High Level Mechanism of Temperature and Water Quality Monitoring System Using IOT Technology

Thotla MadhuYadav
M.Tech (ES),
Department of ECE
TNR Institute of Technology and Science,
Hyderabad, Telangana, India.

Sathish P
Assistant Professor,
Department of ECE
TNR Institute of Technology and Science,
Hyderabad, Telangana, India.

ABSTRACT

In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT(internet of things).the system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, level indicator of the water can be measured. The measured values from the sensors can be processed by the core controller. The raspberry PI can be used as a core controller. Finally, the sensor data can be viewed on internet using cloud computing. Here AC motor is also connected to the processor for pumping purpose.

INTRODUCTION

The online water monitoring technologies have made a significant progress for source water surveillance and water plant operation. The use of their technologies having high cost associated with installation and calibration of a large distributed array of monitoring sensors. The algorithm proposed on the new technology must be suitable for particular area and for large system is not suitable. By focusing on the above issues our paper design and develop a low cost system for real time monitoring of the water quality in IOT environment. In our design raspberry PI B+ is used as a core controller. The design system applies a specialized IOT module for accessing sensor data from core controller to the cloud. The sensor data can be viewed on the cloud using a special IP address. Additionally the IOT module also provides a Wi-Fi for viewing the data on mobile.

Embedded Systems

An embedded system is a special purpose computer system that is designed to perform very small sets of designated activities. Embedded systems date back as early as the late 1960s where they used to control electromechanical telephone switches. The first recognizable embedded system was the Apollo Guidance Computer developed by Charles Draper and his team. Later they found their way into the military, medical sciences and the aerospace and automobile industries.

LITERATURE SURVEY

Literature review is an assignment of previous task done by some authors and collection of information or data from research papers published in journals to progress our task. It is a way through which we can find new ideas, concept. There arelot of literatures published before on the same task; some projects are taken into consideration from which idea of the project is taken.

P. Nithya et al., in their work on Design of Wireless Framework for Energy Efficient Street Light Automation suggested an Intelligent management of the lamp posts by sending data to a central station by ZigBee wireless communication. With the suggested system, maintenance can be easily and efficiently planned from the central station, allowing additional savings. Srikanth M et al. [4], in their work on ZigBee Based Remote Control Automatic Street Light System. This streetlight control system helps in energy savings, detection of faulty lights and maintenance time and increase in life span of system.

Anila Devi Y et al.[5], worked on GSM Based Remote Control System of High Efficiency Intelligent Street Lighting System Using AZigbee Network of Devices and Sensor. New intelligent and smart street light system is designed with wireless technology for maintenance and network of sensors for controlling. In which, they used high efficiency LED lamp which consumes less energy with high life time and which are supplied with renewable energy of solar panels.

OBJECTIVE OF PROJECT

The main aim of the project is to design "**Ultrafast Streaming Camera Platform for Scientific Applications".**

EXISTING METHOD

The existing system is to design such as temperature, PH, level indicator of the water can be measured. The measured values from the sensors can be processed by the core controller. The technique can be used as a core controller. Finally, the sensor data can be viewed on display in LCD. Here AC motor is also connected to the processor for pumping purpose.

PROPOSED METHOD

The parameters such as temperature, PH, level indicator of the water can be measured. The measured values from the sensors can be processed by the core controller. The raspberry PI can be used as a core controller. Finally, the sensor data can be viewed on internet using cloud computing. Here AC motor is also connected to the processor for pumping purpose.
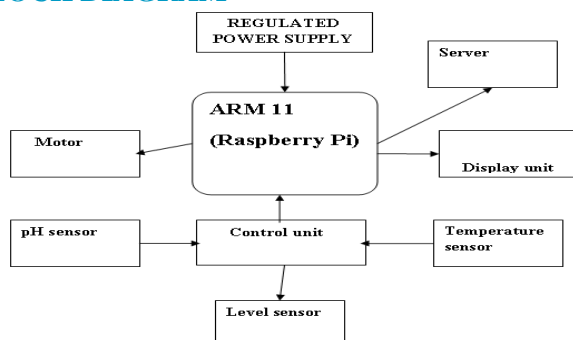
BLOCK DIAGRAM

