

Wireless data acquisition system for industrial monitoring

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ABSTRACT

In this paper we concern with designing and implementing data acquisition system for industrial monitoring which can accurately monitor and control the temperature in industries. In traditional acquisition systems the sensors are connected to acquisition system with wires. For monitoring in large industries traditional acquisition systems can be complex and more power consuming. To overcome this problem wireless data acquisition comparatively better than traditional data acquisition systems.

Keywords: ATMEGA 328, NRF24L01, BC582 solide state relay

1. INTRODUCTION

The terms monitoring and assessment are frequently confused and used synonymously. The process of industrial quality assessment is an evaluation of the industrial quality in relation to standard quality set by pollution control board. Particular attention is given to factors which may affect human health and the health of the natural system itself. Environmental quality assessment includes the use of monitoring to define the condition of the water, to provide the basis for detecting trends and to provide the information enabling the establishment of cause effective relationships. Industrial quality monitoring is the collection of information at set locations of different industries and at regular intervals in order to provide the data which may be used to define current conditions, establish trends etc. Due to the complexity of factors determining industrial quality, large variations are found between different industries. Similarly, the response to industrial impacts is also highly variable. The main reason for the assessment of the quality of the industrial environment has been, traditionally, the need to verify whether the observed industrial quality is suitable for intended uses. The use of monitoring has also evolved to determine trends in the quality of the water, air and soil environment and how

they are affected by the release of contaminants, other anthropogenic activities, and/or by waste treatment operation (impact monitoring). More recently, monitoring has been undertaken to estimate nutrient or pollutant fluxes discharged to rivers, ground waters, lakes, oceans and soil or across international the boundaries. The assessment of background quality of the industrial environment is also now widely undertaken as it provides a means of comparison with impact monitoring. It is also used simply to check whether any unexpected change is occurring in otherwise pristine pollutants. However, it should be noted that industrial environmental quality is very variable depending on local conditions. Fresh water is a finite resource essential for use in agriculture, industry, propagation of wildlife & fisheries and for human existence. India is a river in country. It has 14 major rivers, 44 medium rivers and 55 minor rivers besides numerous lakes, ponds and wells which are used as primary source of drinking water even without treatment. Most of the rivers being fed by monsoon rains, which are limited to only three months of the year, run dry throughout the rest of the year often carrying wastewater discharges from industries or cities or towns endangering the quality of our scarce water resources. Similarly working environment in an industry is important for safety of its workers and people who live near to it. Hence it is important to monitor amount of temperature in an industry.

2. RELATED WORK

This wireless system continuously monitors the temperature. The system has hardware, software and a personal computer. The whole system is comprised of power subsystem, server and client and sensor subsystem. The server and client communicate with each other using SPI protocol. This system uses radio frequency (RF) for sending the data from client node to server node.

The server node collects the data from client node and transfers the real time values to personal computer using a USB communication link.

2.1. HARDWARE IMPLEMENTATION

The basic block diagram of wireless data acquisition system is shown in figure. Figure 1 is transmitter part which will be placed near equipment where temperature monitoring is required. Figure 2 shows the receiver part which is connected with a pc using a usb communication link. This project implements a wireless data acquisition system on atmega 328 microprocessor which capability of RF networking. The system uses 2.4 GHz transceiver antenna NRF24L01 which is capable of transmitting the signals upto 1000 meters.

Temperature sensor: The temperature sensor which could give proper output of sensed temperature of location for monitoring and controlling.

