ISSN: 2277-9655
Impact Factor: 4.116

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

A RECONFIGURABLE SMART SENSOR INTERFACE FOR WEATHER MONITORING WITH IOT ENVIRONMENT

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DOI: 10.5281/zenodo.58570

ABSTRACT

Internet of things (IoT) is a network of devices with local intelligence (sensors, lights, gas pumps), which share access & control mechanisms to push and pull status and command information from the networked world. In this paper, a system is proposed for monitoring the weather changes in the environment. This project is about to collect the data from environment and is displayed on the webpage using wireless networks.

KEYWORDS: IoT, Weather, Wireless network, Environment.

INTRODUCTION

In most recent years, the usage of internet and its applications has grown rapidly. As everyone's work is dependent on it, without internet it would be difficult. In the past analog mechanisms are used to measure the physical environmental parameters and these are recorded on papers. Data loggers replaced these analog mechanisms. Data loggers are electronic devices which records the data over time with respect to location with inbuilt instruments i.e. sensors. Data loggers are merged with communication networks to retrieve the data. These loggers are cheap and are easy to operate and maintain.

Now a day's wireless sensor networks are widely used and these are low power devices with a processor, storage, power supply, and a transceiver and with one or more sensors. The wireless sensors are cheaper and small than the regular sensors. These are arranged themselves to form a multi hop network. Wireless sensor networks (WSNs) consist of more number of sensor nodes to complete a common task. These are self operating, fault tolerating and self optimizing. WSNs have their own design and resource constraints. Design constraints depend on the characteristics of environment. i.e. the size of network , network topology etc. Resource constraints consist of small amount of energy, communication network, low throughput and storage.

An instrument that records the parameters without the interference of humans using sensors is an automated weather station. The recorded parameters are stored in data loggers through communication link. These can be downloaded to the computer for further usage. So, an communication system is important in an automated weather station. Monitoring of environmental parameters is used in several applications and also in industrial processes.

The rest of the paper is presented as follows. Section-II presents literature survey on IoT and wireless sensor and networks. Section-III explains the system architecture with a detailed description of its components. Section-IV presents the implementation of design and its results followed by applications and advantages in section V. Section-VI cover the conclusion of paper with future scope in section VII.

LITERATURE SURVEY

Internet of Things

The Internet of Things **(**IoT**)** is becoming an increasing topic among technology giants and business communities.

IoT is the network of interconnected devices which are integrated with sensors, software, network connectivity and necessary electronics that collects and exchange data making them active.

Fig 1: Internet of Things

Components of Internet of Things

The fundamental components of internet of things are:

- **Hardware**: Making physical objects active and giving them competence to retrieve data and respond to instructions.
- **Software**: Enabling the data collection, storing, processing, manipulating and instructing.
- **Communication Infrastructure**: Most important one is the communication infrastructure which contains protocols and technologies enabling two physical objects to exchange data.

As the telecommunication sector is becoming more wide ranging and efficient, internet is widely available. With technological advancement it is now much cheaper to embedded necessary sensors with built-in wifi capabilities making connecting devices less costly.

Wireless Sensors and Networks

A wireless sensor network is defined as distributed, independent sensors that monitor physical and environmental quantities i.e. temperature, humidity, pressure, sound etc. These are applicable in military, civilian scenarios like home and building automation, health monitoring, environment, traffic control and many others. In particular, two standard communication protocols (i.e. Wireless HART, released by the HCF consortium, and ISA100.11a, released by the ISA association) have been proposed in the last few years, purposely designed for process monitoring and control. Each node in a wireless sensor network is usually equipped with a sensor, a small microcontroller, a radio transceiver device and a local energy source in the form of an electrochemical battery.

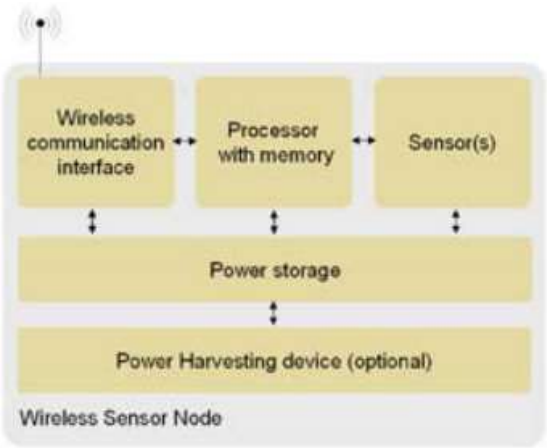

Fig 2: Typical WSN node.

