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Design of Embedded Irrigation System by Using WSN

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Abstract: The application of embedded web technology in the remote monitoring system has given rise to the technological change in the field of industrial control. Nowadays the management of the domestic laboratories in the research institute and universities has issues of poor real time, high cost and low precision. This paper comes up with a design solution of an embedded web-based remote monitoring system for the environment in the laboratories, which realizes the local management and remote publishing applications for large-scale dynamic data of sensor networks and video images.Here, we propose the design and implementation of low cost web based remote monitoring system with built-in security features. Due to the usage of an embedded intelligent monitoring module which is the Samsung S3C2440 32-bit ARM Samsung processor as its main controller, the performance and frequency of which are suitable for real-time video image capture and processing applications. This micro controller works for a voltage of +3.3V DC and at an operating frequency of 400 MHz, The maximum frequency up to which this micro controller can work is 533 MHz making it very much suitable for a portable system. Later programming is done on this Board to make it act as an embedded web server.

Keywords: ARM board, HTTP

I. INTRODUCTION

Agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial, and institutional improvements [1].There are many systems to achieve water savings in various crops, from basic ones to more technologically advanced ones.For instance, in one system plant water status was monitored and irrigation scheduled based on canopy temperature distribution of the plant, which was acquired with thermal imaging [2].In addition, other systems have been developed to schedule irrigation of crops and optimize water use by means of a crop water stress index (CWSI) [3].

The empirical CWSI was first defined over 30 years ago [4]. This index was later calculated using measurements of infrared canopy temperatures, ambient air temperatures, and atmospheric vapor pressure deficit values to determine when to irrigate broccoli using drip irrigation [5].Irrigation systems can also be automated through information on volumetric water content of soil, using dielectric moisture sensors to control actuators and save water, instead of a predetermined irrigation schedule at a particular time of the day and with a specific duration. An irrigation controller is used to open a solenoid valve and apply watering to bedding plants(impatiens, petunia, salvia, and vinca) when the volumetric water content of the substrate drops below a set point [6].

Other authors have reported the use of remote canopy temperature to automate cotton crop irrigation using infrared thermometers.Through a timed temperature threshold, automatic irrigation was triggered once canopy temperatures exceeded the threshold for certain time accumulated per day. Automatic irrigation scheduling consistently has shown to be valuable in optimizing cotton yields and water use efficiency with respect to manual irrigation based on direct soil water measurements[7].

II. PROPOSED SYSTEM

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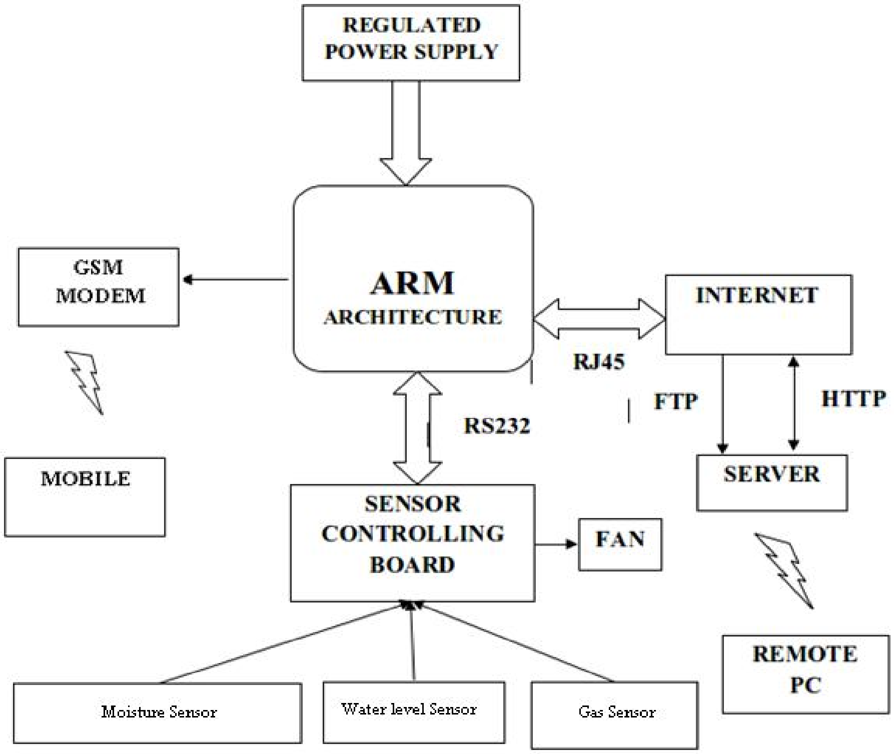

Fig 1: Proposed system outline

Our system is designed by using ARM micro controller developed by Samsung which can support different features and algorithms for the development of automotive vision systems. In this paper, it performs application as, the sensor detects the information and give it to the ARM board,The ARM output is given to protocols, the protocols analyse the dataand give the message.

