



Wireless Sensor Network for Monitoring of Air Pollution Near Industrial Sector

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Abstract: *Monitoring of the parameters, revealing air pollution and causing to deteriorate the industrial and nearby environment is of a great significance. The effluents released by the industries such as pharmaceutical, chemical, sugar, alcohol etc is the major cause of the environmental pollution. In fact, the hazardous gases dissolved in the air depict site specific variability (SSV). To monitor the concentration of Carbon Monoxide (CO) gas, present in the air, a Wireless Sensor Network is designed, wherein the sensor nodes have been designed by deploying embedded technology. The Nodes have been developed about PIC 18F4550 microcontroller, wherein the IEEE 1451 standards are realized. The sensor interface module is developed by using precise sensor MQ6. All nodes were calibrated, employing process of regression, to the scientific units. The Zigbee devices are employed to ensure wireless communication, supporting IEEE 802.15.4 standards of ISM band. The nodes are deployed systematically within the area of investigation, nearby industrial sector, wherein the Link Quality (LQ) and Received Signal Strength (RSS) values are emphasized. The network is established in star protocol and the site specific data is demonstrated at the Base Station. A dedicated GUI is also developed for Base Station. It also ensures the storage of data in real time. The Wireless Sensor Network developed for monitoring of concentration of carbon monoxide gas in the air is on site implemented and results of implementation are interpreted in this paper.*

Keywords: *Industrial Wireless Sensor Network, LabVIEW, Zigbee Devices, Air Pollution, Industrial Parameters, Pollution Monitoring.*

I. INTRODUCTION

The field of an embedded instrumentation system [1] opens space for emerging wireless communication technology [2] to exchange information from remote location, which overcomes the limitations of traditional telemetry system [3]. Modern semiconductor technologies are producing the devices of promising features such as small size and low power consumption, great configurability, flexibility in design etc, which can be developed for dedicated tasks in embedded system like, signal processing, storage and wirelessly transceiver. Deploying such devices the field of wireless sensor network [4] could be made more pervasive. The Wireless Sensor Network is the composition of either mobile or fixed located small devices equipped with functionalities such as sensing, signal conditioning, signal processing, capability of wireless communication through RF module, etc. Such devices are familiar as sensor nodes [5] or sensor motes [6], which are operated on tiny rechargeable batteries. Furthermore, coordinator [5] is a device in Wireless Sensor Network, which collects sensed signal from scattered active nodes in the investigation area.

On survey, it is found that, wireless sensor network covers wide application area [7], like medical, precision agriculture, military, industrial sectors and rescue operations. Furthermore, researchers are developing new trends in such application areas. Researcher, Kumbhar et al reported about the traditional Ethernet interface for industrial automation system based on PIC microcontroller [8]. This report gives LAN to SPI communication to control industrial parameters. Nowadays, drawbacks of traditional systems are overcome by wireless sensor network. The Raut et al developed industrial automation based on zigbee module, wherein, the system is particularly developed for industrial power management [9]. Further, Chourasia reported the wireless air pollution monitoring system based on zigbee as RF module. System was developed to collect pollutant gases such as CO, NO₂, and SO₂ etc [10]. In [11], wireless ECG monitoring system is reported, wherein hardware is developed around atmega32 microcontroller along with CC2500 utilized for wireless communication. Furthermore, Ling et al reported zigbee based blood pressure monitoring system to ensure biomedical application of WSN. They availed visual studio for monitoring blood at base station and X-CTU to configure zigbee modules to form a network of devices for data collection [12]. The Thakur et al reported wireless home automation system [13]. Lopez, reported wireless monitoring system for various parameters from fish farm [14], wherein, the parameters like pH, NH₄, etc are wirelessly monitored. Further, Ladgaonkar et al reported the ARM based embedded system for soil moisture monitoring [15]. Moreover, Anita et al reported wireless monitoring for disaster management system of dams [16]. Besides, hazardous gas concentration monitoring and pollution monitoring system is also reported by some researchers [17] [18]. Further, Jero et al have reported wireless nodes for gas pipeline leakage detection [19].