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ISOLATED TEMPERATURE SURVEIL AND MANAGE USING IoT

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Abstract

Today monitoring environmental parameters have gained more importance due to the increasing security and regulatory compliance needs. So the measurement of such parameters becomes critically important. To do the parameter measurement of remote places, the traditional wired systems fail. Hence there is a need of next generation technology such as wireless technology. Nowadays in many cases we have to maintain, monitor and analysis temperature, pressure, humidity.. etc in food and chemical industries. So we are going to provide a IoT based solution to collect these data from various locations in the industry, make a decision (control i/o's) and make analyses based on that data. Such wireless system will prove to be boon for agriculture, health care, storage areas etc.

Keywords: ZigBee; Arduino;

I. Introduction

A monitoring system generally refers to an automated system that simultaneously and continuously records one or more physical parameters such as temperature, relative humidity, wind flow, light intensity, soil moisture etc. at one or more predefined places. Continuous monitoring of any sensitive environment helps to meet security and regulatory compliance needs. Monitoring temperature and/or humidity conditions is an essential ingredient of a wide range of quality assurance applications. Monitoring deterioration would provide an early warning of incipient problems enabling the planning and scheduling of maintenance programs, hence minimizing relevant costs. Furthermore, the use of data from monitoring systems together with improved service-life prediction models leads to additional savings in life cycle costs [1, 2].

Temperature and humidity are key issues to be taken care of in manufacturing plants and particularly that of electronic assemblies. Lack of control over any of them will not only affect the component and equipment but also the process and the operators' comfort, all ultimately leading to loss in production [3].

Temperature and relative humidity affects the airborne survival of viruses, bacteria and fungi. Thus environmental control in hospitals is important because of infectious disease transmission from the aerosol or airborne infection. [4] Temperature and relative humidity plays an important role in the lifecycle of the plants. When plants have the right humidity they thrive, because they open their pores completely and so breathe deeply without threat of excessive water loss. [5]

Wireless sensor network (WSN) has revolutionized the field of monitoring and remote sensing. Wireless sensor network or wireless sensor & actuator network (WSAN) are spatially distributed sensors to monitor physical or environmental conditions such as temperature, humidity, fire etc. and to cooperatively pass their data through the network to the main location [6].

II. System Hardware Description

A. ZigBee Standard

There are many types of wireless communication technologies such as ZigBee, Wi-Fi and Bluetooth. All these types work at similar RF frequencies and their application sometimes overlap. ZigBee works on 802.15.4 standard which uses unlicensed frequency spectrum such as ISM band. In this project, ZigBee technology has been used because of advantages over the others technologies and the aspects are most suitable to our proposed application. The features are reliable and self-configuration, Supports large number of nodes, easy to deploy, very long battery life, secure and low cost. [7].

B. Arduino Microcontroller

Arduino is a software company, project, and user community that designs and manufactures computer open-source hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. This Project uses Arduino UNO board which is based on ATmega328. It has 14 digital Input / output pins (of which 6 can be used as PWM outputs), a 16 MHz ceramic Resonator, a USB connection, a power jack, an ICSP header and a reset button as shown in figure 2. Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232.

III. Existing System

As we know the manual processing is quite tedious, time consuming, less accurate in comparison to computerized processing. Obviously the present system is not is exception consultant encountering all the above problems.

- Time consuming

- It is very tedious.
- All information is not placed separately.
- Slow data processing.
- Not user-friendly environment.
- It is difficult to found temperature level

C. Architectural Design

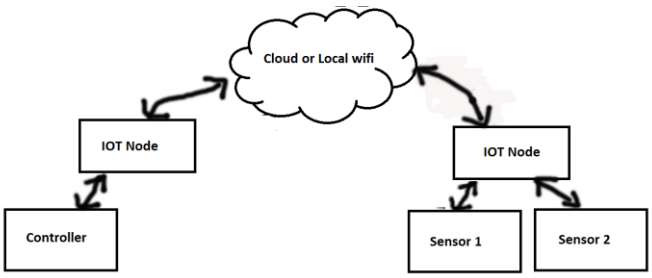

Fig: Architectural Design.

Proposed System

D. Flexible usage of Internet of Things

One of the buzzwords in the Information Technology is Internet of Things (IoT). The future is Internet of Things, which will transform the real world objects into intelligent virtual objects. The IoT aims to unify everything in our world under a common infrastructure, giving us not only control of things around us, but also keeping us informed of the state of the things. In Light of this, present study addresses IoT concepts through systematic review of scholarly research papers, corporate white papers, professional discussions with experts and online databases. Moreover this research article focuses on definitions, geneses, basic requirements, characteristics and aliases of Internet of Things. The main objective of this paper is to provide an overview of Internet of Things, architectures, and vital technologies and their usages in our daily life. The Internet of Things is a novel paradigm shift in .

Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in

E. Flexible Language Optionusage

Lua is a powerful, efficient, lightweight, embeddable scripting language. It supports procedural programming, object-oriented programming, functional programming, data-driven programming, and data description.

