Proc. Annual Symposium on Research & Industrial Training, 02(2015) 17-22
Department of Electronics – Wayamba University of Sri Lanka

REAL-TIME REMOTE SYSTEM FOR INDUSTRIAL ENVIRONMENTAL PARAMETER MEASUREMENT AND MONITORING

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ABSTRACT

Modern technologies extensively influence on the output gain of today's industries. Many industries are using real-time monitoring technology to improve their productivity with fewer or rare breakdowns of machineries. But the complexity of installation and high cost associated with such monitoring systems are the disadvantages. Data transferring in current remote monitoring systems should be developed with the accessibility to wireless technology as wireless sensing devices provide increased flexibility. The aim of the research study is to build a reliable and cost effective remote monitoring system that would be able to link the input data wirelessly to a remote computer which control industrial process. The remote monitoring system has three main components; transmitter unit, receiver unit and the client software. An ATMega328P-PU microcontroller is used to collect inputs and XBee radio modules are used to build the wireless network between the remote locations. This system is designed to gather data from DC or AC sources as inputs to the transmitter which placed outdoor in order to transmit data wirelessly. The receiver unit of the system connected to an indoor remote computer which receives data. Then the data can be displayed on the screen with the use of client software. This shows unique as implemented system gives about 50% cost advantages and increase speed of 90% than human involved monitoring.

Keywords: Remote-real-time-monitoring, Wireless communication, Receiver, Microcontroller based automation

1. INTRODUCTION

Many processes in today's industries are automated and hence human assistance is manually used for maintaining the system. Whenever there is an equipment failure, supply run out or unexpected condition at a remote location, it may sometimes results in costly catastrophic

consequences. Such can happen as the result of the unawareness of the maintenance responsible company people about the sudden occurrence of such situations. The people responsible for making corrective action of such automated systems are not aware of the abrupt situation[1]. Therefore, in order to avoid such situations, this proposed new device will be more helpful for industry. So nowadays, it is essential to monitor such information from a remote location or need to be gathered into a database of a central monitoring system.

Although the remote monitoring system features are developing faster within more user friendly environment, there are some problems and difficulties for local adoption of those systems such as; high cost unbearable for medium scale industries, machine-oriented, complexity of installation and maintenance, need of long distance network wiring.

Thus the idea behind the research project is to build a real-time remote monitoring system for measuring industrial parameters in order to overcome shortcomings associated with readymade industrial systems. This remote monitoring system would be a reliable and cost effective embedded device that would link the input data wirelessly to a remote computer. The basic idea is to improve the applicability and adoptability of the system for a real-time industrial environment. The use of wireless communication techniques will eliminate the need of lengthy and costly network wiring and crate a tidy easy-to-install software based system. These kinds of features are highly valuable for today's industry environment with less human interactions.

2. EXPERIMENTAL

2.1. Wireless network requirement

This project has been chosen to use a wireless communication medium than wired one in order to make use some advantage features such as; easy implementation of physical components, one time bearable high cost of wireless media based software solution. Moreover such implementation doesn't interfere or damage architectural aspects of a building or device connected and easy expandability bare for future enhancements.

The project requires certain quality features in the wireless technology to be used for the proposed system. During the selection process of the wireless technology for the project, the most required features were the reliability, maximum range approach and the bearable cost. Maximum range is very important as the system communicate outdoor to indoor vice versa. Also this system is primarily targeting the electrical device manufacturing industrial application; it should be robust and much reliable. Other than that, operating frequency, amount of data can be transmitted; system autonomy and compatibility with microcontroller

based system interfacing operations are needed to be considered. The standard (IEEE 802.15.4) low cost, low power and low bandwidth digital radio technology; ZigBee has chosen as the most compatible wireless technology for this system[2].

2.2. System overview and operation

The goal of this project is to monitor the conditions of parameters and sensor readings of the devices placed outdoor, with the use of a computer (GUI) placed at indoor. Basically the real-time remote monitoring system has three parts; Transmitter unit, Receiver unit and the client software. An overview of the implemented system is shown as in Figure.1.

