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IOT Based Temperature Monitoring System Using FPGA

G Subashini*[1], A Annie Sheryl[2], R Vimala[2]
[1]Assistant Professor, [2]UG Scholar, Department of Electronics and Communication, AAA College of Engineering and Technology, Sivakasi, Tamil Nadu, India
Email: **gsubhaammu@gmail.com*
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Abstract

FPGA with Internet of Things is a latest technology and this technique has been used to introduce many smart devices with wonderful applications in our day today life. One more challenge for IOT is to handle vast amount of sensing the data generated from smart devices that are resource limited and subject to missing data due to link failures. In this paper mainly going to focus on FPGA with IOT platform, i.e., the use of low cost FPGA implementation of entire IOT subset including TCP/IP protocol, Control System and Data Acquisition etc. In the past few years, we have enormous improvement in the field of IOT applications on FPGA platform. This technique has been updated with low cost, efficient power usage with real time observing and remote recognising system. The main objective of this research is to focus how the FPGA based hardware resources can be accessed from anywhere. The maintenance cost of servers can be reduced by building a cloud based monitoring system. The data losses are avoided with the help of this technique. To make the communication with various internets coupled devices (computer, tablet, mobile phone) at the same time anywhere in the world. There are various business spaces it needs you to observe temperature and update the status to the cloud. The temperature must be maintained at the lowest level in food preservation process. IOT based temperature monitoring system help us to monitor the food preservation system temperature and update the data to the cloud at the regular interval.

Keywords: *IOT Based, Temperature Monitoring System, FPGA*

INTRODUCTION

Web services with FPGA based hardware have already been realized and defined. Their embedded nature permits the developers to simply adjust those services to energetically interrelate with their surroundings, e.g., to attain real-world measurement data or control arious actuators. Such entities can be called environment-aware web services in difference to classical web services that work on remote physical or virtual machines. The IOT applications can be developed by implementing IP address with the particular VHDL code in order to make Internet of Things.

LITERATURE SURVEY

Ajay Rupani in her review article title 'A Review of FPGA implementation of Internet of Things' has briefed about the growth of IOT [1].

The internet has enabled an unpredictable growth of information sharing with the introduction of embedded and sensing technology, the number of smart devices including sensors, mobile phones, RFIDs and smart grids has grown quickly in recent years.

Andrea Caputo in his review article title 'The Internet of Things in manufacturing innovation processes: Development and application of a conceptual framework' has briefed about the services provided by IOT [2].

Internet of Things (IOT) is an integrated part of future internet including existing

and evolving Internet and network developments and could be conceptually defined as a global dynamic network infrastructure into the information network. Services will be able to interact with these "smart things/objects" using standard interfaces provide the necessary that will link via the Internet, to query and change their state and recover any message connected with them, taking into account security and privacy issues. M Kiruba in her review article 'FPGA implementation of automatic industrial monitoring system' has briefed about the control stability of FPGA [3].

Dr. KK Sharma proposed that, proposed the automatic monitoring of industrial system that deals with the core controller of FPGA, the analogy sensor such as gas sensor, digital sensor and dust sensor such as PIR motion sensor. This confirms a safer monitoring system. The parameters of Area, Power and timing report are investigated.

BLOCK DIAGRAM

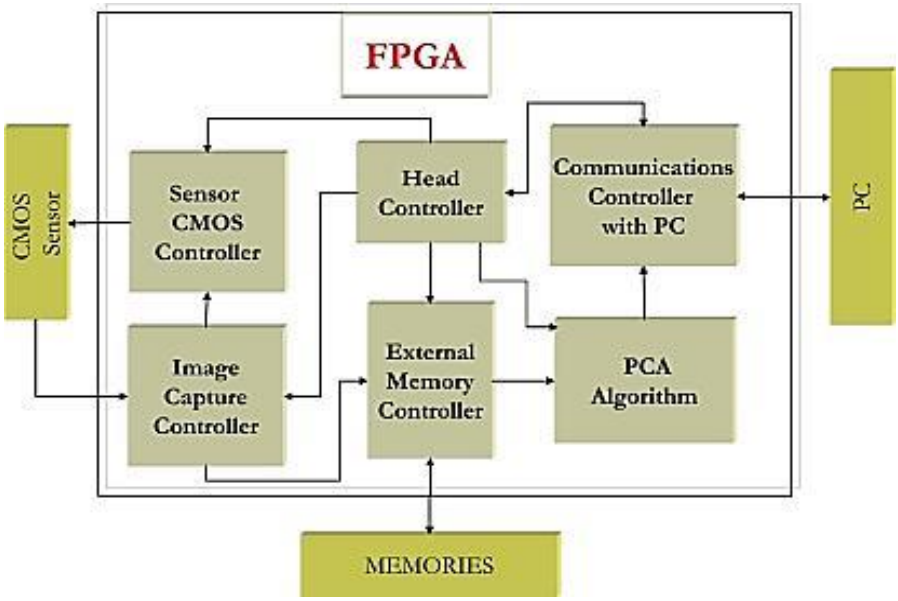

Figure 1: *Block diagram of FPGA.*

Block Diagram Description

The general FPGA architecture is shown in Fig. 1 consists of three types of modules. They are I/O blocks, Configurable logic blocks (CLB) and Switch Matrix/Interconnection Wires. The FPGA has two dimensional arrays of logic blocks which is used to arrange the interconnection between the logic blocks.

