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Implementation of Sensor Network to Monitor Environmental Parameters of Preparatory Unit of Textile Industry

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***Abstract*- To maintain the quality of the cotton yarn, the environmental temperature and humidity is maintained at the précised level in textile industry. In textile industry, monitoring of the environmental parameters such as temperature and relative humidity is essential. In fact, these parameters depict site specific variability (SSV). To play with such site specific data, deployment of the Wireless Sensor Network is most suitable solution. To monitor such parameters the wireless sensor network is established, wherein the wireless sensor nodes play a vital role. With the greater reliability and flexibility the wireless sensors nodes are designed, wherein ARM microcontroller, ARM LM4F120H5QR, is used as a core for computational task and RF transceiver module Xbee series-2, from DIGI International Inc, is used for Wireless Networking. Deploying embedded technology the sensor nodes have been designed for on-line monitoring of the two parameters such as, environmental temperature (^{0}C) and environmental humidity of the preparatory unit of textile industry. The smart sensors, SY-HS-220 for humidity measurement and LM35 for temperature measurement are deployed. By employing of embedded system, both hardware as well as software is co-designed. Deploying such nodes and the coordinator, the wireless sensor network is established by employing Zigbee technology and implemented for monitoring of the dedicated parameters of the preparatory unit of textiles industry. The results of implementation of WSN for monitoring of environmental parameters of preparatory unit of textile industry are interpreted in present paper.**

***Keywords*-- Sensor Node, Wireless Sensor Networks, RF Module, Microcontroller, Base Station.**

1. Introduction

Wireless sensor network provides new paradigm for sensing and disseminating information from various environments with a great potential to serve many and diverse applications [1]. The monitoring of various physical parameters such as temperature, fluid level, relative humidity, intensity of light, concentration of gasses dissolved in the atmosphere, vibrations, strain, soil moisture, industrial process parameters, pH and salinity of water etc plays commendable role in various sectors such as environmental pollution monitoring, high-tech agriculture, structural engineering, chemical and physical industries, transportation, military and defense, healthcare, forestry etc [2-6]. The Wireless Sensor Network (WSN) may be described as the collection of nodes organized into co-operative network. Due its salient features, the WSN is becoming significant area of research of global relevance. Due to their several popular applications, efficient design and implementation, wireless sensor networks [7-8] have become an area of current research. Sensing, processing and communication are key elements, whose combination in one tiny device gives rise to a vast number of remote sensing applications [9-10]. The Sensor Nodes in a WSN operate with small and limited battery power and usually non-renewable resource. Since communication among nodes consumes most of the energy [11], it is important to design the network with less communication among the nodes to estimate the required parameter vector. The important factor in designing of the sensor network is the reduction of the cost of the node without compromise in the performance. Due to low cost of the nodes the denser deployment can be ensured. Recently, to establish a wireless sensor network, the use of Zigbee technology is suggested [12]. Moreover, IEEE has also laid down the standards, IEEE802.15.4 standards for WSN [13] and allowed to works at 2.4 GHz of ISM frequency band [14].

The wired networks are not only infeasible for typical environment but also shows high cost, hardware complexity, hard to debug and upgrade. The wireless sensor network provides suitable solution to overcome the limitations of the wired system. The WSN is the application specific establishment of smart sensor nodes. The sensor nodes are systematically distributed over a geographical area of interest. Therefore, it becomes possible to design the intelligent, autonomous and energy efficient sensor nodes to facilitate the desired WSN. Emphasizing an implementation at textile industry, the WSN is designed and results of investigation are reported in this paper. Section 1 is of introduction. Section 2 is devoted for design and establishment of the WSN. Results of on-site implementation are interpreted in section 3 and 4 and conclusion is given in section 5.

2. Wireless Sensor Network (WSN)

Wireless sensor network (WSN) is the distributed network of large number of wirelessly connected autonomous devices, called Wireless Sensor Nodes, which collaboratively collects the information about physical world and disseminates the same towards the monitoring stations