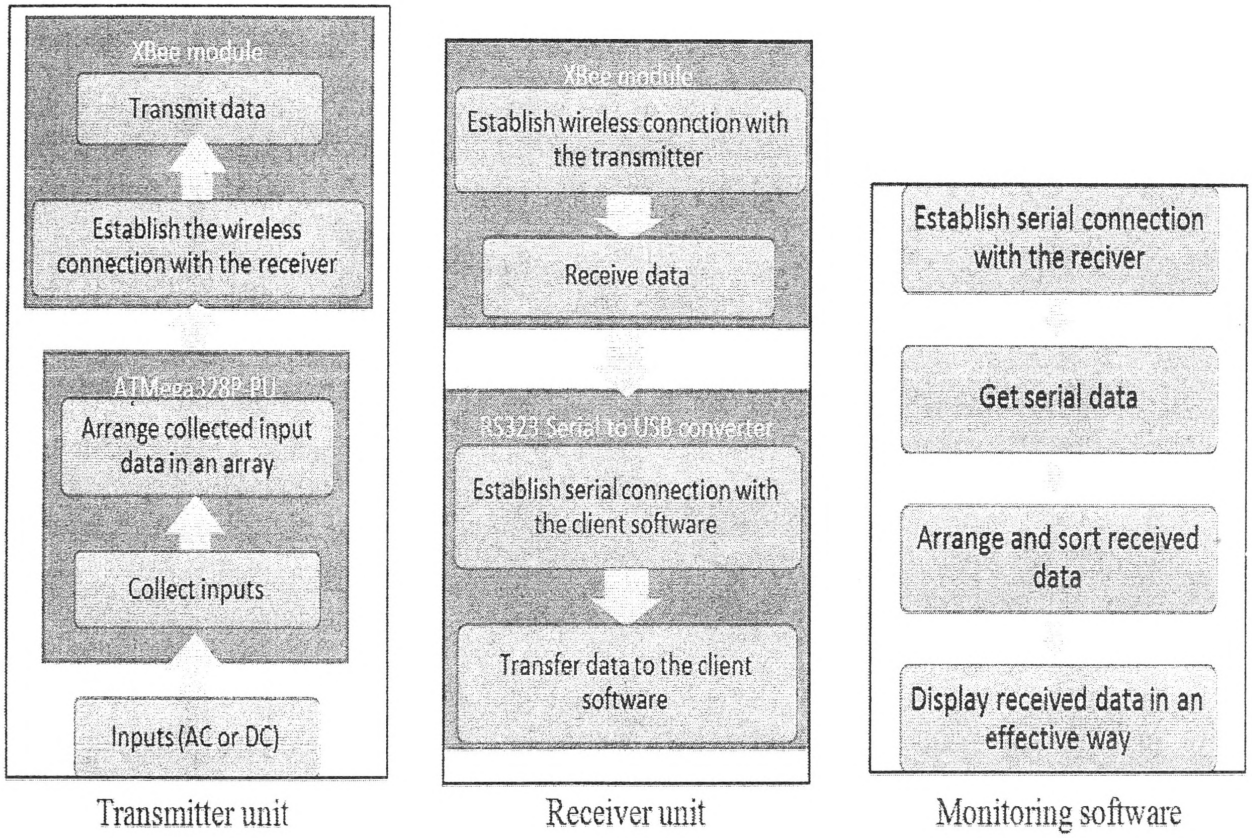

Figure 1: Overview of the implemented monitoring system operation

Basically sensors and required parameters from outdoor panels (AC or DC inputs) are taken as the inputs and they are interfaced to an ATMega328P-PU microcontroller. Then the signals can be transmitted with the use of XBee to the remote receiver. The microcontroller has been programmed to collect input data signals, arrange them in an array and serially transfer the data to the XBee module. The XBee module has been configured to transmit the collected data, establishing wireless connection with the receiver module at a remote location. Then the XBee receiver module which is interfaced to the computer through an RS323 serial to USB converter module received data. Then the readings will be displayed in the computer

GUI with the use of created monitoring software. The monitoring software refresh always since the data receiving in every second has to be updated and thus real-time monitoring could be achieved.

