

ARM CORTEX M3 BASED ADVANCED INDUSTRIAL AUTOMATION USING LABVIEW

¹Jnapana H S, ²Mrs.Indira Bahaddur
¹Student, ²Associate Professor
^{1,2}Dept. of ECE,
^{1,2}Malnad College Of Engineering, Hassan, India

Abstract : Industry is nothing but the production of goods or related services within an economy. In today's life, it plays a very important role by production of goods and as well as by providing employment for many people. Maintaining the temperature, humidity and gas level as well to secure anything by allowing only authorized person inside the industry is very hard in heavy industries. So I came up with this project titled as "Arm cortex M-3 based advanced industrial automation using LabVIEW". In this project the temperature sensor and humidity sensor senses the corresponding values and those values will be stored and displayed on the LabVIEW and database of LabVIEW respectively. In industries it is very important to know the person enter and exit so IR sensor is used. In industries if the fire happens suddenly then this leads to huge mass of loss so to know whether the fire exist or not gas sensor or smoke sensor is used. Then finally the sensed values are displayed on LabVIEW system and also stored in database.

Index Terms - ARM-Cortex M3, LabVIEW and Security System.

I. INTRODUCTION

In this age of computing and automation, it has become a trend in monitoring data through system. Remotely monitoring of environmental parameters is important in various applications and industrial processes. In earlier period weather monitoring systems are generally based on mechanical, electromechanical instruments which suffer from the drawbacks like poor rigidity, need of human intervention, associated parallax errors and durability.

Kang and Park have developed monitoring systems, using sensors for indoor climate and environment based on the parameters mentioned in 2000. Combination of these sensors with data acquisition system has proved to be a better approach for temperature and relative humidity monitoring in 2005[1]. Vlassov in 1993 introduces the usage of surface acoustic wave's devices as temperature sensor [2]. Then the GSM and RFID technology came up with the ideas of data transmission and reception. In this technology, microchips are used to transmit the identified information to the reader through wireless communication.

Another technology is the wireless sensor networks, which mainly use interconnected intelligent sensors to sense and monitoring. Then the upcoming technology is IOT. In this IOT, internet is used to monitor and the value is stored in webpage. Then to avoid internet I came up with this proposed system in which labview technology is used. In large industries it is very important to monitor the temperature, humidity values. Therefore this industrial automation using labview is proposed in which the data can be monitored and displayed on the labview and as well stored in database so that one can change and take some remedies if any variations occurred.

In this project, an attempt is made to interface arm cortex m-3 with labview through Ethernet shield. This proposed system includes monitoring of data and as well as indication of person enter and exit from the industry or secured room. In this system, arm cortex m-3 is used which is strong operating system supporter and speed will be more compare to other controllers. In this project, the sensors are used to monitor the data continuously and then the data can be displayed.

II. PROBLEM DEFINITION

Existing System Used GSM and Cortex-M-3.

- Interface GSM module with cortex-M3 using UART.
- Developing UART drivers to send SMS through
- GSM
- Mobile Phone

