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Synchronized Air Pollution Monitoring System Using Wireless Sensor Devices

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ABSTRACT:The system proposes to vehicular pollution, effect of increase in vehicular pollution on environment as well on human health. To monitor the pollution wireless sensor network (WSN) system is proposed. The proposed system consists of a Mobile Data-Acquisition Unit (Mobile-DAQ) and a fixed Internet-Enabled Pollution Monitoring Server (Pollution-Server). The Mobile-DAQ unit integrates a single-chip microcontroller, air pollution sensors array, a General Packet Radio Service Modem (GPRS-Modem), and a Global Positioning System Module (GPS-Module). The Pollution-Server is a high-end personal computer application server with Internet connectivity. The Mobile-DAQ unit gathers air pollutants levels (CO_2, NO_2, and SO_2), and packs them in a frame with the GPS physical location, time, and date. The frame is subsequently uploaded to the GPRS-Modem and transmitted to the Pollution-Server via the public mobile network. A database server is attached to the Pollution- Server for storing the pollutants level for further usage by various clients such as environment protection agencies, vehicles registration authorities, and tourist and insurance companies.

I. INTRODUCTION

A wireless sensor network (WSN) is distributed autonomous sensors to monitor physical or environment conditions such as temperature, sound, pressure, etc. And to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. In the field of soil environmental monitoring, real-time monitoring the temperature and humidity of soil can correctly guide horticulture. Traditional wired communications exist many problems it has broad application prospects in soil environmental monitoring field. The age of the Internet of things comes; wireless sensor networks become the core of networking. In order to achieve greater things on the technical requirements of the Internet of things, it adopt the technology of wireless sensor network based on Zigbee, GPRS and Web Services technology designing a set of low cost, low power consumption, flexible automatic networking temperature humidity monitoring system of soil.

II. RELATED WORK

A wide range of instrumental methods have been reported for the monitoring of air pollutants. Many of the systems are based on photometric techniques, and the most common examples of these are described below. Non-Dispersive Infra-Red (NDIR) NDIR analyzers have been developed to monitor SO2, NO2, CO2, and other gases that absorb in the infra-red, including CO2 and hydrocarbons. However it is probably true to say that the is the "preferred" technique only for CO2 monitoring of pollutants in ambient air. The technique is of relatively low sensitivity, and is more applicable to the concentrations found in source emissions than in ambient air. An NDIR analyzer is basically an instrument that does not disperse the light emitted from an infra-red source - i.e. the light is not split up into its component wavelengths by means of a prism or grating. Instead a broad band of light is produced by means of a band pass filter, which is chosen to coincide with an absorption peak of the pollutant molecule.

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III. PROPOSED ALGORITHM

Sensor networks are dense wireless networks of small, low-cost sensors, which collect and disseminate environmental data. Wireless sensor networks facilitate monitoring and controlling of physical environments from remote locations with better accuracy they have applications in a variety of fields such as environmental monitoring, indoor climate control, surveillance, structural monitoring, medical diagnostics, disaster management, emergency response, and ambient air monitoring and gathering sensing information in inhospitable locations. Sensor nodes have various energy and computational constraints because of their inexpensive nature and ad-hoc method of deployment. Considerable research has been focused at overcoming these deficiencies through more energy efficient routing, localization algorithms and system design.

In this system, it proposed a wireless sensor network air pollution monitoring system (WAPMS) for Mauritius. Indeed, with the increasing number of vehicles on our roads and rapid urbanization air pollution has considerably increased in the last decades in Mauritius. For the Past thirty years the economic development of Mauritius has been based on industrial activities and the tourism industry. Hence, there has been the growth of industries and infrastructure Works over the island. Industrial combustion processes and stone crushing plants had contributed to the deterioration of the quality of the air.

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IV. EXPERIMENTAL ANALYSIS

Sensor Manager

The function of sensor manager is to manage the delivery of sensor data. It provides and manages the resources provided to a sensor.

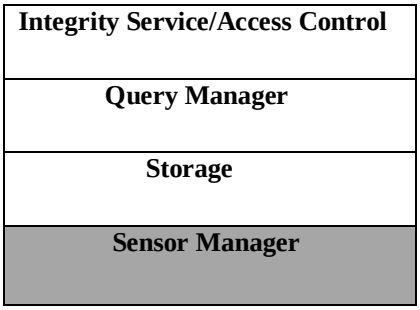

Fig.no:1. Sensor manager

Storage Manager

It receives the data from all nodes and persistently stores data streams from all the nodes.

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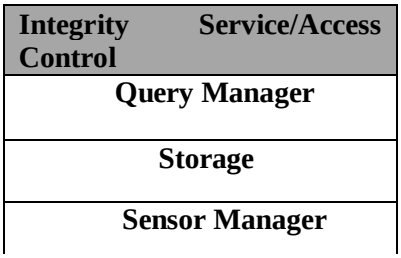

Fig.no:2.Storage manager

Query Manager

It manages active queries, it also provides query processing and delivery of events ,query results to registered, local or remote consumer.

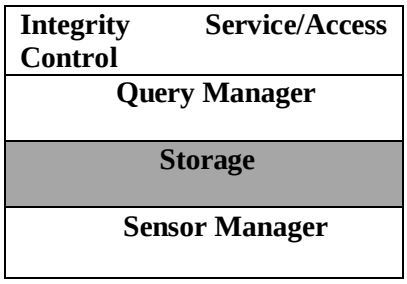

Fig.no:3.Query manager

Access Control And Integrity Service

TinyOS: when an event occurs, it calls the appropriate event handler to handle the event.