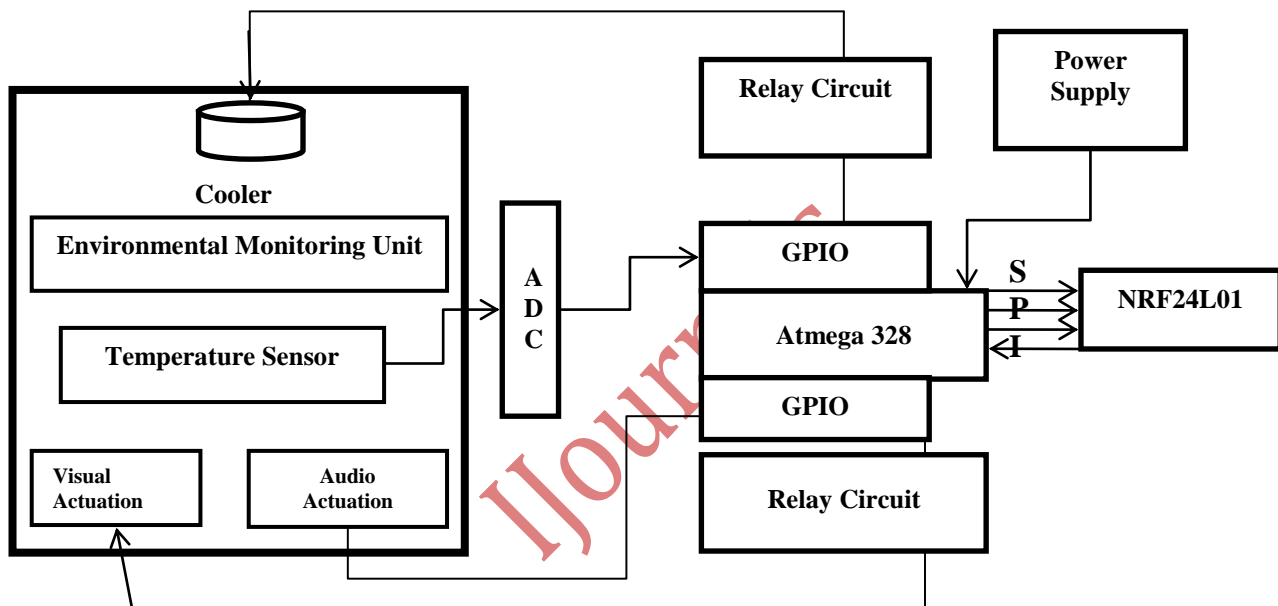


Figure 1: Transmitter

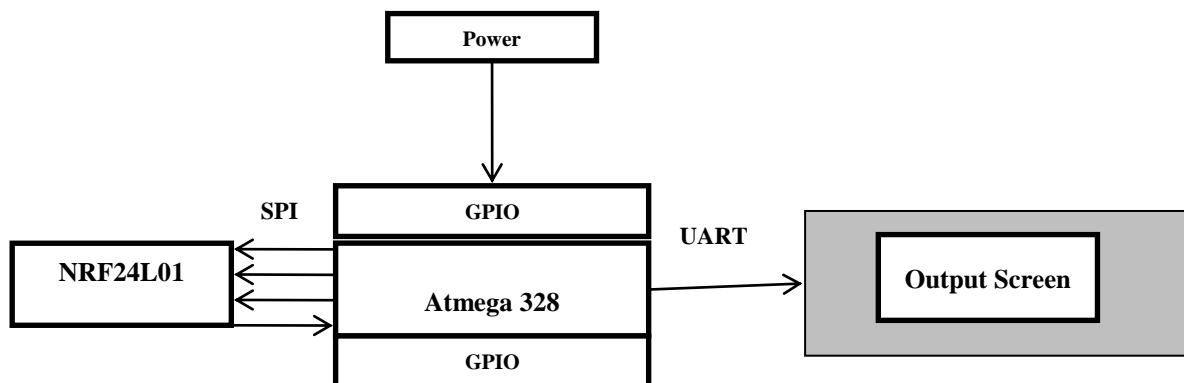


Figure2: Receiver

Antenna: NRF24L01 antenna is used in transmitter and receiver side. This antenna is available in two versions one with onchip antenna and other with external antenna support. Any one type of antenna can be selected based on

power requirement and distance between transmitter and receiver.

2.2. Software Implementation

Software used for this project was arduino uno. It is a open source software used for dumping program in microprocessor. The main advantage of this software is:

- Clear and easily understandable interface.
- It is easy to compile, debug and run the program.
- Easy to write and understand the codes.
- A make facility.

3. Flowchart

Flowchart of the whole system is shown in figure 3.