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The evolution of these wireless sensor networks need technologies from three very different research areas, i.e. technologies related to the growth of the sensor, of the communication device and of computing device (not limited to the hardware, but also includes software and its algorithms). Combined and separate advancements in each of these areas have driven research in this field.

SYSTEM ARCHITECTURE

The block diagram is designed for weather monitoring using IoT and WSNs. A microcontroller is used as an processing unit connected to all devices and sensors. Three sensors are used in this system. These sensors collect the data from the environment using sensor technology and the data will be sending through GSM to cloud and it will be displayed on the WEBPAGE.
Sensors collect data from the environment. Microcontroller processes the data, analyze it and communicate with GSM. Specific gateways through which sensor data is further analyzed and sent to the cloud and it will be display in the webpage

1.DESCRIPTION OF COMPONENTS

Temperature Sensor

The LM35 is an integrated circuit(IC) sensor that can be used to measure temperature with an electrical output which is proportional to the temperature (in Celsius).

Gas Sensor

Sensitive material of MQ-6 gas sensor is SnO which has lower conductivity in air. MQ-6 gas sensor has high receptive to propane, Butane and LPG, also response to natural gas. The Sensor is used to detect different combustible gas, especially methane. It is of low cost and suitable for different applications.

Fire Sensor

The Fire sensor is used to detect fire flames. The module makes use of Fire sensor and comparator to detect fire up to a range of 1 meter. This helps to prevent major damages and losses created by a fire accident. If the fire is detected then the AC motor will on and sprinkle the water to remove fire.

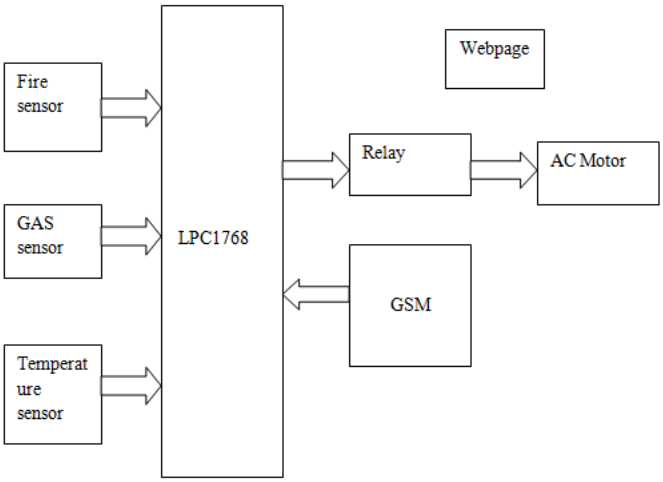

Fig 3: Block diagram of weather monitoring

LPC1768

The LPC1768 is a microcontroller of ARM Cortex-M3 which is used for embedded applications with a high level of integration and low power dissipation. The ARM Cortex-M3 CPU has a 3 stage pipeline and uses Harvard architecture with individual local instructions and data buses. The LPC17xx contains 512kB flash memory, 64kB data memory,

Ethernet, a USB interface that can be used as Host/device/OTG. It also contains 8 channel general purpose DMA controller, UARTs, SPI interface, motor control PWM, ultralow power RTC with individual battery supply and 70 general purpose I/O pins.

Relay

Relay is used to perform the switching actions for the AC/DC devices. In the proposed system, relay is used to switch the cooling fan. Whenever the room temperature is getting higher than the limit, then the cooling fan will be ON automatically through relay.

GSM Network

Global System for Mobile communication (GSM) is a standard for digital communication. GSM benefits the Time Division Multiple Access (TDMA). The switching system is accountable for performing call processing and subscriber-related functions. The view of cellular service is the use of low - power transmitters where the frequencies can be restate within a geographic area.

Web Page

A web page is a document that is suitable for the World Wide Web and web browsers. A web browser shows a web page on a monitor or mobile device. The web page is nothing but a computer file, usually written in HMTL or comparable markup language. Web browsers correspondent the various web resource elements for the written web page such as style sheets, images and scripts to present the web page.

IMPLEMENTATION AND ITS RESULTS

IV.1.DEVICEIMPLEMENTATION

Software Used:

- ISIS Professional release 8
- KEIL µVision4 software

ISIS Professional Release

Proteus is software of microprocessor simulation, schematic capture, and printed circuit board (PCB) design. It is evolution of Lab center Electronics.

System Components

• ISIS Schematic Capture - a tool for inserting designs.

• PROSPICE mixed mode SPICE simulation - industry standard SPICE3F5 simulator associate with a digital simulator.

