Wireless Linked Navel Substation for International Boundary Scanning and Surveillance System Using GPS

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ABSTRACT
The boaters may sometimes cross their area limit without their knowledge. This causes a lot of problems. They may be caught by the other peoples. This project is developed for the boat users to find out their border in the sea area. The main modules in this project are RF transducer, microcontroller unit and LCD display. The Zigbee transmitter is connected at the border area. It transmits RF signals within the particular limit. The Zigbee receiver with the micro controller unit is connected at the boat. When the boat reaches the particular area, the RF signals are received by the receiver and given to the micro controller unit. The micro controller analyses the signal and calculates the distance and sends corresponding message to the LCD display. If it crosses the limit, the micro controller operates the warning buzzer and it switches off the running motor of the boat. Thus the boat may be automatically off and the boater may easily understand the situation. The micro controller program is written in embedded c language and the microcontroller used is ARDUINO.

Keyword: Air pollution, wireless sensor system, carbon monoxide, smoke, PHP-MYSQL, Lab VIEW

I. INTRODUCTION

II. PROPOSED SYSTEM
III. HARDWARE DESCRIPTION


A. PIC16F877A Microcontroller

B. Sensors Array
The Sensor Array Consists Of Two Air Pollutions Sensors. Each Of The Sensors Has A Linear Current Output In The Range Of 4 Ma–20 Ma. The 4 Ma Output Corresponds To Zero-Level Gas And The 20 Ma Corresponds To The Maximum Gas Level. A Simple Signal Conditioning Circuit Is Designed to Convert the 4 Ma–20 Ma Range Into 0–5 V to Be Compatible with the Voltage Range Of The Built-In Ana log-To-Digital Converter in The PIC Microcontroller.

C. GPS Receiver
The GPS Module Provides The Physical Coordinate Location Of The Mobile-DAQ. Time And Date In National Marine Electronics Association (NMEA) Format. NEMA Format Includes The Complete Position, Velocity, And Time Computed By A GPS Receiver Where The Position Is Given In Latitude And Longitude. The Data Packet From The GPS-Module Includes An RMS Header Followed By UTC Time, Data Validity Checksum, Latitude, Longitude, Velocity, Heading, Date, Magnetic Variation And Direction, Mode, And Checksum. The Only Information Required For The Proposed System Is Date, Time, Latitude And Longitude. The GPS Modem Is Interfaced With The Microcontroller Using The RS-232 Communication Standard.

D. Zigbee Modules
In This Paper, Two Types Zigbee Modules Are Used To Organize A Network For Air Pollution Monitoring System. The Network Is Controlled By Devices Called The Zigbee Coordinator Modem (ZCM). The Zcms Are Responsible For Collecting Data And Maintaining The Other Devices On The Network, And All Other Devices, Known As Zigbee End Devices (ZED), Directly Communicate With The ZCM. The Zigbee Module Is Hardware Platform Of Wireless Device.

The Modules Realize The Basic Function Of Physical And MAC Layer, Such As Transmit And Receive, Modulation And Demodulation, Channel And Power Control.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Band</th>
<th>Data rate</th>
<th>Coverage</th>
<th>Ch</th>
<th>Sensitivity Rx Modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 GHz</td>
<td>ISM</td>
<td>250 Kbps</td>
<td>Worldwide</td>
<td>16</td>
<td>-85dbm O-QPSK</td>
</tr>
<tr>
<td>868 MHz</td>
<td>Europe</td>
<td>20 Kbps</td>
<td>1</td>
<td>-92dbm BPSK</td>
<td></td>
</tr>
<tr>
<td>915 MHz</td>
<td>ISM</td>
<td>40 Kbps</td>
<td>Americas</td>
<td>10</td>
<td>-92dbm BPSK</td>
</tr>
</tbody>
</table>

Figure 5. Frequency Bands For Zigbee

Zigbee Operate At 2.4 GHz Frequency ISM Band Wireless Communication. The Modules Include A Digital Direct Sequence Spread Spectrum Base Band Modem and an Effective Data Rate Of 250 Kbps. They Employ the EM2420 2.4 GHz Radio Frequency Transceiver and the ATME 8-Bit AVR Microcontroller. They Also Exhibit A Nominal Transmit Of 1.5dbm And A Receive Sensitivity Of -92dbm When Powered At 3.0V, The Modules Draw 31.0ma In Transmit Mode And 28ma In Receive Mode. When The Entire Module Is In Sleep Mode, The Current Draw Is Reduced To Approximately 10ua.

E. Central Server
The Central-Server Is An Off-The-Shelf Standard Personal Computer With Accessibility To The Internet. The Pollution-Server Is Connected To The Zigbee-Modem Via RS-232 Communication Standard. The Air Pollution Information Sent From Each ZED Are Collected To ZCM. And Then The Data Are Saved To Database Of Central Server. Figure 5 Block Diagram of Zigbee Module

Clients Such As The Municipality, Environmental Protection Agencies, Travel Agencies, Insurance Companies And Tourist Companies Can Connect To The Central-Server Through The Internet And Check The Real-Time Air Pollutants Level Using A Normal Browser On A Standard PC Or A Mobile Device.

IV. System Implementation and the Results
The Sensor Output Voltages Representing The Level Of Gas For Each Pollutant Were Converted To A Ppm Value For Each Gas And Simultaneously Displayed On The LCD Display Of The Hardware.
Ordered Sensors Abroad.

The Values Of The Level Of Smoke And Temperature From The Serial Port Is Taken In Account By The Lab view Software Which Is Used To Display These Data In Their Respective Textbox And Also It Displayed In The Form Of Continuous Waveforms In Two Different Panel. The Screenshot of the Computer Window for the Lab view Designed Page Is Shown Below.

The Air Pollution Monitoring System Includes a Feature Which Automatically Publishes the Results into Hyper Text Mark up Language (Html). The Figure 8 Shows The Interface Of The Website.

V. CONCLUSION
The System Detects Temperature And Smoke Emissions By Using Sensors Lm35 And Tgs 813 Which Is Commercially Available In The Local Market Makes It More Convenient And Variably Cheaper Compared To Pre-Ordered Sensors Abroad. This Sensor Saves 1/7 Of Power Consumption. All Data Were Treated Using A Developed Lab view-Based Program. The System’s Overall Functionality Was Verified with Series of Temperature and Smoke Level Tests Including Tests in a Normal or Clean Environment, Cigarette Smoke, And Car Exhaust Emission on Different Time Intervals. The Cigarette Smoke Tests Showed That Carbon Monoxide Reading Is 6 Times Greater Than The Smoke Reading And For The Car Exhaust Tests It Showed The Carbon Monoxide Reading Is 4 Times Greater Than Smoke Reading. Systematized Data Logging Was Also Done To Back Up Every Result Which Will Be Of Valuable Reference During Erroneous Reading, Debugging And Calibration. The Results Were Processed Automatically Using A Lab view And My sql-Based Program With Output Published In Php Format Which Is Readily Available For Uploading In The Internet. The System Provided A Low Cost Data Acquisition Of Temperature And Smoke Pollutants That Can Be Read Online For Air Pollution Monitoring For Environmental Awareness.

VI. FUTURES COPE
In Order To Make The Present Design More Realistic With Low Power By Replacing The Semiconductor Sensor, It Is Possible To Use Nano SENSOR; So That The Solar Power Base System Design Can Be Made Possible. For Longer Distance Communication We Can Use Gsm System Also We Can Control The Air Pollution By Using Sensed Data As Command.

REFERENCES


