Air Pollution Monitoring using Mobile Phone in Real Time

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Abstract

This system includes air pollution sensor table, mobile phone's Global Positioning System (GPS), single chip microcontroller, Bluetooth modem. The sensor is a measurable answering hardware tool for a change in the physical condition of air pollution. The analog signal sent by the sensor is digitized by a digital converter and sends the controller to the next process. CO, N, Smoke and Temp sensor gas sensitize and communicate data with a microcontroller. To transmit data on mobile, Bluetooth modem is used with LPC2148. The GPS modem of the mobile is used to send location information. The main purpose of this system is to monitor continuous monitoring at the pollution level provided by various sensors through the Bluetooth modem in the control section. Therefore, a special plan should be taken to control air pollution.
Keywords: Air Pollution, Global Positioning System (GPS), Microcontrollers, Wireless Mobile Networks, Sensors

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I. INTRODUCTION

There is nothing like opening doors and breathing in fresh air. Now, how clean is air for breathing? Until and unless you are a scientist with a chemist Lab on your fingers, there is no real way to know. The nitric gas through your nose can slowly kill you: According to the World Health Organization, 2 million people die each year due to polluted air effect. Air pollution is a major problem, not only for people living in smoking habits: Through things like global warming and damage to the ozone layer, this is the ability to affect all of us, so whether this major environmental problem Really causes, When it is grown from smoke -proof (chimney), it is quite clear, but it is not always easy for the spot, the smoke is removed from a coal power plant and its pollutants are sulfur dioxide And "greenhouse gas" carbon dioxide.

Air pollution prevents plants, animals from killing or growing properly, damages some other aspect of the environment (such as moving the buildings), or any other type of nuisance (less visibility, possibly, or unpleasant odor) the reason may be. With water pollution and land pollution, it is the quantity (or concentration) of a chemical substance in the air, which makes a difference between "harmless" and "pollution". Carbon dioxide (Co2) is present in the air present near our concentration of less than 0.05 percent and it usually does not hurt (you breathe it all day) but air with high concentration of carbon dioxide (Say, 5-10 percent) is toxic and can kill you in a matter of minutes.

Carbon monoxide (CO) - Carbon mono-oxide prevents the acceleration of oxygen by blood, which measures an environmental air pollution monitoring system, not smoke and temporarily. The reason for the significant reduction in the supply of oxygen to the heart Can be made, especially in people suffering from heart disease, on the respiratory system not only is the evidence of adverse effects of air pollution rising, but also on cardiovascular systems. In this system, LPC 2148 uses a temperature sensor to measure the temperature of the terrain. LM-35 an angel-test this temperature sensor is proportional to the temperature (in °C). The sensor circuitry has been discontinued and therefore it has not been subjected to oxidation and other processes. With LM 35, the temperature can be measured more precisely with a thermostat. This work is also self-hitting and still does not increase the temperature of 0.1 degree Celsius in the air. The operating temperature ranges from -55 ° C to 150 ° C. In response to every °C rise/fall in ambient temperature, the output voltage varies by the rate of 10mv, i.e. its scale is 0.01v / °C. Additionally, a voltage output can also be set to the voltage output.

Most of the over air toxic waste and class examine systems are based on sensors which description impurity stars to the server by wired modem, router, or short-range wireless access points. In this character, we propose a system that a single-chip microcontroller, several air pollution sensors (CO, No2, and So2) integrate the normal positioning system (GPS) model and Bluetooth model. Integrated unit is a mobile and wireless data acquisition unit which uses wireless mobile public networks. The unit can be mounted on any moving device such as the public transport vehicle when it is running; the microcontroller becomes a frame which includes the air pollutant star acquired from the sensor array and the physical location reported from the attached GPS mode. The pollutant frame Then it is loaded and the pollution-server is transmitted through the public mobile network.

