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An Integrated Wireless Sensor Network for Monitoring Gully Pot Drainage, Land Slides and Waste Gas Measurement

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ABSTRACT - The system is about adequate warning on potential blockage incidents to prevent Sewer Failure in Drainage, Obtaining Forewarning Time for Landslides, Development of Waste Gas, Monitor System using Wireless Sensor. A key issue with blockage formation is its intermittent nature so that current inspection technology may not be efficient enough to detect sudden incidents or serious blockage which may have accumulated before the routine check and which may lead to a flooding incident. Likewise, the phenonminalframework for the geographical topologicalevent detection such as landslides and inception of Gas cannot be predicted before occur. By placing the deployment of wireless sensors near the gullies and data gather on lamp post, then the microcontroller on the DAQ board is programmed to wake up from sleep mode to measure the water level, condition every five minutes while keeping the transceiver in the sleep mode. Once it detects a low/high alarm, the transceiver wakes up to sense the Received Signal Strength Indicator (RSSI) from the hub as well as from its neighboring sensor's node. This will give the warning signal to the Base station. Then, it compares the RSSI and selects the best route to relay the data back to the data gatherer via the zigbee mesh network. After that, the data gatherer enables the GPRS connection and sends the data to the remote server. Subsequently, the remote user can send an inspector to investigate the event. Similarly, it predicts the land slide and waste gas before occur and send warning information to the base station

Index Terms— potential blockage,Forewarning Time for Landslides,Waste Gas, Monitor System Wireless Sensor, warning signal,zigbee mesh network

1. INTRODUCTION

Monitoring is of little use without a clear and unambiguous definition of the reasons for the monitoring and the objectives that it will satisfy. Almost all monitoring (except perhaps remote sensing) is in some part invasive of the environment under study and extensive and poorly planned monitoring carries a risk of damage to the environment.

Almost all mainstream environmentalism monitoring projects form part of an overall monitoring strategy or research field, and these field and strategies are themselves derived from the high levels objectives or aspirations of an organisation. Unless individual monitoring projects fit into a wider strategic framework, the results are unlikely to be published and the environmental understanding produced by the monitoring will be lost.

It provides all monitoring data in a single central place. Quality validation, compliance checking, verifying all data has been received, and sending alerts are generally automated. Typical interrogation functionality enables comparison of data sets both temporarily and spatially. They will also generate regulatory and other reports.

Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. The design of a monitoring program is must therefore have regard to the final use of the data before monitoring starts.

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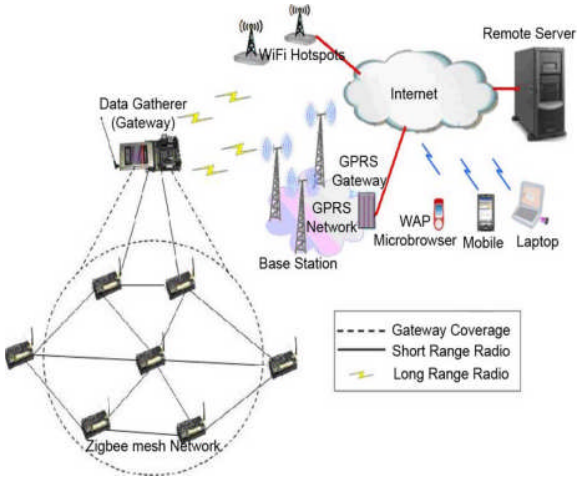

Fig. 1. Wireless sensor network system architecture.

2. RELATED WORK

In this thesis, about adequate warning on potential blockage incidents to Prevent Sewer Failure in Drainage, Obtaining Forewarning Time for Landslides, Development of Waste Gas Monitoring System is to be developed based on Wireless Sensor.

The proposed system is summarized with 3 modules.

a)Ultrasonic Sensor

b) Accelerometer Sensor

c) Gas Sensor.

ULTRASONIC SENSOR

Navigation is based on signal i.eBy monitoring the water level of the gully pot at each residential property by using Ultrasonic Sensor, it will be proactively informed the best course of actions to eliminate the causal problems blockage and leakage within the sewer infrastructure.

ACCELEROMETER SENSOR

To identify the possible landslide areas from the numerous gathered data by Accelerometer Sensor,this proposes a data analysis method that indicates the severity and a mechanism for detecting the movement.

GAS SENSOR

Gas leak detection is the process of identifying potentially hazardous gas leaks by means of Gas sensor in underground. It is designed to monitor the various tasks in an adverse environment,these measurements are continuously monitor by the Base Station.If any changes happens in Natural Calamatiesi.e blockage, landslide or unwanted gas produced in underground it gives intimation to the Base Station through an Alarm Sound.

It is specially designed by using the prototype system consists of eight Zigbee based wireless sensor nodes and a GPRS enabled data gatherer.EachZigbee sensor node comprises of a radio transceiver, a data acquisition board and an acoustic sensor probe.By using this sensing method, many false alarms were reported. Thedeterioration of the ageing and primarily underground system has presented significant challenges in society.Not only to maintain the structural and operational reliability of the sewer system, and also to reduce progressively its risk of failure. In order to overcome these problems and to become more operationally efficient, this factor will give a sufficient solution. As a result, significant efforts have gone into research. so this is one of the more advanced methods to properly monitor, and to maintain rehabilitate sewer infrastructure. Durability of sensors, the sensor nodes and gateways gives reliability of communication under real operational conditions.