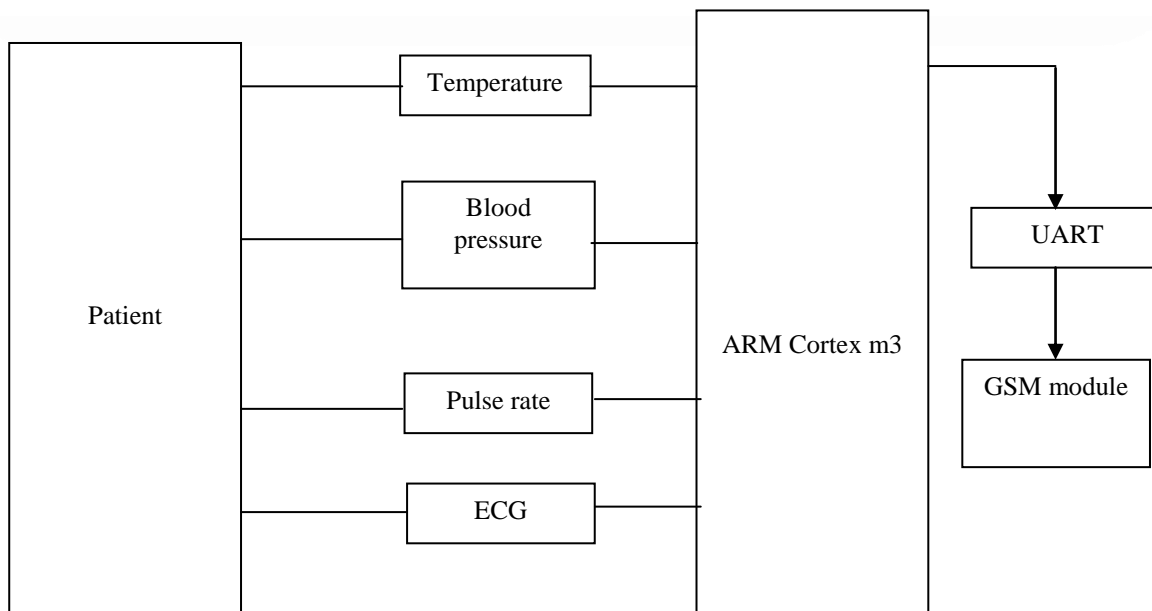


Fig 1: Block diagram

The proposed system used ARM cortex-M3 and GSM module and Mobile phone. Using this some time will get late results on mobile because of the network problem and we can't extend to IOT application and monitor data by worldwide.

III. OBJECTIVES

The main objectives of this project is,

- Converting input analog value to digital values using ADC pins.
- Monitoring the data and display the monitored data on LabVIEW.
- Converting analog values into digital using Arm cortex m-3.
- Continuously monitoring the data using sensors.
- Studying the architecture of arm cortex.

IV. BLOCK DIAGRAM OF THE SYSTEM

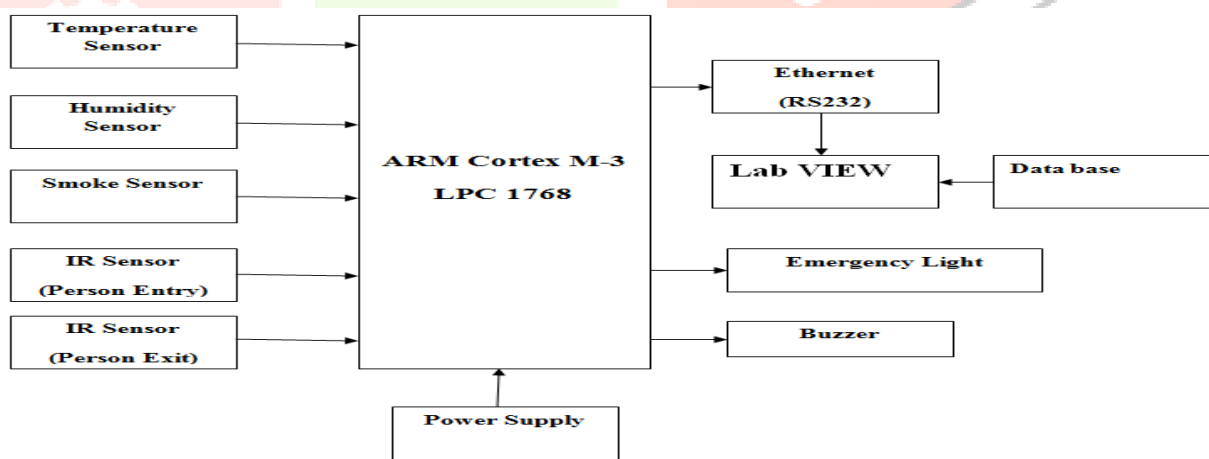


Fig 2: Block diagram of the system

- A. The Hardware part of the project includes.
 - ARM Cortex M-3 LPC-1768
 - Sensors: Temperature, Humidity, Gas. Ethernet Cable
 - USB power supply Adopter
- B. The Software part of the project includes.
 - Flash Magic
 - Keil IDE
 - Embedded C