Fig. 1: Air Pollution

A database server is connected to the pollution-server to accumulate pollution levels for further use by interested consumers like environmental production agencies, uplift officials, tourism, vehicles and insurance companies. Pollution-servers are interactive in real-time polluting stars and Google Maps to display their locations in large metro areas. The effects of air pollution are dangerous for the environment and human health. Due to global warming, the ozone layer is decreasing and the heat is increasing in the atmosphere, thus it is the main problem that we can control so that we need to develop this system.
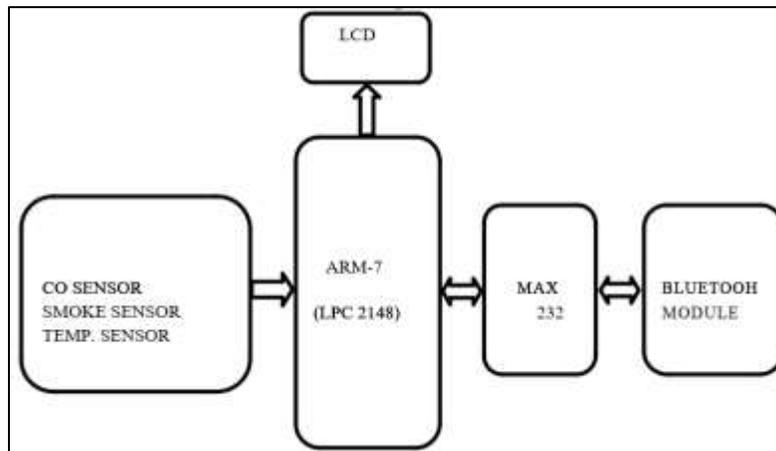
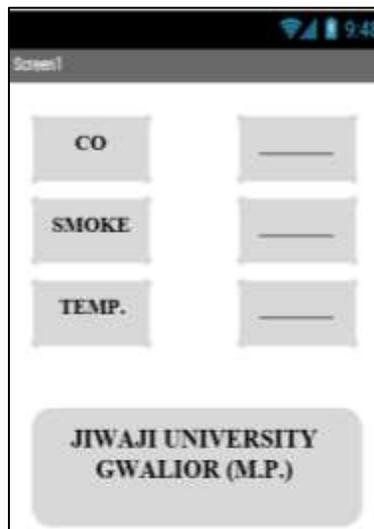## II. HARDWARE ARCHITECTURE

Fig. 2: Central Control

Fig. 3: Mobile Unit

A. Wireless Sensor Node

A wireless sensor network (WSN) is a transportation that consists of calculates, sensing and communication part, which permit the supervisor to examine and manage the specified parameters in the system. The specific application of WSN includes data collection, monitoring, and medical telemedicine. It is also used in the irrigation system, the parameters of monitoring and controlling greenhouse such as water flows, temp, humidity, moisture etc.

B. Sensors

Sensors are hardware devices that create the computable answer to modify in a physical state of air pollution. The analog signal transmitted by the sensors is digitized by an ADC converter & transmit to the controller for additional processing. There is various kind of sensors from which we can decide the suitable & appropriate sensor depending on the purpose.
1) Sensor 1 (CO sensor): The CO sensor senses the gas and communicates the data with the microcontroller.
2) Sensor 2 (N sensor): The Nitrogen sensors sense the gas and communicate the data with the microcontroller.
3) Sensor 3 (smoke sensor): The smoke sensor senses the gas and communicates the data with the microcontroller.
4) Sensor 4 (temp sensor): The temp sensor senses the temperature and communicates the data with the microcontroller.