III. HARDWARE IMPLEMENTATION

A. Mini2440 Development Board

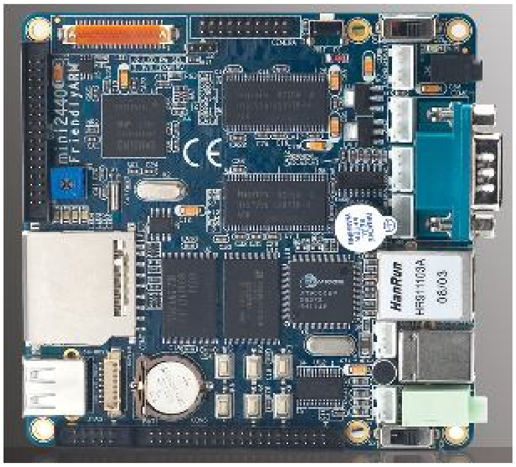

Fig2. Mini2440 Development board

The ARM9 processor is ideal for many real-time embedded applications with demanding size constraints and cost-sensitive considerations. The enhanced DSP extensions in the ARM9 processor remove the need for a separate DSP in the SoC design, resulting in additional savings in chip complexity, power consumption, and time-to-market. Today, the ARM family accounts for approximately 75% of all embedded 32-bit RISC CPU are, making it the most widely used 32-bit architecture.

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ARM CPUs are found in most corners of consumer electronics, from portable devices (PDAs, mobile phones, iPods and other digital media and music players, handheld gaming units, and calculators) to computer peripherals (hard drives, desktop routers). ARM does not manufacture the CPU itself, but licenses it to other manufacturers to integrate them into their own system.

B. Moisture Sensor

Moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use includes the Frequency domain sensor such as the capacitance sensor.Moisture Sensor usage in urban landscape irrigation will only increase over the next decade. Cities and states have begun rebate programs for the installation of moisture sensors on new properties as well as retrofitting installed sprinkler and irrigation systems. In addition, cities and counties are introducing local legistlation requiring the installation of soil moisture sensors.

C. Water Level Sensor

The Cable Float Level Switch is a structured by using either micro switches proximity switches or reed switches to control the contact. It's user-friendly design is ideal for level measurement.The switches will transmit an ON or OFF contact signal output when the float rises and turns upwards. The switch contains a metal ball that can slide as the float position changes. For different water or solution temperatures, different float materials are available for selection. Plastic and stainless steel switches are the most common. The cable float level switch can not only can be used in clear liquids but also can be used in granular liquids. Long distance detection points and multi-point contacts are also available. Cable float level switches can be applied in all water management, petrochemical, chemical industries. Other uses include: air-conditioner systems, drainage systems, most tanks or containers with level switch requirements.

D. Gas Sensor

Sensitive material of gas sensor is SnO_2, which with lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. Gas sensor has high sensitivity to Ammonia, Sulfide and Benze steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different application.

E. Modem

Global System for Mobile communications (GSM: originally from *Groupe Spécial Mobile*) is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 82% of the global mobile market uses the standard GSM is used by over 2 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signaling and speech channels are digital call quality, and thus is considered a *second generation* (2G) mobile phone system. This has also meant that data communication was built into the system using the 3rd Generation Partnership Project (3GPP).

IV. SOFTWARE REQUIREMENTS

A. Linux Operating System

Linux or GNU/Linux is a free and open source software operating system for computers. The operating system is a collection of the basic instructions that tell the electronic parts of the computer what to do and how to work. Free and open source software (FOSS) means that everyone has the freedom to use it, see how it works, and changes it.There is a lot of software for Linux, and since Linux is free software it means that none of the software will put any license restrictions on users. This is one of the reasons why many people like to use Linux.

