Efficient Irrigation System using GSM and Ethernet Module

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***Abstract*— Due to water scarcity and poor production of crops we have developed a remote irrigation system monitoring , based on the technologies of GSM and ETHERNET 802.3.The remote monitoring system consists of the monitoring equipment, data center server and the clients . The sensor collects ranges of various parameters like fire, humidity , temperature and pH. The most specific task of this project is to discharge precise amount of water only in targeted areas. Thereby, helps in water conservation and saves money. The parameters are continously monitored by the client through Ethernet. Abnormal conditions of parameters are sent to user's mobile phones via GSM. The monitoring of the parameters are developed using an embedded c programming language.**

Keywords*— GSM ,Ethernet , fire sensor, humidity sensor , temperature sensor , pH sensor

I. INTRODUCTION

In today's life agriculture is declining due to poor rainfall and reduced human monitoring.Over utililization of water leads to scarcity of water .As temerature of a plant increases moisture content decreases.Due to the decline of agriculture cultivation of food and cash crops is reduced and makes a downfall for economy.Addition of excessive fertilizers and other chemical to plants on consumption lead to disorder in human life.So there is a need to go for comphrehensive strategies and to adopt newer technologies in order to counter these situations. One such step is taken to conserve water and reduce cost and human monitoring.Agriculture plays a vital role in a country's economy Due to the climate changes and lack of precision agriculture have resulted in poor yield as compared to population growth .Irrigation is mostly done in canal system in which water is pumped into fields .After regular intervals of time without any feedback of water level in field. This type of irrigation affects crop health and produces a poor yield because some crops are too sensitive to water content in soil .Many smart irrigation systems have been devised . A smart irrigation system contrary to a traditional irrigation system ,Regulates supplied water according to the needs of the fields and crop. A feedback mechanism to the smart irrigation is addition of fire sensor , temperature sensor , pH sensors along with humidity sensors.It is a matter of fact that the only possibility to seriously help the farmer is represented by an autonomous, independent, tentatively continuous analysis of the cultivation state, with regular feedbacks about the actions that are needed.The formatter will need to create these components, incorporating the applicable criteria that follow. Reporting the acquired data over the Internet, could allow a troupe of agronomists and biologists to assist the farmer, or a large number of farmers, in real time, for a huge number of cultivations, cancelling logistics and organization costs: the consultancy cost would be shared among many farmers, and no transportation (or very limited one) would be required.A large agricultural field presents an additional problem in the sense that different parts areas of it may have different evaporation rates due to foliage, the presence of rocks at different heights underground, parts of the field being in close proximity to canals or ponds, etc. Hence, moisture measurement at a single location in the filed does not make much sense. Consequently, what is required is a distributed number of sensor nodes and some scattered pumping units to pump water to those specific locations covered by the sensor units. The need for multiple sensors further emphasizes the need for an inexpensive moisture sensor. Furthermore, the requirement of multiple sensors spread out over the field means the presence of many wires in it. This will create a lot of problems to ploughing, harvesting, etc. An alternative parameter to determine crop irrigation needs is estimating plant evapotranspiration (ET). ET is affected by weather parameters, including solar radiation, temperature, relative humidity, wind speed, and crop factors, such as stage of growth, variety and plant density, management elements, soil properties, pest, and disease control [8]. Systems based on ET have been developed that allow water savings of up to 42% on time-based irrigation schedule [9]. In Florida, automated switching tensiometers have been used in combination with ET calculated from historic weather data to control automatic irrigation schemes for papaya plants instead of using fixed scheduled ones. Soil water status and ET-based irrigation methods resulted in more sustainable practices compared with set schedule irrigation because of the lower water volumes applied [10].Home applications comprised wireless embedded sensors and actuators that enable monitoring and control. For comfort and efficient energy management, household devices have been controlled through sensors that monitor parameters such as temperature, humidity, light, and presence, avoiding waste of energy [26]. Sensor networks have been used for security purposes, based on several sensors such as smoke detectors, gas sensors, and motion sensors, to detect possible risk situations that trigger appropriate actions in response, such as send an alert to a remote center through wireless communication [27].