Lua combines simple procedural syntax with powerful data description constructs based on associative arrays and extensible semantics. Lua is dynamically typed, runs by interpreting byte code with a register-based virtual machine, and has automatic memory management with incremental garbage collection, making it ideal for configuration, scripting, and rapid prototyping. Lua has a deserved reputation for performance. To claim to be "as fast as Lua" is an aspiration of other scripting languages. Several benchmarks show Lua as the fastest language in the realm of interpreted scripting languages. Lua is fast not only in fine-tuned benchmark programs, but in real life too. Substantial fractions of large applications have been written in Lua.

F. RICH Classs Framework

Orbit is an MVC web framework for Lua, based on WSAPI.

WSAPI is the API that abstracts the web host server from Lua web applications and is the base for many projects.

Xavante is a Lua Web server that offers a WSAPI interface.

Sputnik is a wiki/CMS developed over WSAPI on Kepler Project used for humor and entertainment.

CGILua offers LuaPages and LuaScripts web page creation, based on WSAPI but no longer supported. Use Orbit, Sputnik or WSAPI instead.

G. Increased Reliability

This system monitoring and controlling the industry temperature related data and preventing from the explosion of industry goods. The industry staffs can remotely monitoring the temperature related data serially.

The sensor module handles current temperature and fire related data from temperature sensors, positioned at fixed locations within a remote area. These sensors are attached to application server node, which is capable of performing the initial processing before passing the data up the user end. In case of the application server node, the temperature data is formatted ready for transmission via the Arduino connection.

The data is transferred over a IoT Node via internet or local Wi-Fi to a dedicated personal computer user. This link is bidirectional, and allows messages to be sent between application server and PC user. The PC module contains the handheld device running the user interface. The data received is represented using user interface of this application.

H. Advantages of Proposed System

- This system has technically high approach.
- It can also stop the repetition of the work.
- Any technical expert can operate the system smoothly.

- It is really times saving system.
- It also provides the work satisfaction to the staff.

Problem Definition

The temperature controller or monitoring system is one of the most required systems in almost all processing and manufacturing industries. Here, the given application demonstrates completely new kind of temperature monitoring and control system. It monitors temperature, display it, send signal wirelessly to remote monitoring node and give alarm signal to this remote node when temperature exceeds beyond critical limit.

Overview of the Paper

We propose a remote temperature monitoring and control using the help of Internet of Things in the industrial areas. In the field of industrial we have to monitor and control the temperature frequently. For example in the milk and chemical industries temperature and pressure take vital role of particular product. In the particular case the temperature is exceeds beyond the certain limit then the product will damage. So effect of this problem the product cost and time also waste. So we must monitoring the temperature level and control it effectively.

In the chemical industries pressure is an important one of the particular product solution so we want to analyses the pressure level also. This system can be easily handle with ease of action with the minimum requirements of hardware and software. The industrial staffs easily analyses the temperature remotely and prevent from the industrial accidents.

IV. Overview

I. ***Sensor Connection***

Initially we can create a connection between the Sensor and Arduino Board. The simulation of temperature levels are analyzed in this area from the temperature sensor. The TMP36 is a low voltage, precision centigrade temperature sensor. It provides a voltage output that is linearly proportional to the Celsius temperature.

It also doesn't require any external calibration to provide typical accuracies of ±1°C at +25°C and ±2°C over the −40°C to +125°C temperature range. We like it because it's so easy to use: Just give the device a ground and 2.7 to 5 VDC and read the voltage on the Vout pin. The output voltage can be converted to temperature easily using the scale factor of 10 mV/°C.

Features

- Low voltage operation (2.7 V to 5.5 V)
- Calibrated directly in °C

- 10 mV/°C scale factor (20 mV/°C on TMP37)
- ±2°C accuracy over temperature (type)
- ±0.5°C linearity (type)
- Stable with large capacitive loads
- Specified −40°C to +125°C, operation to +150°C
- Less than 50 μA quiescent current
- Shutdown current 0.5 μA max
- Low self-heating

Applications

- Environmental control systems
- Thermal protection
- Industrial process control
- Fire alarms
- Power system monitors
- CPU thermal management

General Description

The TMP36 are low voltage, precision centigrade temperature sensors. They provide a voltage output that is linearly proportional to the Celsius (centigrade) temperature. The TMP35/ TMP36/TMP37 do not require any external calibration to provide typical accuracies of ±1°C at +25°C and ±2°C over the −40°C to +125°C temperature range.

The low output impedance of the TMP36 and its linear output and precise calibration simplify interfacing to temperature control circuitry and ADCs. All three devices are intended for single-supply operation from 2.7 V to 5.5 V maximum. The supply current runs well below 50 μA, providing very low self-heating—less than 0.1°C in still air. In addition, a shutdown function is provided to cut the supply current to less than 0.5 μA. The TMP35 is functionally compatible with the LM35/LM45 and provides a 250 mV output at 25°C. The TMP35 reads temperatures from 10°C to 125°C. The TMP36 is specified from −40°C to +125°C, provides a 750 mV output at 25°C, and operates to 125°C from a single 2.7 V supply. The TMP36 is functionally compatible with the LM50. Both the TMP35 and TMP36 have an output scale factor of 10 mV/°C. The TMP37 is intended for applications over the range of 5°C to 100°C and provides an output scale factor of 20 mV/°C. The TMP37 provides a 500 mV output at 25°C. Operation extends to

150°C with reduced accuracy for all devices when operating from a 5 V supply. The TMP36 are available in low cost 3-lead TO-92, 8-lead SOIC_N, and 5-lead SOT-23 surface-mount packages.