C. Bluetooth Module HC-05

In the planned system, we are using Bluetooth modem for sent the data to lpc2138 to mobile. These tiny dimension Bluetooth TTL transceiver modules are designed for serial communication (SPP - serial port profile). It permits intention device to transmit or receive TTL data via Bluetooth equipment not including involving a serial cable to your computer. The modules with the HC-05 firmware are the component which is plant set to be Master or Slave modules. Master and slave method cannot be changed from the plant setting. HC-05 is a business rating product.
- Power input: +3.3VDC (Bluetooth module)
- Built-in CSR Company Bluetooth chip BC417143
- It can set the module control parameters and control commands via AT commands
- Bluetooth® Technology v2.0 + EDR
- Coverage up to 30 ft / 10 m
- Built in antenna
- The maximum serial baud rate is 9600 bps, support for hardware flow control transfer
- Provide seven input and output ports
- It is compatible with all Bluetooth adapters that support SPP
- Connection/non-connection status indicators

D. Microcontroller Unit

ARM (LPC-2148) acts as the microcontroller data processed and controls the functionality of other components in the sensor node. ARM Processor: - The ARM 7 based micro controller runs on load-store RISC architecture with 32-bit registers and fixed session-code length. The architecture provides a linear 4 GB memory address space. Using ARM 7 Corps is easy, cost-effective, and support modern object-oriented programming techniques.

E. Global Positioning System

GPS receivers are used to navigate, position, survey, find out and determine the time, and both are employed by private individuals and companies. During the development of the GPS system:
1) It has to provide users the ability to determine the time, speed and position, whether in motion or comfort.
2) Regardless of the weather, it should be consistent, global, with high accuracy of 3-dimensional positioning capabilities. Global Positioning System Navigational, tracking and location are used for the necessary data logging standards. The board can be interfaced with a microcontroller via UART. Data, such as latitude, is located where the longitude of the area is located. Speaking connector facility with board antenna, it can work only on the 3.3v power supply.

F. LCD Display

The liquid crystal display is the best man and machine interface in which excellent visual information is given, symbols, numerical, letters, and characters are displayed. We used the ODM's 16 * 2 LCD digital display.

This system includes Mobile Data Acquisition Unit (Mobile-DAQ) and fixed internet enabled pollution monitoring server (pollution server). Mobile-DAQ includes 32-bit single-chip integrated microcontroller integrated with a sensor array using the analog port. The mobile-DAQ, RS-232 interface is either connected to a Bluetooth module or mobile phone.
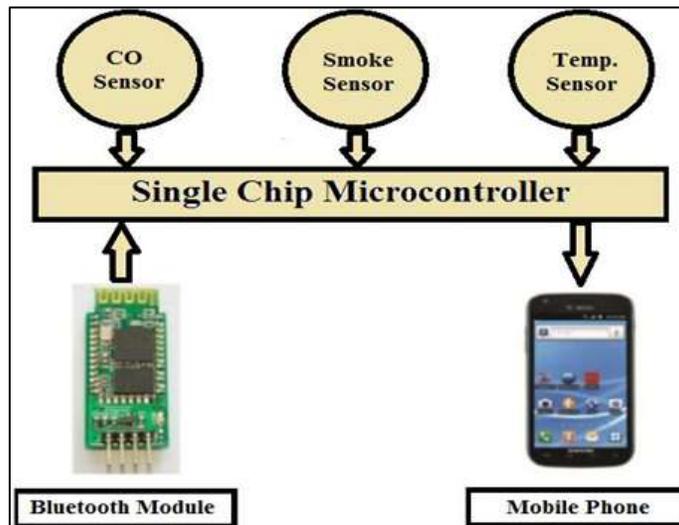
Fig. 4: Mobile DAC