II. HARDWARE DESCRIPTION

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. 98 percent of all microprocessors are manufactured as components of embedded systems.Examples of properties typical of embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interface with. However, by building intelligence mechanisms on the top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functionalities, well beyond those available.[5] For example, intelligent techniques can be designed to manage power consumption of embedded systems.Modern embedded systems are often based on microcontrollers (i.e. CPUs with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialised in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.The main hardware used is ARM-LPC2148 , it is a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB.Due to their tiny size and low power consumption, LPC21418 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.Since the inputs are analog in nature we need ADC to convert into digital.10 bit successive approximation analog to digital converter in LPC2148 .Basic clocking for the A/D converters is provided by the VPB clock. A programmable divider is included in each converter, to scale this clock to the 4.5 MHz (max) clock needed by the successive approximation process. A fully accurate conversion requires 11 of these clocks.

A. TEMPERATURE SENSORS

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. To measure the temperature of the plants a LM35 sensor is used. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range.

B. FIRE SENSOR

The fire sensor circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity. Ordinary signal diodes like IN 34 and OA 71 exhibits this property and the internal resistance of these devices will decrease when temperature rises. In the reverse biased mode, this effect will be more significant. Typically the diode can generate around 600 milli volts at 5 degree centigrade. For each degree rise in temperature; the diode generates 2 mV output voltage. That is at 5 degree it is 10 mV and when the temperature rises to 50 degree, the diode will give 100 milli volts.

C. PH SENSOR

A pH Meter is an electronic device used for measuring the pH which is either the concentration of Hydrogen ions in an aqueous solution or the activity of the Hydrogen ions in an aqueous solution. The pH will indicate if the solution is acidic or basic, but is not a measure of acidity or alkalinity.

D. DC MOTOR

The DC motor has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator. The armature is made of coils of wire wrapped around the core, and the core has an extended shaft that rotates on bearings. You should also notice that the ends of each coilof wire on the armature are terminated at one end of the armature. The termination points are called the commutator, and this is where the brushes make electrical contact to bring electrical current from the stationary part to the rotating part of the machine.

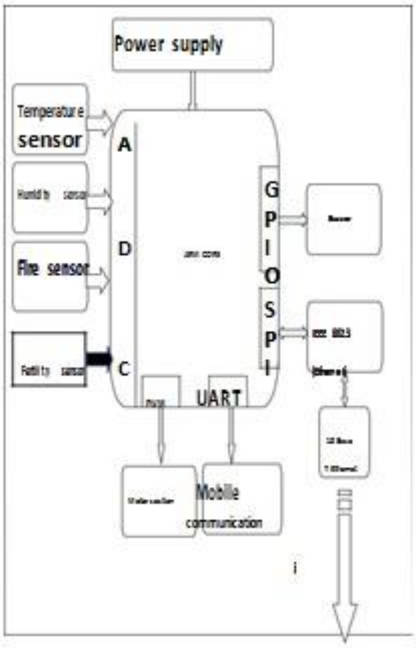


Fig 1 Control System

E. GSM

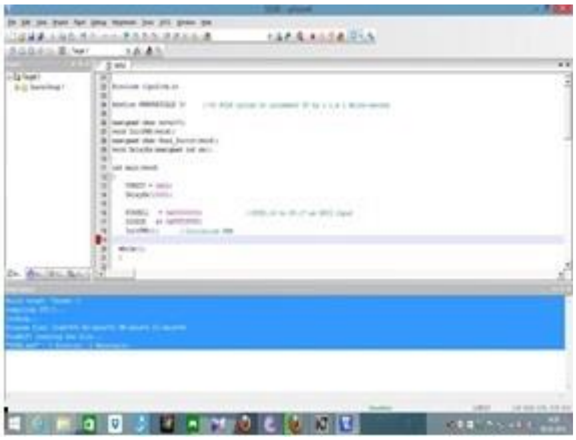
Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. This is used for transferring the abnormal conditions of parameters simultaneously to the user monitor.

F. ETHERNET

IEEE 802.3 is a working group and a collection of IEEE standards produced by the working group defining the physical layer and data link layer's media access control(MAC) of wired Ethernet. This is generally a local Area network technology with some wide area network applications. Physical connections are made between nodes and/or infrastructure. Devices (hubs, switches, routers)by various types of copper or fiber cable.802.3 is a technology that supports the IEEE 802.1 network architecture.802.3. Also defines LAN access method using CSMA/CD

Fig.2 Receiver system

III. RESULT & DISCUSSION



Simulation is performed using keil . Only compilation can be done then the entire program is downloaded into kit and then the final output is obtained.