Fig 1: Block Diagram

ARM ARCHITECTURE: AN OVERVIEW
Introduction

ARM is a 32-bit RISC processor architecture developed by the ARM Corporation. ARM processors possess a unique combination of features that makes ARM the most popular embedded architecture today. First, ARM cores are very simple compared to most other general-purpose processors, which means that they can be manufactured using a comparatively small number of transistors, leaving plenty of space on the chip for application specific macro cells. A typical ARM chip can contain several peripheral controllers, a digital signal processor, and some amount of on-chip memory, along with an ARM core. Second, both ARM ISA and pipeline design are aimed at minimizing energy consumption — a critical requirement in mobile embedded systems. Third, the ARM architecture is highly modular: the only mandatory component of an ARM processor is the integer pipeline; all other components, including caches, MMU, floating point and other co-processors are optional, which gives a lot of flexibility in building application-specific ARM-based processors. Finally, while being small and low-power, ARM processors provide high performance for embedded applications.

For example, the PXA255 XScale processor running at 400MHz provides performance comparable to Pentium 2 at 300MHz, while using fifty times less energy.

RASPBERRY PI BOARD

Fig 2: Raspberry Pi

BOARD FEATURES
BCM2836 features
AT Raspberry Pi board contains BCM2836 controller which supports ARM11 processing unit which supports following features

- BCM2836 contains the following peripherals which may safely be accessed by the ARM:
- A 900MHz quad-core ARM Cortex-A7 CPU
- 1GB RAM
- Timers
- Interrupt controller
- GPIO
- USB
- PCM / I2S
- DMA controller
- I2C master
- I2C / SPI slave
- SPI0, SPI1, SPI2
- PWM
- UART0, UART1

HARDWARE COMPMONENTS
Level sensors
Level sensors detect the level of liquids and other fluids and fluidized solids, including slurries, granular materials, and powders that exhibit an upper free surface. Substances that flow become essentially horizontal in their containers (or other physical boundaries) because of gravity whereas most bulk solids pile at an angle of repose to a peak. The substance to be measured can be inside a container or can be in its natural form (e.g., a river or a lake). The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place, while point-level sensors only indicate whether the substance is above or below the sensing point. Generally the latter detect levels that are excessively high or low.

SUBMERSIBLE MOTOR:
This is the components which named as submersible motor (or sub pump, electric submersible pump (ESP)) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped.The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface.Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids. Submersibles are more efficient than jet pumps.

LM35 TEMPERATURE SENSOR:
LM35 converts temperature value into electrical signals. LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. . The LM35 does not require any external calibration or trimming to provide typical accuracies of $\pm 1⁄4°C$ at room temperature and $\pm 3⁄4°C$ over a full -55 to $+150°C$ temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air.

PH MEASUREMENT:
Definition of pH:
Just as the kilometer is a measure of distance and the hour is a measure of time, the pH unit measures the degree of acidity or basicity of a solution.

Almost all processes containing water have a need for pH measurement. Most living things depend on a proper pH level to sustain life. All human beings and animals rely on internal mechanisms to maintain the pH level of their blood. The blood flowing through our veins must have a pH between 7.35 and 7.45. Exceeding this range by as little as one-tenth of a pH unit could prove fatal.Commodities such as wheat and corn, along with other plants and food products, will

grow best if the soil they are planted in is maintained at an optimal pH. To attain high crop yields, farmers must condition their fields to the correct pH value. Different crops need different pH levels. In this case, one size does not fit all.Acid rain can be very detrimental to crop yields. Rainwater is naturally acidic (below 7.0 pH). Rain is typicallyaround 5.6 pH but, in some areas, it increases to harmful levels between 4.0 and 5.0 pH due to atmosphericpollutants.

Heavily industrialized areas of the US, such as the Midwest, have been targeted by variousenvironmental agencies to minimize the pollutants that cause acid rain.

pHis defined as the negative logarithm of the hydrogen ion concentration. This definition of pH was introduced in 1909 by the Danish biochemist, Soren Peter Lauritz Sorensen. It is expressed mathematically as: where: [H+] is hydrogen ion concentration in mol/L.

SOFTWARE TOOLS
QT EMBEDDED FRAME WORK

Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface (GUI) (in which cases Qt is classified as a*widget toolkit*), and also used for developing non-GUI programs such ascommand-line tools and consoles for servers.

Qt uses standard C++ but makes extensive use of a special code generator (called the *Meta Object Compiler*, or *moc*) together with several macros to enrich the language. Qt can also be used in several other programming languages via language bindings. It runs on the major desktop platforms and some of the mobile platforms. It has extensive internationalization support. Non-GUI features include SQL database access, XML parsing; thread management, network support, and a unified cross-platform application programming interface (API) for file handling.