ARM CORTEX M3:

The ARM-Cortex M3 LPC1768 is high level of integration and low power consumption. ARM cortex M3 is based on microcontrollers for embedded application. The LPC1768 operates at a frequency from 100 to 120MHZ. It has Harvard architecture and 3 buses, one for Data bus, Local Instruction bus and third bus is for peripherals, and LPC1768 has 512KB of flash memory, 64KB of data memory. 8 channel general purpose DMA controller, Ethernet MAC, USB/device/host/OTG interface, 4 UARTS, 2 CAN .I2c-bus interface, 8 channel 12bit

ADC, 10 bit ADC, motor control PWM, four general purpose timer, 6 output General purpose PWM, ultra-low power real time clock (RTC) with separate battery supply to general purpose I/O pins.

ETHERNET:

The aim of this project is to convert input analog value to digital values with help of ADC and transferring these values to web server with help of Ethernet TCP/IP protocol used to update digital values on the webpage. CSMA/CD protocol used for Ethernet wire transfer. Ethernet is a local area network which transfers data with set of rules. Ethernet have few hundred meter of wire between Transmitter and Receiver.

4.1 PROCEDURE OF THE PROJECT

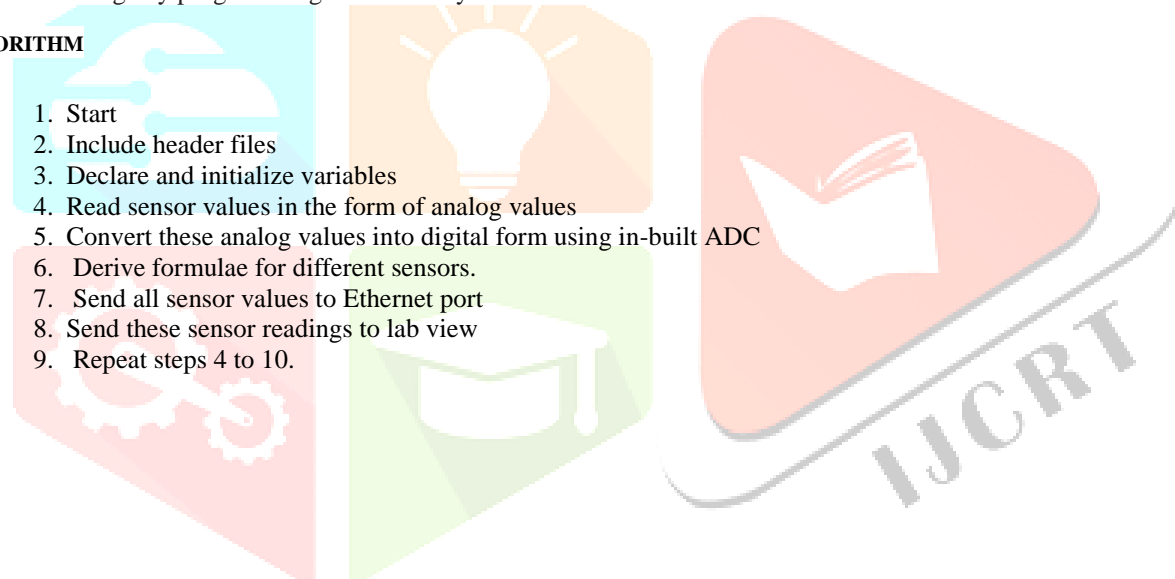
The main aim of the project is to monitor the data and store the data without using any internet. The temperature sensor is used to monitor the industrial room temperature continuously if the temperature is exceed the threshold value then automatically fan or Ac switch turns on. This system is not going to control the devices but it monitors the data and store the data in database which is created using labview. The analog value of temperature can be send to the controller so that it can be converted from analog to digital using ADC pins.