G. *Pollution Server*

This (LAN) connects to a database management system through local area network. The pollution server connects the Bluetooth module through the internet / public mobile network through a multiplex/app. Travel forward: Check the actual confluent air pollution level by connecting pollution-servers to customers such as tour companies, municipal corporations, insurance companies and environmental protection agencies, using the standard browser on a standard PC or mobile phone
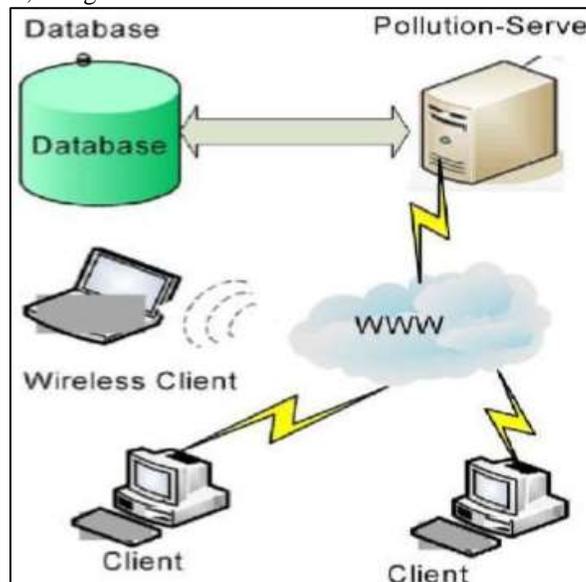

Fig. 5: Pollution Server

III. SOFTWARE ARCHITECTURE

A mobile web server is Apache HTTP Server or Apache Jetty Server Luggage Software, which provides mobile devices, such as tablets, smart phones, and the ability to host web sites, applications, and web services hosting web services on a mobile server for consumers. Convenience, Capacity, Flexibility The way we share data, communicate and gather information, there will be a revolutionary change. Mobile web servers face unlimited possibilities in the areas of enterprise mobile data access and are sharing for attractive markets such as music, military, and health care; some examples are engineering mobile devices all over the world as a mobile web server. The scenario will change. It will basically change the way we access maps with web services such as geographic location documents, medical records, information, and news. Mass transit system can use a mobile server, which is providing geographic location services, which can provide timings, real time location and route information to travelers.

The primary goal was to create a full web server lane on the Smartphone and a web server to run on mobile phones accessible from any web browser using a web browser. Access to mobile phones from the Internet is not easy because operators typically work on a firewall, which prevents access to the phone within the firewall from the Internet. By implementing a custom, we can disrupt that limit and now we are able to provide a web server to mobile phones with a global URL that can be accessed from any

browser. In a way, mobile phones have finally become a full member of the Internet. The components that enable this application are the following:

− An android server which will permit users to host websites.
− An Android application which will be dependable for HTTP protocol
− Communication
− Most of the communication to the stage occurs above the TCP port joined to the Android Device. Message instructions contain information such as ports use for stream the video, client login information, conference papers, and extinction commands. Sign up and forgot key dialogs get the benefit of the purpose previously implemented on the server region web page by using the java build in HTTP consumer to obtain web pages by Getting by including necessary information in the GET URI.

IV. IMPLEMENTATION

A. *Algorithm*

− Start
− Initialize all the devices
− Read the inputs from sensors
− Display it on LCD
− Send it to the android phone
− All the values can be seen from anywhere as it displays on the web page.

B. *Software Used*

− Keil Micro Vision
− Regarding the compiler and IDE used we have used Keil Micro Vision 3 which is provided by KEIL for development on ARM controller.
− It supports the USB boot loader enabled controller. It supports the on-chip debugging and programming tool.
− It currently supports all ARM family devices. It even facilitates the download of the program to the ARM ISP board.

C. *System Specification*

1) *Hardware*
− Microcontroller (LPC2148)
− Gas sensors
− Bluetooth module
2) *Software*
− Keil micro vision 4: for LPC2148
− Languages used: embedded c, JAVA for the mobile

V. RESULT

Table – 1

S.NO.	Parameters	Value
1.	CO	45.00PPM
2.	SMOKE	0.8mg/m3
3.	TEMP.	20oC

VI. CONCLUSION

The system uses city buses to collect pollutant gases such as CO, N, Smoke, and Heating, which are transmitted from different locations imposed by sensor arrays to the pollution data control center unit, which is the data through the Google map interface From the Internet using the Bluetooth model.

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