3. METHODOLOGY

3.1 ACOUSTIC SENSOR PROBE AND DATA ACQUISITION BOARD (DAQ)

The developed acoustic probe comprises of two pairs of piezoelectric transducers,which are able to convert electric signals to acoustic waves or vice verse. The lower pair of transducers is designated to determine thedry (leakage) condition of a gully, while the upper pair of the transducers is used to detect the high fluid level (flood condition). In both pairs of the piezoelectric transducers, one of them plays the role of a transmitter, while the other acts as a receiver. An electrical pulse at the resonant frequency of transducer is sent to the transmitter to generate sound, whereas the receiver detects the sound field and converts it to the electric signal fed back to the interface circuit board. Due to the high acoustic impedance mismatch between air and water the level of fluid in

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a gully can be easily identified from the amplitude of the response between the acoustic transducer pair. A suitable prototype of the acoustic sensors has been designed and constructed to generate signals to indicate three different conditionsi.e.Normal,Leaking and Flooding. In the case of the normal fluid level the high and low acoustic responses between the lower and upper transducer pairs are recorded, respectively. In the case of low fluid level (leaking condition), the low acoustic responses between the lower and upper transducer pairs are recorded. In the case of high water level (flooding condition), the high acoustic responses between the lower and upper transducerpairs are recorded.

3.2 DATA GATHERER/HUB

Due to its compact, low-profile, easy to program and compliance with common wireless standards including Wifi, GPRS, Wimax and GSM, the Stargate platform is adopted as the data gatherer for this work.In this present application, it is used as a data gatherer/hub which collects the data from all the wireless sensors. These data are then processed and displayed on a webpage and stored in a SD memory card. For the optimum radio coverage of the monitored area, the data gatherer was mounted on a lamppost in order make it as visible as possible to the sensor nodes. The Stargate sends the recorded data back to the remote server once a day using a GPRS connection.

3.3 LAND SLIDE WARNING SYSTEM

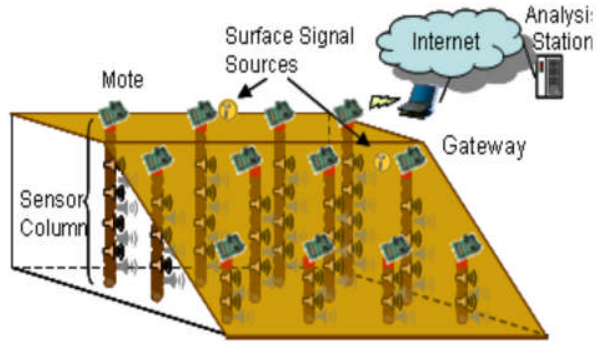

Fig. 2.Landslide Warning System

A disaster warning system conducts the environment sensing, data analysis, and communication. A database stores the periodically collected sensor data. The proposed system analyses the gathered sensor data from the database that is a part of AMI system. This disaster warning system uses the tilting degree of an electric pole to define the severity of the location that the pole is set. The system stores every analyzed data in the same database. Using a specialized suffix-tree algorithm, the warning system sends the forewarning signals according the information. Both data gathering and message broadcasting use AMI-associated communication network.

AMI-associated sensor network

AMI has a communication network that consists of many advanced metering and sensing devices, including Smart meters. Smart meters provide interval usage (at least hourly) and collect at least daily. According to the analysis from Gartner, AMI system consists of following characteristics: data acquisition, data transform, data cleansing, data processing, information storage/persistency.

3.4 GAS DRAINAGE FLOWMETER

Since the inception of gas drainage in underground coal mines there has been a need to monitor the amount of gas produced from the boreholes. There are a number of reasons for this monitoring, namely:

- To establish that the gas drainage borehole initially works.
- To find out whether the gas drainage borehole blocks with time.
- To establish the amount of gas left in the block of coal by the material balance calculation.

To date monitoring has been substantially achieved by hand, using orifice plate flow meters that are manually placed in the line from the standpipe to the gas drainage range. Such monitoring is too expensive to be undertaken at a desirable frequency.

An automatically monitored flowmeter for gas drainage applications is therefore highly desirable. For storing the collected data, there is a meter data

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management system (MDMS) that communicates with thecustomer information portal, the customer information management system

4. MINIATURE DESIGN

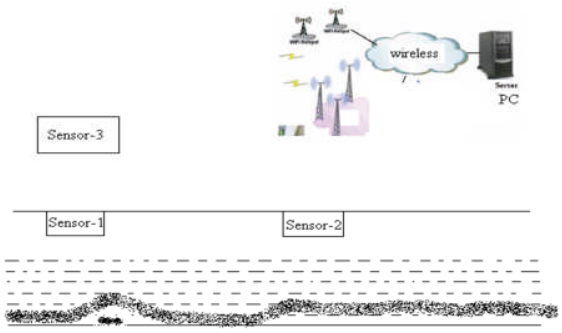

Fig. 3.Wireless sensor in underground

A key issue with blockage formation is its intermittent nature so that current inspection technology may not be efficient enough to detect sudden incidents or serious blockage which may have accumulated before the routine check and which may lead to a flooding incident. Likewise, the phenonminalframework for the geographical topological event detection such as landslides and inception of Gas cannot be predicted before occur.While we place the Deployment of wireless sensors near the gullies and data gather on lamppost.Then, The microcontroller on the DAQ board is programmed to wake up from sleep mode to measure the water level condition every five minutes while keeping the transceiver in the sleep mode. Once it detects a low/high alarm, the transceiver wakes up to sense the Received Signal Strength Indicator (RSSI) from the hub as well as from its neighboring sensor's node.

5. CONCLUSION

"An Integrated Wireless Sensor Network For Monitoring Gully Pot Drainage, Landslides, And Waste Gas Measurement" satisfies all the needs of "sewer infrastructure" and also Detects Topological Events and Inception of Gas produced in Underground Drainage by large scale construction.It is a Boon for our Environment.The project is developed in such a way that it has very less demerits which can be corrected for large scale consumption. Thus,if implement this in bigger size, it will be very useful in environment.

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