IV. CONCLUSION

Automatic irrigation systems are convenient, especially for those who travel. If installed and programmed properly, automatic irrigation systems can even save your money and help in water conservation. Dead lawn grass and plants need to be replaced, and that can be expensive but the savings from automatic irrigation systems can go beyond that. Watering with a hose or with oscillator wastes water, either method targets plant roots with any significant degree of precision. Automatic irrigation systems can be programmed to discharge more precise a mounts of water in a targeted area, which promotes water conservation since the deployment and use of wired systems in remote areas is usually unfeasible due to high costs, wireless is the best solution. Web server is used to transmit the information of these resources to users in an orderly and controlled manner using Ethernet protocol. The irrigation controller node is composed of a micro-processor, transceivers, analog to digital converters. Sensor nodes are deployed for field process monitoring and control. The sensing parameters can be displayed as values in PC.if there are any exceed condition of parameters (temperature, humidity, moisture) using mobile communication (GSM) it will send SMS. The proposed system makes remote monitoring possible in irrigation applications.

REFERENCES

[1] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta-Gándara" Automated Irrigation System Using a Wireless Sensor Network and GPRS Module"

[2] G. P. Asner, J. M. O. Scurlock, and J. A. Hicke, "Global synthesis of leaf area index observations: implications for ecological and remote sensing studies," Global Ecology and Biogeography, vol. 12, no. 3, pp. 191–205, 2003.

[3] E. Boegh, H. Soegaard, N. Broge, C. Hasager, N. O. Jensen, K. Schelde, and A. Thomsen, "Airborne multispectral data for quantifying leaf area index, nitrogen concentration, and photosynthetic efficiency in agriculture," Remote Sensing of Environment, vol. 81, no. 2–3, pp. 179– 193, 2002.

[4] N. Br´eda, “Ground-based measurements of leaf area index: a review of methods, instruments and current controversies,” Journal of Experimental”

[5] G. A. Carter, “Ratios of leaf reflectances in narrow wavebands as indicators of plant stress,” International Journal of Remote Sensing, vol. 15, no. 3, pp. 697–703, 1994.

[6] J. M. Chen and T. A. Black, “Defining leaf area index for non-flat leaves,” Plant, Cell & Environment, vol. 15, no. 4, pp. 421–429, 1992.

[7] C. Daughtry, K. P. Gallo, S. N. Goward, S. D. Prince, and W. P. Kustas, “Spectral estimates of absorbed radiation and phytomass production in corn and soybean canopies,” Remote Sensing of Environment, vol. 39, no. 2, pp 141–152, 1992.

[8] B. Duchemin, R. Hadria, S. Erraki, G. Boulet, P. Maisongrande, A. Chehbouni, R. Escadafal, J. Ezzahar, J. Hoedjes, M. Kharrou, S. Khabba, B. Mougenot, A. Olioso, J.-C. Rodriguez, and V. Simonneaux, “Monitoring wheat phenology and irrigation in CentralMorocco: On the use of relationships between evapotranspiration, crops coefficients, leaf area index and remotely-sensed vegetation indices,” Agricultural Water Management, vol. 79, no. 1, pp. 1–27, 2006

[9] H. W. Gausman and W. A. Allen, “Optical parameters of leaves of 30 plant species,” Plant Physiology, vol. 52, no. 1, pp. 57–62, 1973.

[10] O. Gnawali, R. Fonseca, K. Jamieson, D. Moss, and P. Levis, “Collection Tree Protocol,” in Proc. of the 7th ACM Conference on Embedded Networked Sensor Systems (SenSys ’09), Berkeley, CA, USA, 2009, pp. 1–14.

[11] Hamamatsu, “Si photodiodes S1087/S1133 series,” p://www.hamamatsu.com/resources/pdf/ssd/s1087 etc kspd1039e02. pdf, Last checked: August 13, 2014.

[12] T. Jarmer, “Spectroscopy and hyperspectral imagery for monitoring summer barley,” International Journal of Remote Sensing, vol. 34, no. 17, pp.

[13] H. Kobayashi, Y. Ryu, D. D. Baldocchi, J. M. Welles, and J. M. Norman, “On the correct estimation of gap fraction: How to remove scattered radiation in gap fraction measurements?” Agricultural and Forest Meteorology, vol. 174–175, no. 0, pp. 170–183, 2013.

[14] K. Langendoen, A. Baggio, and O. Visser, “Murphy loves potatoes: experiences from a pilot sensor network deployment in precision agriculture,” in Proc. of 20th International Parallel and Distributed Processing Symposium (IPDPS ’06), Rhodes Island, Greece, 2006.

[15] LI-COR, “LAI-2200 Plant Canopy Analyzer - Instruction Manual,” http://www.licor.co.za/manuals/LAI-2200 Manual.pdf, Last checked: August 13, 2014.