The block diagram also consists of humidity sensor. It monitors the value and send to cortex. And also it is useful for another application of industries. In industries some of the processes in manufacturing or productive level must be carried out in particular temperature and humidity range so that it is necessary to monitor the value of temperature and humidity.

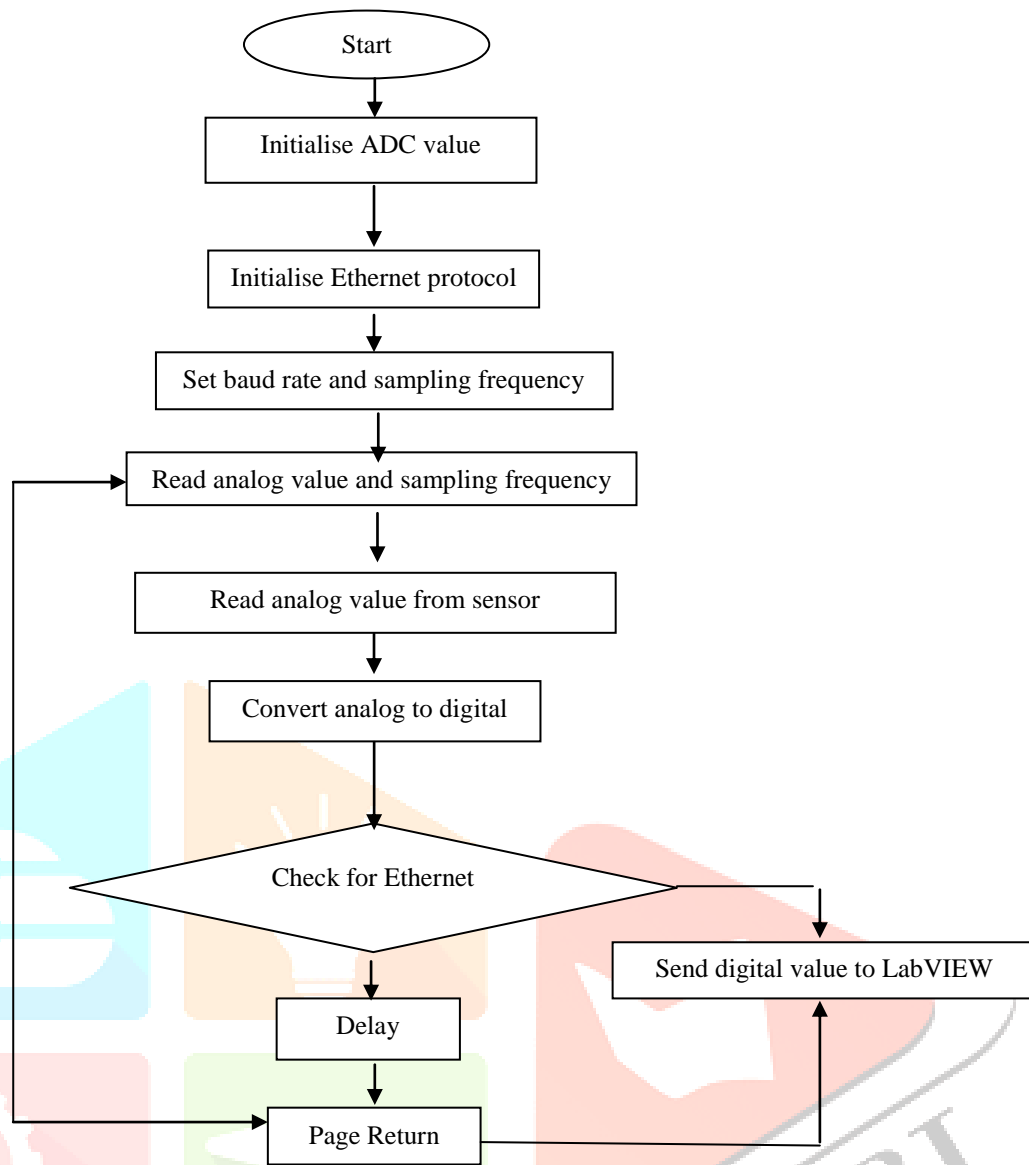
The other sensor used in the system is IR sensor. If the person enters inside then the IR sensor for enter indicates that the person enters inside the room or unit. Similarly for exit also IR sensor for exit indicates the person exit state. This application is very useful in home automation and as well as in industries. In industries for any control unit or secret unit, only authorized limited number of people must enter if it exceeds the amount then this sensor continuously monitors and send information to the higher authority. And this application can also be used to control the electrical appliances like bulbs in such a way that if the person enter inside the room, then automatically IR sensor senses and send it to the cortex then it automatically turns on light until the number of people enter inside must be equal to the number of people exit the room. These sensor values can be converted and is send to the graphical user interface through Ethernet shield which is RJ45 cable. By using this cable, one can eliminate the internet so that the cost will be reduced. The GUI in this system is labview. The same values can be stored in the database of the labview. This system can save electricity and is user friendly since labview is easy to learn. Any person can learn labview without having any programming ideas. The system is cost effective since labview.