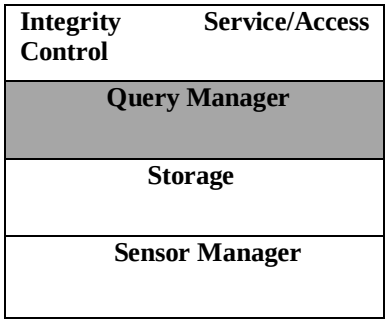

Fig.no:4.Access control and integrity service

V.SYSTEM ARCHITECTURE

A wireless sensor network is a collection of nodes organized into a cooperative network. Each node consists of processing capability (one or more microcontrollers, CPUs or DSP chips), may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single Omni-directional antenna), have a power source (e.g., batteries and solar cells), and accommodate various sensors and actuators. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. Currently, wireless sensor networks are beginning to be deployed at an accelerated pace. It is not unreasonable to expect that in 10-15 years that the world will be covered with wireless sensor networks with access to them via the Internet. The can be considered as the Internet.

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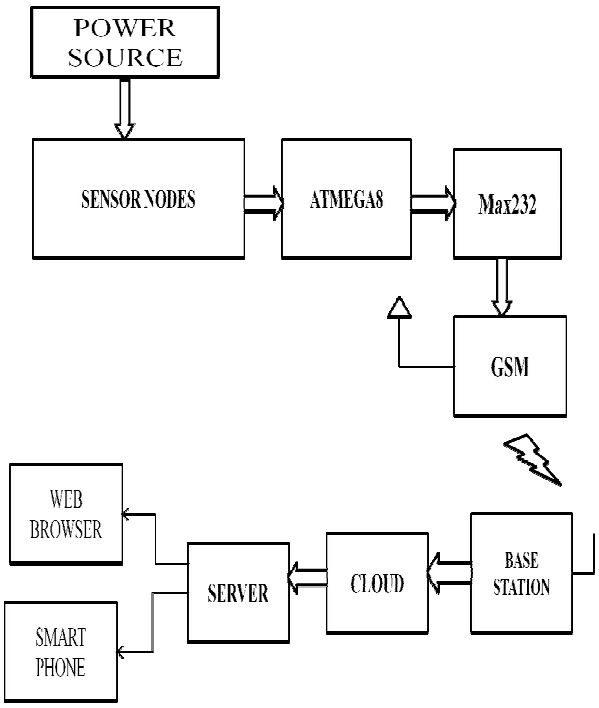

Fig.no:5.Architecture Diagram

VI. Simulation Results

It has one Micro controller, GSM slot and pollution sensors. The kit is 120v power supply. The GSM is transmit the pollution level into message. The message will be received in the application to view the pollution level vice versa. The Cloud side of air pollution monitoring system are include the username, password and submit. The pollution level to be monitoring in the cloud view the admin.

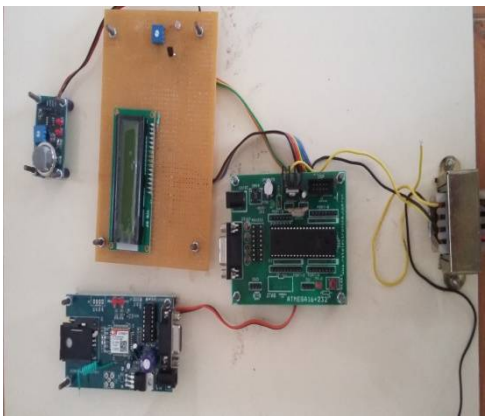

Fig1. Screen Shot 1

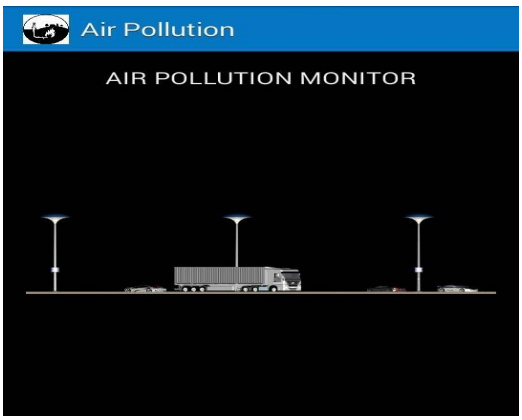

Fig2. Screen Shot 2

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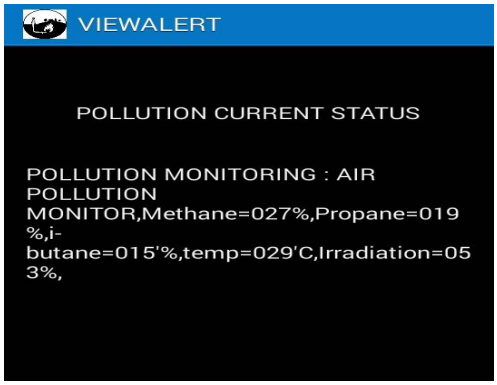

Fig3.Screen Shot 3

Fig4. Screen Shot 4

Fig5. Screen Shot 5

VII. Conclusion and Future Work

The proposed Wireless Air Pollution Monitoring System provides real-time information about the level of air pollution in , as well as provides alerts in cases of drastic change in quality of air. The information can then be used by the authorities to take prompt actions such as evacuating people or sending emergency response team. It uses an Air Quality Index to categorize the various levels of air pollution.

There are a few aspects we would like to address in the future. The framework developed an implement in the paper, gives the power of abstracting the underlying architecture at the gateway. For example, the sensor network can be an Ethernet based IP system or a host of WiFi Hotspots.

The underlying structure and nature of the network does not affect the architectural framework. However the abstraction requires a formalization of the services that must be offered at the sensor network and gateway interface. The set of services can only be determined when the entire end to end service requirements are as certained. Thus would like to develop a structured approach and framework for identifying and designing the services at the interfaces.

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