the sensors and the central server. Using GSM technology and an Android application the message will be sent to the corresponding authorities. It fulfils the purpose of introducing proper waste management in Indian cities as it depends on device-to-device communication instead of manual intimation of officials.

V. CONCLUSION AND FUTURE WORK

In this work has been introduced a new optimization algorithm called SCOA, which is based on the behavior of stem cells in reproducing themselves. SCOA was found to have high speed of convergence, low level of complexity with easy implementation process. It could also avoid the local minima in an intelligent manner. MSC is currently used for the treatment of a variety of clinical conditions. Segmentation of images is a challenging issue. Successful segmentation is an important precursor to successful pattern recognition. A novel approach was proposed in this study for optimized cell image segmentation. For experiments, stem cell optimization was proposed with classifiers such as naïve Bayes and MSVM. The focus of the present work is on the optimization algorithm with MSCs. The Future work can be carried out with the stem cells obtained from adult's different organs like brain, peripheral blood, blood vessels, skeletal muscle, skin, teeth, heart, gut, liver, ovarian epithelium, and testis. The input data set can be tested with other feature selection algorithms. Also we can employ classifiers like ANN and so on.

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