4.2 ALGORITHM

1. Start
2. Include header files
3. Declare and initialize variables
4. Read sensor values in the form of analog values
5. Convert these analog values into digital form using in-built ADC
6. Derive formulae for different sensors.
7. Send all sensor values to Ethernet port
8. Send these sensor readings to lab view
9. Repeat steps 4 to 10.



4.3 FLOW CHART



The LPC1768 is an ARM Cortex-M3 based microcontroller designed for installed applications showing an abnormal state of joining and less power utilization. The ARM Cortex-M3 is a next bearing centre that offers framework upgrades, for example, improved troubleshoots bearing a more elevated amount of help square mix. The LPC1768 work at CPU frequencies of up to 100 MHz ARM Cortex-M3 CPU coordinated a 3-arena pipeline and utilizes a Harvard design with isolated nearby direction and information transports, third transport for peripherals. The ARM Cortex-M3 CPU additionally incorporates an interior administrator unit that backings theoretical spreading. LPC1768 pin diagram is shown in below figure.

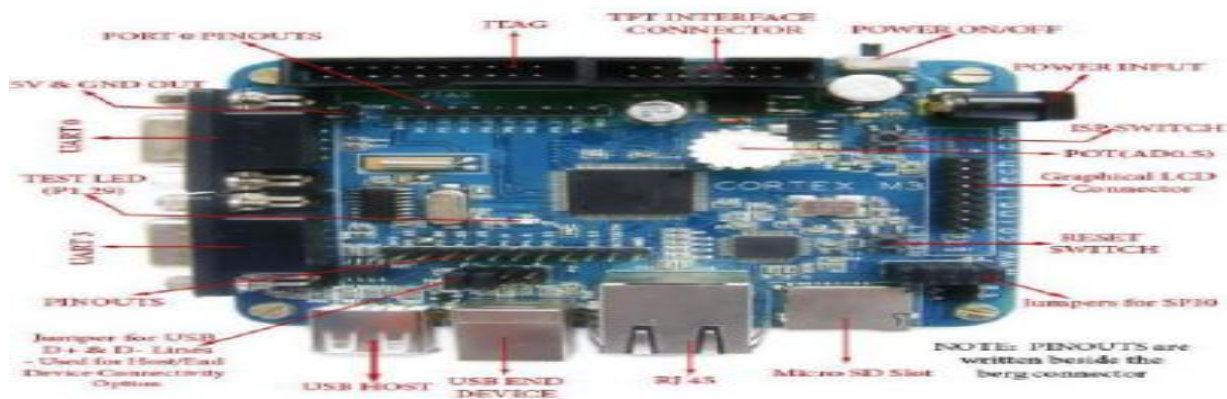


Fig 3: LPC-1768 (ARM-Cortex M-3)