FPGAs have gained rapid growth over the past decade because they are useful for a wide range of applications. Some of the applications are cryptography, filtering and communication encoding and many more.

HARDWARE DESCRIPTION

LM35 Temperature Sensor

A temperature sensor is a thermocouple or a resistance temperature detector (RTD) that gathers the temperature from a specific source and alters the collected information into understandable type for an apparatus or an observer. Temperature sensors are used in several application namely HV(high voltage) system and AC(alternating current) system environmental controls, medical devices, food processing units, chemical handling, controlling systems, automotive under the hood monitoring and etc.

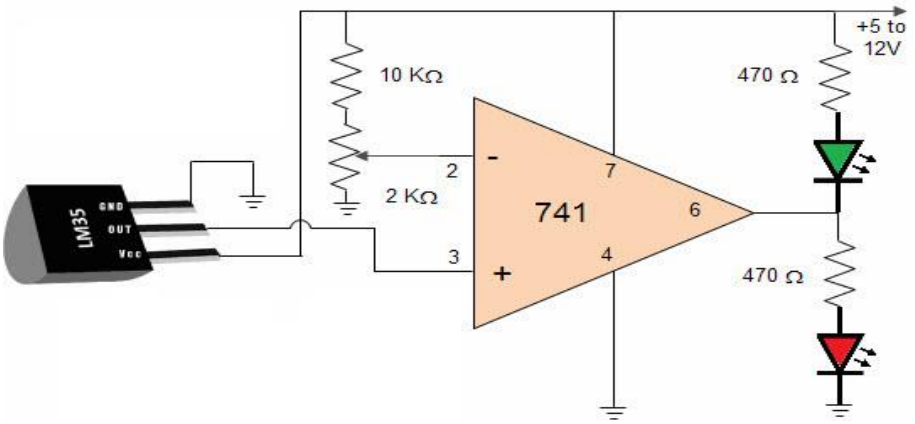

Figure 2: *Circuit Diagram*

This circuit comprises of the following components:

- LM35 Sensor transmitter and receiver pair.
- Resistors of the range of kilo ohms.
- Supply voltage.

SYSTEM IMPLEMENTATION

Spartan3AN FPGA starter kit consists of on board 2 channels ADC with channel connected with LM35 temperature sensor. VHDL code is used to perform conversion of analogy to digital and read the LM35 output as a digital data and 2*16 LCD is used to display the output.

Initializing 8266 Wi-Fi Module

ESP826 Wi-Fi Module is used to transmit the temperature data wirelessly to the Wi-Fi Modem at the other end with internet connection. ESP826 Wi-Fi Module can be initialized using set of AT Commands. After the initialization process, we have to program for configuring the Wi-Fi module as a TCP/IP client. The Wi-Fi module is shown in figure 3.

Figure 3: *Wi-Fi module.*

RESULTS

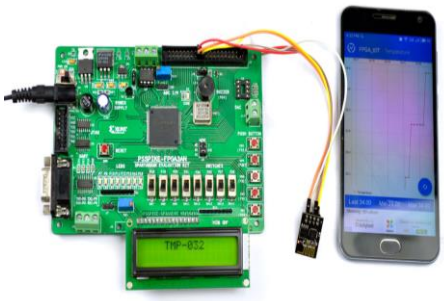

Figure 4: *Cloud based temperature monitoring output image.*

CONCLUSION AND FUTURE WORK

The IOT based embedded system has facing many challenges in difficult IOT applications. The Field Programmable Gate array structure is the alternate arrangement to overcome the problem which is facing in ARM processor. In this paper, we have introduced the study of technology paradigm for IOTs on FPGA Platform. The IOT based FPGA includes communication protocols, Data Acquisition and controlling systems. The temperature has been monitored with the combination of IOT and FPGA architecture and for every second time period the temperature has been updated in the particular IP address. There are various business spaces it needs you to observe temperature and update the status to the cloud. The temperature must be maintained at the lowest level in food preservation process. IOT based temperature monitoring system help us to

monitor the food preservation system temperature and update the data to the cloud at the regular interval.

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