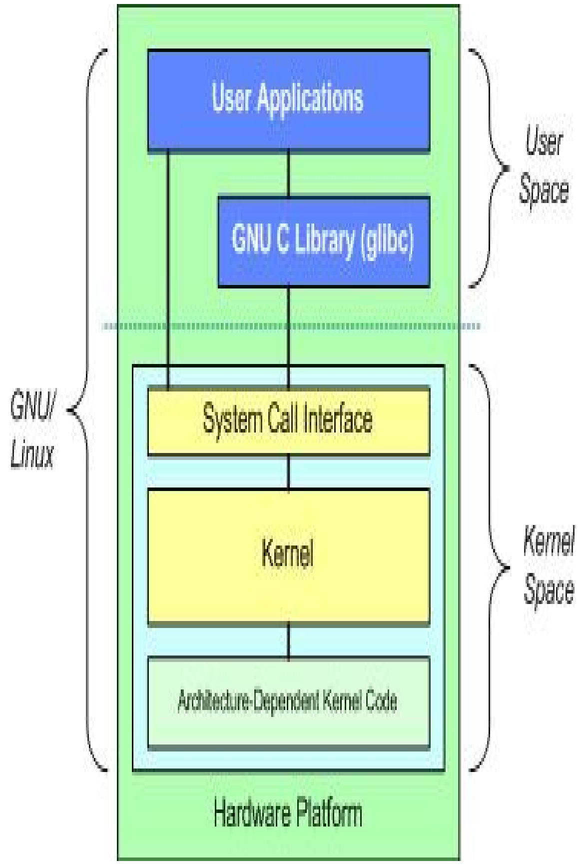

Fig3. Architecture of Linux Operating System

A Linux-based system is a modular Unix-like operating system. It derives much of its basic design from principles established in UNIX during the 1970s and 1980s. Such a system uses a monolithic kernel, the Linux kernel, which handles process control, networking, and peripheral and file system access. Device drivers are either integrated directly with the kernel or added as modules loaded while the system is running.

1) Qt For Embedded Linux: 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 awidget 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. Non-GUI features include SQL database access, XML parsing, thread management, network support, and a unified cross-platform application programing interface for file handling.It has extensive internationalization support.

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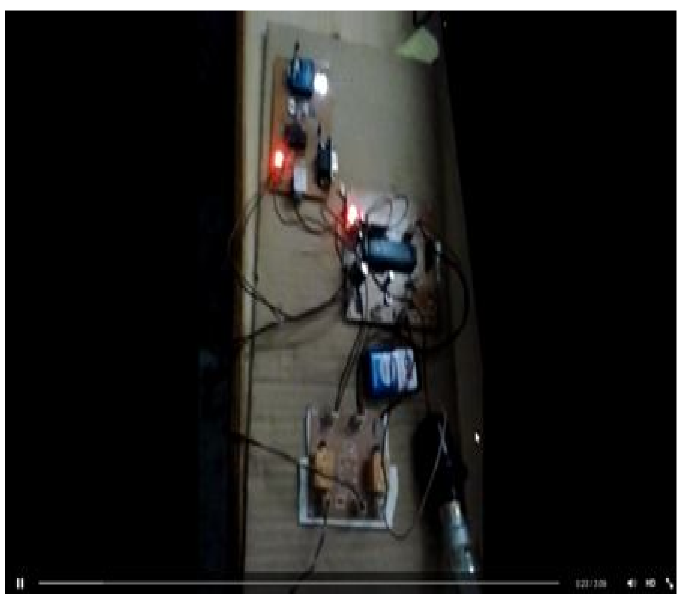
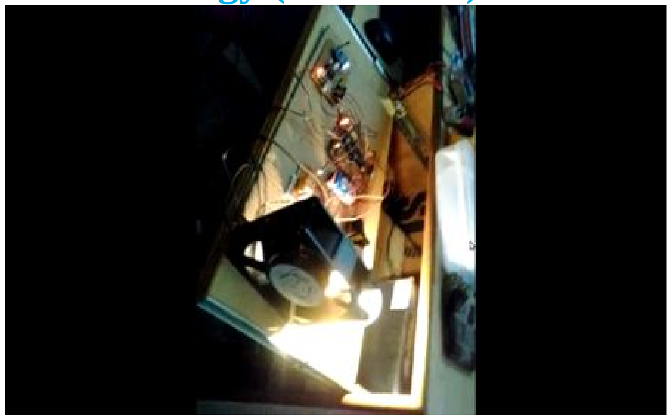
V. RESULTS





VI. CONCLUSION

The project **"Design Of Embedded Irrigation System By Using WSN"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software 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 ARM9 board and with the help of growing technology the project has been successfully implemented.

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