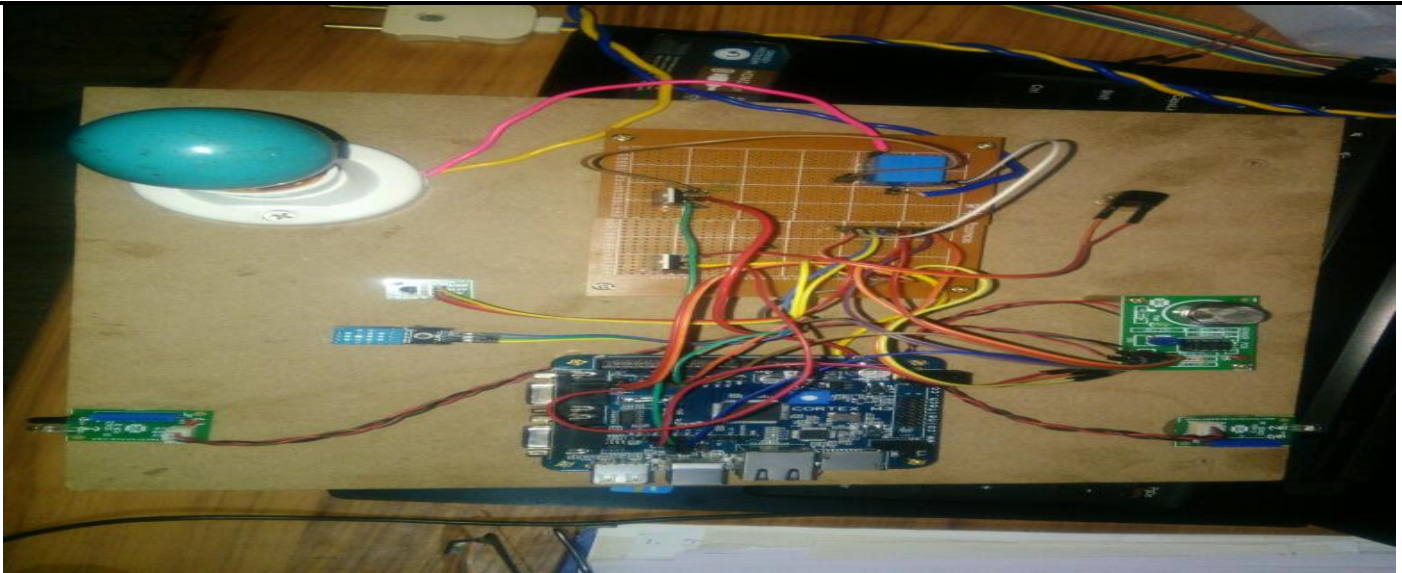


Fig 4: Implementation of the project

V. RESULT

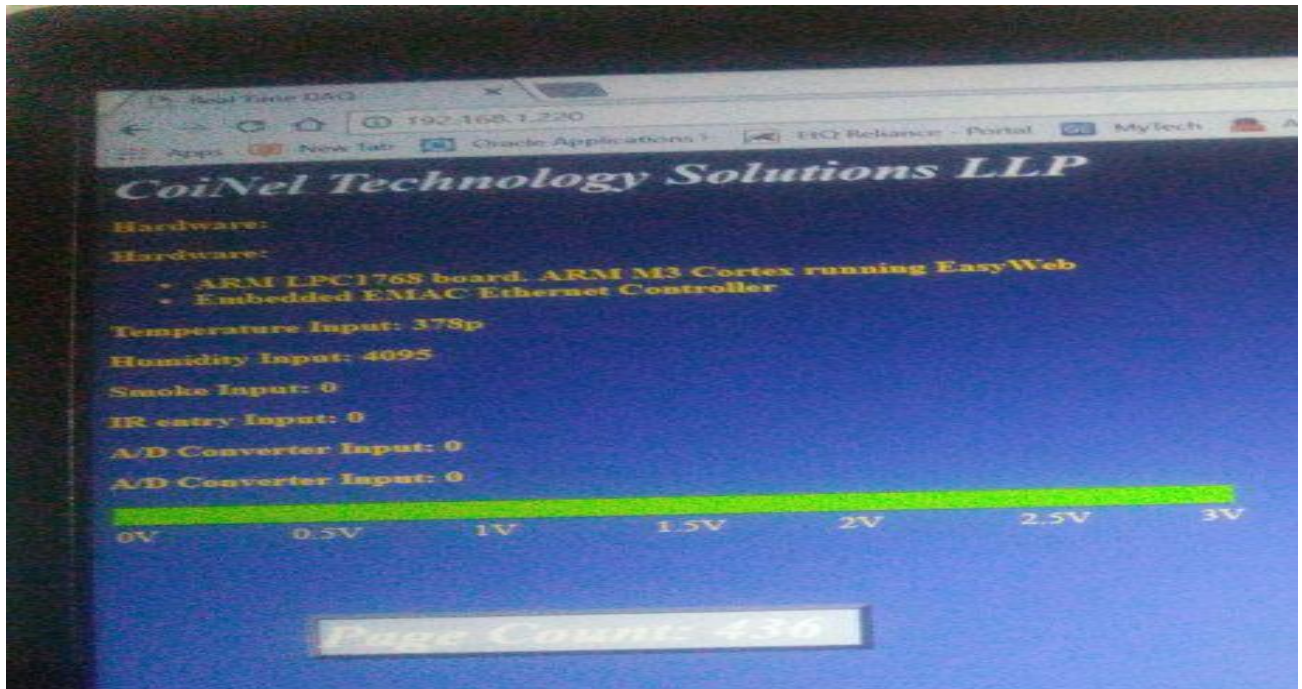


Fig 5: Output

Input Temperature, gas, humidity value is in the form of Analog. ADC converts analog to Digital value and transmit to Host through Ethernet Protocol and monitor Result on Web page. This web page Reading with range from 0v to 3.3v .for every two second s the web page can Refreshed Automatically and page count can display on the Result. This project we can implement to home automation, industrial, Security Systems.

CONCLUSION:

The project is Design and Implement for data monitoring using LabVIEW and CortexM3. Data is displaying on page without internet and using Advanced Cortex M-3 Technology. The project had been successfully implemented. It can be used for Industrial Automation, Home Automation and Security systems.

REFERENCES

- [1] Moghavvemi M. and Tan. S. "A reliable and economically feasible remote sensing system for temperature and relative humidity measurement". *Sensors and Actuators*. 2005. 181-185.
- [2] Campbell Scientific, Data loggers, Sensors and Weather stations, <http://www.campbellsci.co.uk>.