• ARES PCB Layout - PCB design system with automatic component placer, rip-up and retry self-router and mutual design rule checking.

• VSM - Virtual System Modeling lets co-simulate embedded software for well known micro-controllers alongside hardware
design.

KEIL µVision4 Software

Keil software is an integrated development environment (IDE), which combines a text editor to write programs, a compiler and it will convert source code to hex files too.

µVision can assist multiple screens and allows creating separate window layouts on the visual surface. The µVision debugger provides a single window in which testing, verifying and optimizing can be done for application code. This debugger contains some features like simple and complex breakpoints, watch windows, execution control and allows full visibility to device peripherals.

RESULTS

The schematic of the architecture is designed in proteus is shown below in fig 4 and the software implementation in keil µVision is shown in fig 5.

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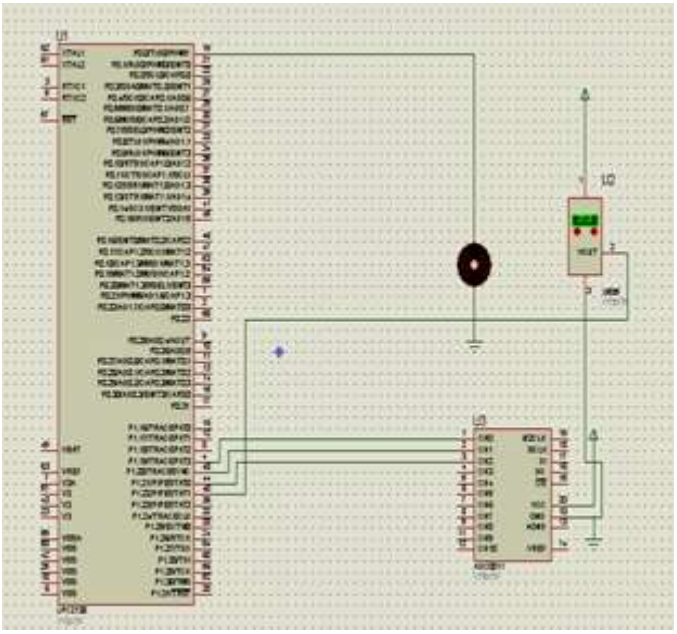

Fig 4: Proteus output

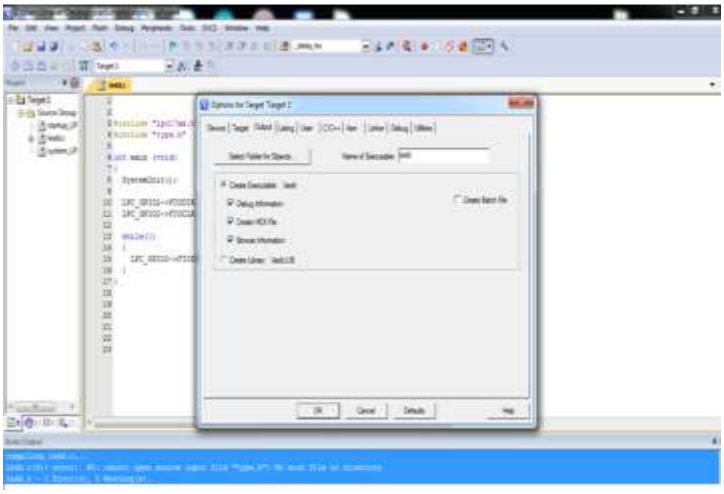

Fig 5: Keil µVision screenshot

APPLICATIONS & ADVANTAGES

Applications

1. Industrial applications.
2. Agricultural field monitoring.
3. In power plants
4. Home automation
5. Used in coalmines, biogas manufactures centers.

Advantages

1. Saves power.
2. Enhanced for monitoring and controlling of atmospheric conditions.
3. Security purpose.

CONCLUSION

This paper explains the design and implementation of Weather monitoring and controlling system. Embedded controlled sensor networks have proved as a reliable solution in providing remote control and sensing for environmental monitoring systems. The sensors are integrated with the system to monitor and compute the level of existence of gas, temperature and fire in atmosphere by using the information and communication technologies. The sensor data is uploading in the WEBPAGE using IoT.

FUTURE SCOPE

Adding more sensors to monitor other environmental parameters such as Soil PH Sensor, CO2 and oxygen Sensor while allows replacing the current sensors and also integration of additional monitoring devices like Wi-Fi camera to monitor growth of agricultural product. These data can also be uploaded to web server continuously.

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