Fig : TMP36 sensor.

J. IArduino Board Connected to IoT Node

Arduino is a software company, project, and user community that designs and manufactures computer open-source hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. This Project uses Arduino UNO board which is based on ATmega328. It has 14 digital Input / output pins(of which 6 can be used as PWM outputs), a 16 MHz ceramic Resonator, a USB connection, a power jack, an ICSP header and a reset button as shown in figure 2.Arduino boards are programmed via Universal Serial Bus(USB), implemented using USB-to-serial adapter chips such as the FTDI FT232.

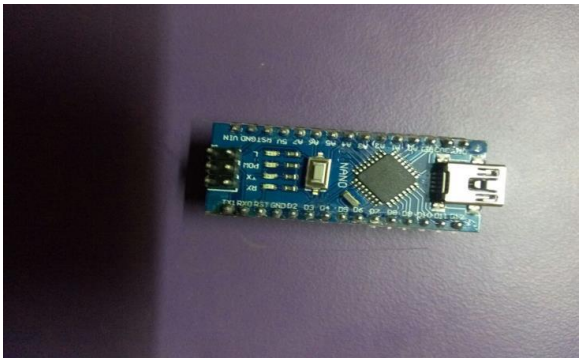

Fig: Arduino Nano controller.

The Uno has 6 analog inputs, labelled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024different values). A Software Serial library allows for serial communication on any of the Uno's digital pins. The features of ATmega328 are 5V operating Voltage, 6-20V input Voltage, 32 bit Flash Memory, 2KB SRAM, 1KB EEPROM, Clock Speed: 16 MHz.

K. Connected to IoT Node

Internet of Things is maturing and continues to be the latest, most hyped concept in the IT world. Over the last decade the term Internet of Things (IoT) has attracted attention by projecting the vision of a global infra- structure of networked physical objects, enabling anytime, anyplace connectivity for anything and not only for any one [4]. The Internet of Things can also be considered as a global network which allows the communication between human-to-human, human-to-things and things-to-things, which is anything in the world by providing unique identity to each

and every object. IoT describes a world where just about anything can be connected and communicates in an intelligent fashion that ever before. Most of us think about "being connected" in terms of electronic devices such as servers, computers, tablets, telephones and smart phones. In what's called the Internet of Things, sensors and actuators embedded in physical Objects from roadways to pacemakers are linked through wired and wireless networks, often using the same Internet IP that connects the Internet.

Fig : IoT Node.

L. Network Formation

In the means of IoT we requires an internet connection seamlessly for an data transformation and receive. Connectivity, it is one of the main things to keep in mind while developing any Internet-of-Things (IoT) project. The main impacts of while developing the IoT Connection are:

- How do I want it to be connected?
- Do I have any power or range constraints?
- What would be my data rate?
- What network infrastructures are currently available?

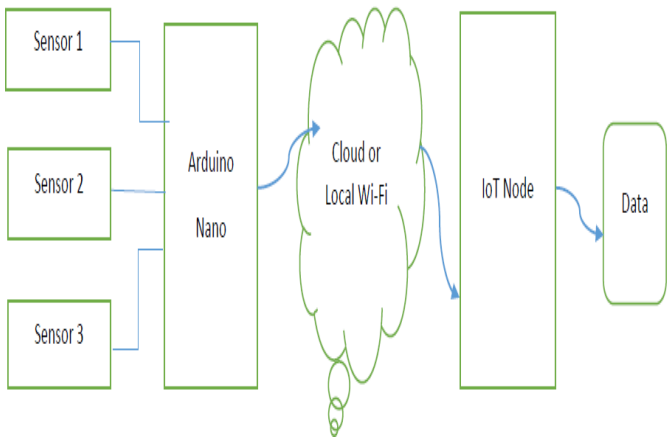

Fig : Network Formation.

We are sure a lot of we would have the same questions when starting any IoT project. Sometimes we have an idea about what communication protocol we want to use, but it doesn't hurt to do our research and make sure that would be the most suitable for our application.

Fortunately, there are a bunch of network infrastructures and communication protocols available. Unfortunately, there are so many that they might render we confused.

We will discuss (well, most) of the popular communication protocol and how to pick the most suitable one for our project. We will also go into detail about the pros and cons of each.

Conclusion

The advantage of this system is one can remotely monitor system temperature and get the idea of whether temperature is constant / increasing / decreasing. Another and most important advantage is when temperature exceeds specified limit the alarm signal is available on remote terminal. This can help in taking any immediate or automatic action.

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