- [3] Guo X. & Song Y., "Design of Automatic Weather Station Based on GSM Module", *Int. Conf. on Computer, Mechatronics, Control and Electronic Engineering*.
- [4] AlenRajan and AbyK.Thomas; "ARM Based Embedded Web Server for Industrial Applications," *International Conference on Computing and Control Engineering*, April 2012.
- [5] Li J, Zhang B, Qiu D.Y, "Multi-computer communication based on Modbus RTU in power quality monitoring system" *Electric Power Automation Equipment*, 2007,27,(1):93-96.

[6] Karia, D.C., Adajania, V., Agarwal, M and Dandekar, S.; “Embedded Web Server Application Based Automation and Monitoring System,” *International Conference on Signal Processing, Communixation, Computing and Networking Technologies*, pp.634-637, July 2011.

[7] Manivannan, M and Kumaresan, N; “Design of On-line Interactive Data Acquisition and Control System for Embedded Real Time Applications,” *International Conference on Emerging trends in Computer and Information Technology*, pp.551-556, March 2011.

[8] V.BillyRakesh Roy, SanketDessai, and S. G.Shiva Prasad Yadav.”Design and Development of ARM Processor Based Web Server” *International Journal of Recent Trends in Engineering*, Vol. 1, No. 4, May 2009, pp 94-98.