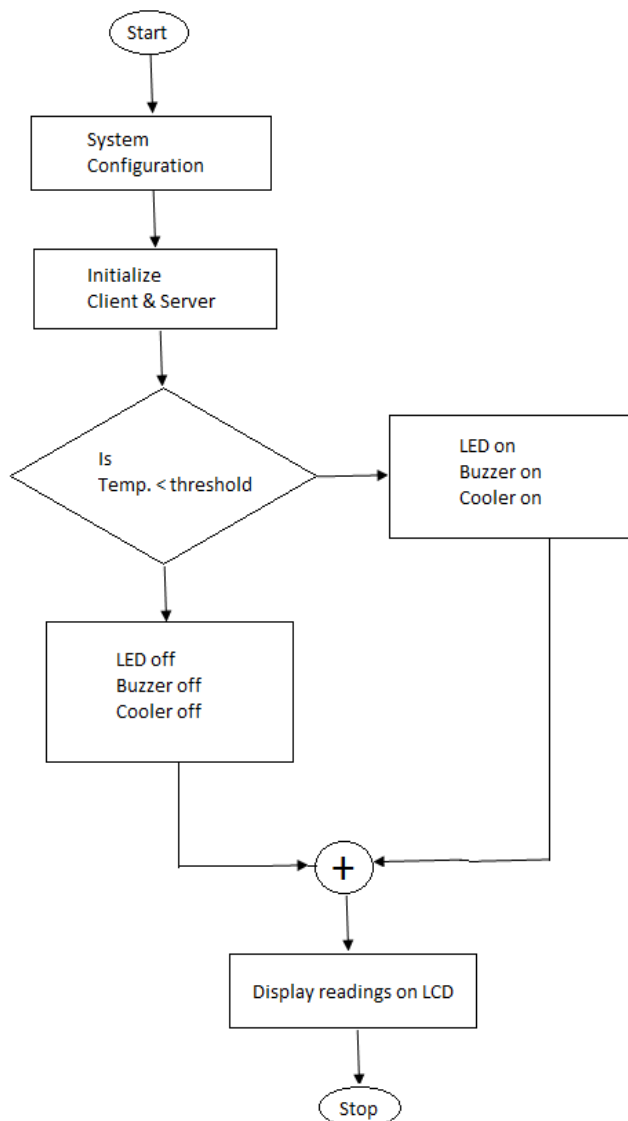


Figure 3: Flowchart

4. Advantages

- Can use hazardous/remote areas where life is at risk.
- High data reliability.
- Support for multiple network topology
- Transmission range available upto 1 km
- Lower power consumption with battery life ranging from months to year.
- Highly reliable cost effective ,and compact in size.
- Independent of line of sight communication.
- Simple to install and easy to maintain. It helps to monitor and control the parameters in a place where human inference is difficult.
- No need of any technical person for control or monitoring. Number of parameters can be added in the system.

5. Result and conclusion

This chapter gives the various steps involved in obtaining the results at different stages of the implementation.

Test Bed Set Up

Test bed set up for industrial environmental monitoring system test bed consists of monitoring sensors, ATMEGA328 module and wireless module. Industrial environmental sensors sense the parameters and transmit it to the GPIO pin of the ATMEGA controller. The dice will perform the ADC operation successfully and transmit the data to wireless device using SPI protocol; the data will be wirelessly transmitted for a range nearer to 1000mts. The receiver once receives the signal based on RSSI the data will be read and based on the data the device will perform the actuation system.

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7. References

- [1] IEEE Std 802.15.4 Specifications for Low-Rate Wireless Personal Area Networks WPANs. IEEE Computer Society, September 2006.
- [2] G. Montenegro, N. Kushalnagar, J. Hui and D. Culler, Transmission of IPv6 Packets over IEEE 802.15.4 Networks. IETF RFC 4944, September 2007.
- [3] J. Hui and P. Thubert, Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks. IETF RFC 6282, September 2011.
- [4] Z. Shelby, K. Hartke, C. Bormann and B. Frank, Constrained Application Protocol (CoAP). draft-ietf-core-coap-11, July, 2012.
- [5] T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, J. Vasseur, and R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks," RFC 6550 (Proposed Standard), Mar. 2012.
- [6] P. Thubert, "Objective Function Zero for the Routing Protocol for Low-Power and Lossy Networks (RPL)," RFC 6552 (Proposed Standard), Mar. 2012. [Online]. Available: <http://www.ietf.org/rfc/rfc6552.txt>