

Design and Implementation of Embedded Web Server

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Abstract - *Web technology is the inevitable choice of embedded system network process. With Web, access ability of the embedded devices will get rapid development in communication equipment, information home appliances, remote management and other fields. Traditional technique for fire detection in large forest areas are based on satellite images and forest guard posts. However, these methods are not suitable for local measurement of the relevant parameters involved in fire risk. Forest fires are costly and dangerous because they cause extensive damage to both property and human life. With the help of wireless sensor network and ARM7 Microcontroller, Embedded Web Server is designed for Forest Fire Detection. This system provides solutions to issues observed in traditional fire detection system. There is no any electric wiring. Monitoring environmental parameters like temperature, humidity, gas, fire etc. Data transmission is done in wireless manner. This system requires less power. This system uses LPC2138 MCU with very low energy consumption. Also Cryptographic Technique is applied, providing security to wireless sensor network.*

This system is used for On-line monitoring environmental parameters, which are responsible for fire. Wireless Sensor Network (WSN) is the most preferred platform due to its low cost, small size, low power consumption, which will improve the level of monitoring. Web technology with Wireless Sensor Network (WSN) makes this proposed system more accurate and fast for fire detection.

Key Words: WSN, LPC2138, Web technology, Nodes

1. INTRODUCTION

The forest fire is raising issue throughout the world. It is reported that for last decade, each year total of 2000 wild fires happened in Turkey and more than 100000 in all countries. National Fire Inventory results shows that annual fire events burn 0.4% ($3.4 \times 10^4 \text{km}^2$) of total land across United States, which consists of 0.49% of total forests, 0.64% of savannas, 0.68% of shrub lands, 0.40% of grasslands, and 0.30% of croplands.[6]

Forest fires are costly and dangerous because they cause extensive damage to both property and human life. Hence, early and timely detection of forest fire is crucial as it can help in saving hundreds of lives and billions of dollars worth of resources. If fire breakout can be detected in its early stages it is possible to control the spread of fire.[3]

Now days, the technique for fire detection in large forest areas are based on satellite images and forest guard posts. However, these methods are not suitable for local measurement of the relevant parameters involved in fire risk. For this purpose, distributed sensing systems as wireless sensor networks (WSN) can offer a suitable solution to forest fire. Wireless Sensor Network (WSN) is the most preferred platform due to its low cost, small size, low power consumption, great flexibility, portability and scalability features.WSN in forest fire detection system used in distributed data collection, monitoring in harsh environments.[4] The embedded web server can simplify the design process for embedded web applications. There has been exponential growth of Internet use in recent years. This has generated a strong trend towards Internet protocols, Convenience and safety ability to monitor the status of a various system parameters, to control Internet appliances.[1]

1.1 System Concept

The aim of the proposed work is to design and implementation of embedded web server based on ARM microcontroller for forest fire detection using WSN. Objectives are given as below.

1. Wireless data transmission from node to node.
2. Cryptographic Technique is applied, providing security to wireless sensor network.
3. Embedded web server using LPC2138 Microcontroller and ENC20J60 Ethernet Controller.

1.2 Motivation of the Present Work

The rapid development of modern communication technology, Web technology has been widely used and was

a great success. As the continuous development of information society, increasingly mature network technology applied to the embedded system. With its good generality, platform independence and interactivity, Web technology is the inevitable choice of embedded system network process. With Web access ability of the embedded devices will get rapid development in communication equipment, information home appliances, remote management and other fields. Embedded Web server for embedded devices provide network interface, to realize the remote management and control. The proposed system of Embedded Web Server based on ARM microcontroller for Forest Fire Detection using Wireless Sensor Network, which helps to save hundreds of lives and billions of dollars worth of resources.

2. BASICS OF METHODOLOGY

The proposed system for forest fire detection using embedded web server uses WSN. The ARM based web server collects the data from different sensors. This data is stored in ARM microcontroller as web page this can be accessed easily using PC.

A. Wireless Sensor Node

This level contains design of sensor node for the collection of environmental parameters in forest which are responsible for fire. And send the collected data to another sensor node.

- Wireless sensor node having three sensors, Temperature sensor, humidity sensor and smoke sensor.
- ARM microcontroller reads all sensors in turns (i.e. temperature, %RH and smoke) and this packet of data sent one node to another node.

B. Wireless Sensor Network

This level contains design of sensor network to send the collected data from one sensor node to another sensor node.

- It is proposed to implement two nodes with three sensors each.
- Wireless communication between node to node and this packet of data sent to base station.

- The wireless communication module is mainly responsible for communicating with nodes and base station

C. Embedded Web Server

This level contains designing embedded web server based on ARM microcontroller (base station) for monitoring, transmitted data from Fire detection module to base station. For the designing web server uses TCP\IP protocol. Base station (Receiver side) consists of Wireless Transceiver module and Ethernet controller. PC is connected to ARM microcontroller through Ethernet controller The packet of data is transmitted from Fire detection module to Receiver consisting parameters of smoke sensor, temperature sensor, and humidity sensor. These all parameters are mapped on a web page and this web is stored in ARM microcontroller .When it required to observe different parameters of sensors, giving request from PC to display web page. The web page stored in microcontroller shall appear on screen. Now observe the stored parameters.

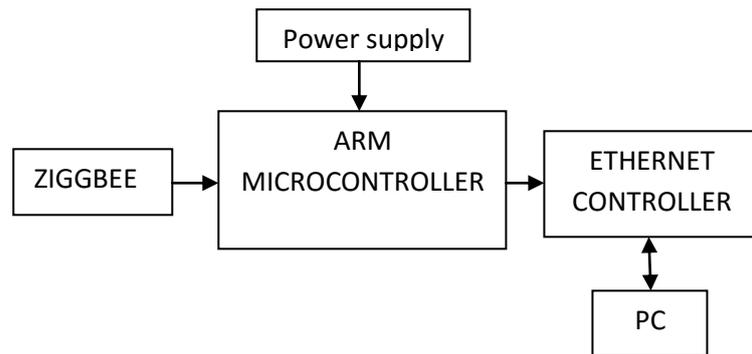


Figure 1. Wireless sensor network structure

3. CONCLUSIONS

Web technology has been widely used and was a great success. As the continuous development of information society, increasingly mature network technology applied to the embedded system. This project presents Embedded Web Server based on ARM Microcontroller and wireless sensor networks. Hardware and software design of wireless sensor network are described in detail, this system can detect the temperature, humidity smoke and uses cryptography technique. Cryptography technique makes this proposed system more secure. Wireless sensor networks and Web

technology applied to breaks the traditional methods and ideas of fire detection, which improves the practical ability and flexibility of monitoring system.

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