Applications of the Qt framework

Qt is available under 3 different licensing, the GNU LGPL v 2.1, GUN GPL v.3.0, and the Qt Commercial Developer License. The Qt framework is used by other widely used softwares, such as VLC media player, Virtualbox, KDE, etc.

As users today uses a variety of different platforms, it is important that developers can have a GUI front that can be run in most OS environment and it is easy to implement, and it interfaces well with the existing language they are using to build the back end of the software without or with little overhead. This is where the Qt framework comes into play.

Because it has a wide range of language bindings, including but not limited to C++, C# and .NET, Java, Perl, PHP, and Python, you can use the Qt framework with most common programming and scripting languages. The most noticeable ones are the KDE desktop environment, and the Nokia N900 interface.

Since Nokia purchased the company that developed Qt, their recent product (came out in Dec 2009) N900's user interface is built using the Qt Creator, which is the IDE for Qt framework. Though the sell of N900 is not as high as expected, and the touch screen feature was not as smooth as Apple products, its multi-tasking feature was more advanced compared to the iOS at that time and since it is open source, there is no "development fee" which makes it accessible to every programmer.

The KDE desktop environment have been around since 1996, and the founder Matthias Ettrich chose Qt from the start, and still using Qt to this date.

PROTOCOLS
HTTP PROTOCO (HyperText Transfer Protocol)

The WEB Internet (or The Web) is a massive distributed client/server information system as depicted in the following diagram.
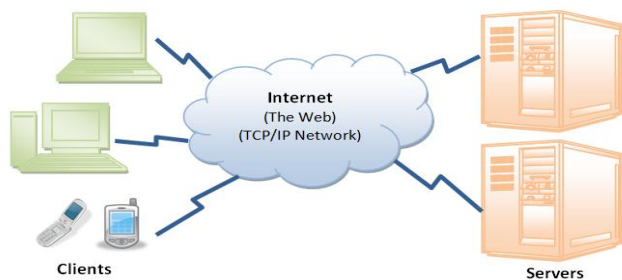
Figure 3: HTTP protocol

Many applications are running concurrently over the Web, such as web browsing/surfing, e-mail, file transfer, audio & video streaming, and so on. In order for proper communication to take place between the client and the server, these applications must agree on a specific application-level protocol such as HTTP, FTP, SMTP, POP, and etc.

WORKING PRINCIPLE/OVER ALL DESCRIPTION OF PROJECT

The proposed system tells that ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT(internet of things).the system consist of several sensors is used to measuring physical and chemical parameters of the water.

The parameters such as temperature, PH, level indicator of the water can be measured. The measured values from the sensors can be processed by the core controller. The raspberry PI can be used as a core controller. Finally, the sensor data can be viewed on internet using cloud computing. Here AC motor is also connected to the processor for pumping purpose in real time applications.
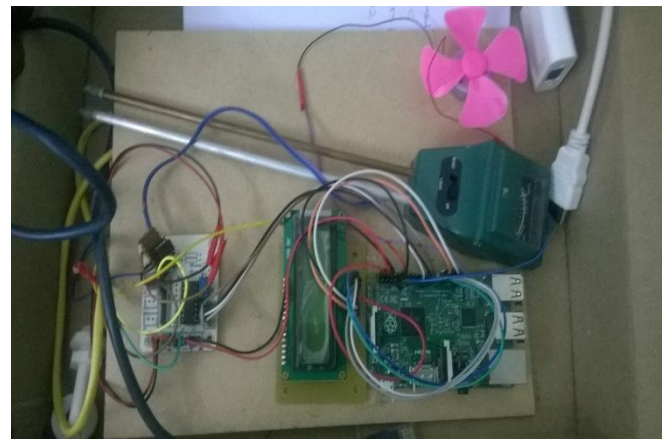
ADVANTAGES:

- Home
- Schools
- Hospitals
- High Accuracy
- Reliable cost

DISADVANTAGES:

- Unable to operate the through cloud.

RESULTS

CONCLUSION

The project**"THE REAL TIME MONITORING OF WATER QUALITY IN IoT ENVIRONMENT"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

FUTURE SCOPE

To ensure the safe supply of the drinking water the quality needs to be monitor in real time. The system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, level indicator of the water can be measured and control. The measured values from the sensors can be processed by the core controller. The raspberry PI can be used as a core controller.

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