3. RESULTS AND DISCUSSION

3.1. Results

The prototype of the real-time remote monitoring system was successfully implemented within the company in a project called Wireless fire panel monitoring system. For this the novel proposed system was interfaced with the fire panel.

Software was tested by connecting the transmitter unit to the AC inputs taken from fire panel placed outdoor and receiver unit to the remote computer. The results of the monitoring system was analyzed and obtained from the software and they are shown in Figure.2 and Figure3.

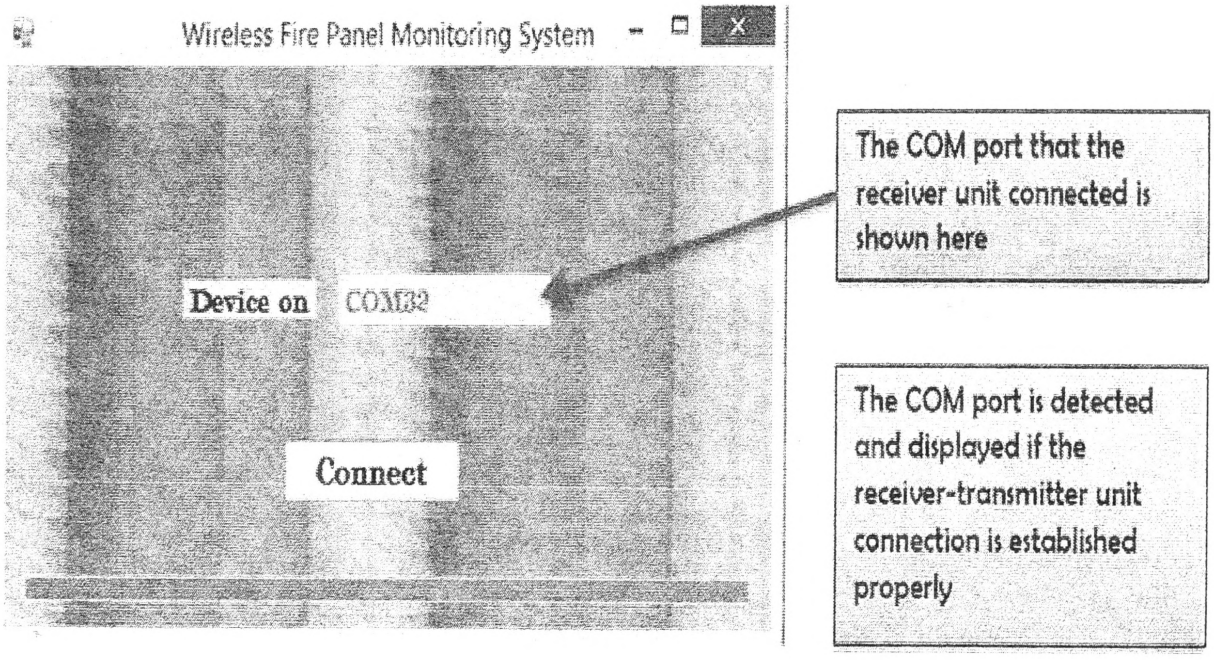

Figure 2: Wireless network connection detecting window GUI

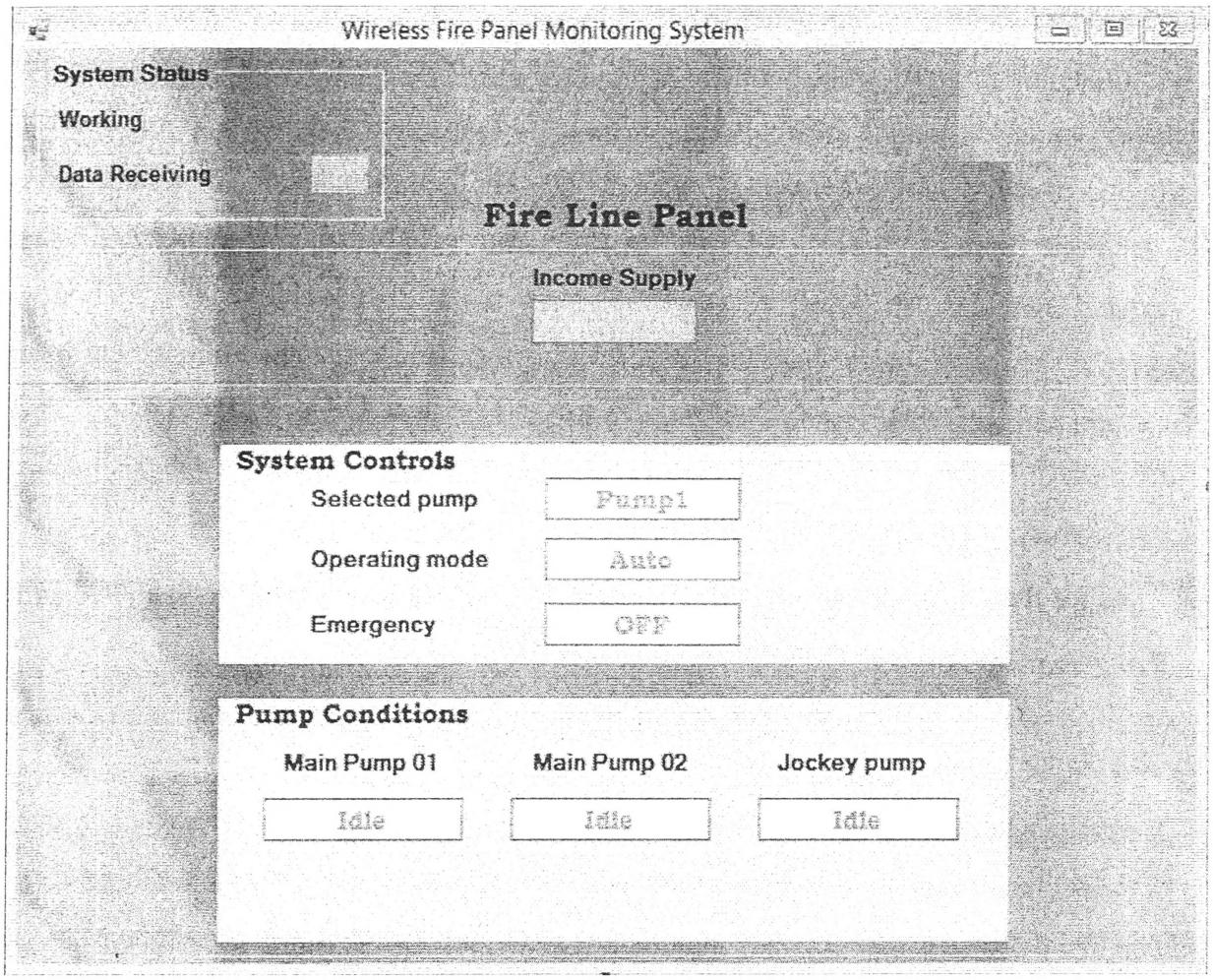

Figure 3: The GUI of the system input monitoring interface

The changes of input signals were detected by the monitoring software and were displayed. All the input states and the system states were correctly and dynamically displayed while refreshing the main monitoring window automatically in every second. In the future develop state it was proposed continue as system for critical machinery which have tendency to get fire due to unawareness of their temperature increase.

3.2. Discussion

The project objectives were successfully achieved by implementing a real-time remote monitoring system that communicates wirelessly as a modification to the existing systems for medium scale local industry environment. The wireless network connection strength is depend on the distance between the remote locations and the CPU, so the network range should be extend when required by replacing XBee modules with higher power and range capable transceiver module.

4. CONCLUSION

The final outcome of this research study is a reliable, cost effective real-time remote monitoring system which can be used for industrial purposes regardless of the input signal type AC or DC that will be useful for medium scale local industry environment. Moreover this simple system doesn't require inconvenient wire or LAN connection since it communicates through wireless connection and hence reduce the cost by about 50%. Moreover this shows unique as implemented system increase speed of monitoring by about 90% than human involved monitoring because it facilitates real-time monitoring.

ACKNOWLEDGEMENTS

The author would like to acknowledge and extend increment gratitude for everyone who has supported to make this research project a success.

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