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Design Of Wireless Sensor Network In Agricultual Reforms

B.v.v.satyanarayana[1]
Research Scholar, Department of E.C.E K.L.University Vijayawada, India narayanabvv@yahoo.com

Dr.K.S.Ravi[2]
Professor Department of E.C.M K.L.University Vijayawada, India Ravi.kavuluri@kluniversity.in

Abstract
Agriculture is a source of livelihood of majority Indians and has great impact on the economy of the country. In a country like India, where climatic conditions vary substantially and irrigation facilities are poor. Agriculture is timely and sufficient supply of water. This paper provides with a method to control wastage of water and electricity used for irrigation in paddy fields. This system utilizes water level, temperature sensor, LDR, potentiometer and wireless camera for real time monitoring of the field without human intervention by design, development and trial work of a monitoring system. In this study, monitoring system which used a commercial inexpensive wireless camera and an embedded system was developed. This kind of system should be robust and be considerably small in size for outdoor use. In addition, it should also be made in low cost to reduce farmer's expense.

Keywords: USB Camera, Sensors, PIC, Zigbee Tx, Zigbee Rx, ARM, GSM, Monitor.

INTRODUCTION

Even in the modern era of industrialization, agriculture plays a very significant role in the overall socio-economic development of India. India has an agriculture based economy, 43% of India's territory comes under agricultural lands. Agriculture along with other related fields like forestry and logging provides employment to 52% of India's population. Agriculture also accounts for 8.56% of the country's total exports. According to a survey made in 2007, agriculture accounts for 16.6% of India's Gross Domestic Product. Hence, it is agriculture that is the most influential field as compared to others in India.

In agriculture, demands for the system which enable real time monitoring of field condition from remote site are increasing to prevent crops stolen or watch their growth. Farmers prefer to monitor their field condition by image data captured in the field than numerical data such as temperature and so on. It would be considered that exterior network camera would be the most preferable device to capture outdoor images and to monitor field condition in real time. But the total cost of such system was still expensive and it was too difficult to customize its function for users purposes. One of the major concerns of farmers would be water level gauging in their paddy field or small pond. Although the automatic water level measuring systems are readily available, they are usually expensive and need periodical maintenance. In this study, a prototype of field image monitoring system is constructed using low cost USB webcam and wireless transmitter. Total cost of the system was sufficiently low and well-known software packaging system helped to increase the flexibility of the system.

SYSTEM DESCRIPTION

In agriculture, demands for the system which enable real time monitoring of field condition from remote site are increasing to prevent crops stolen or watch their growth. Farmers prefer to monitor their field condition by image data captured in the field than numerical data such as temperature and so on. It would be considered that exterior network camera would be the most preferable device to capture outdoor images and to monitor field condition in real time.

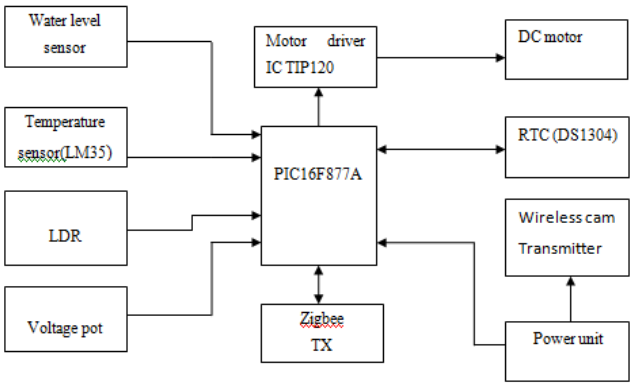
This system consists of two modules one is the transmitter module and the other is receiver module. The transmitter module consists of some kind of sensors like water level sensor, temperature sensor and LDR to give field condition. There is a wireless camera to monitor the field. The transmitter section also contains zigbee transmitter to transmit sensor data to receiver.

The receiver section consists of zigbee receiver, GSM module, LCD display, and TV tuner card and PC. Zigbee receiver is used to receive information from the transmitter module.GSM module is used to send message to the farmer about the field. TV tuner is used receive the video of farm. The block diagram of the two modules is shown below.

Merits of This System:
It reduces the wastage of water
It reduces the human effort
It increases agricultural production
It reduces damage to crops
Security

TRANSMITTER MODULE

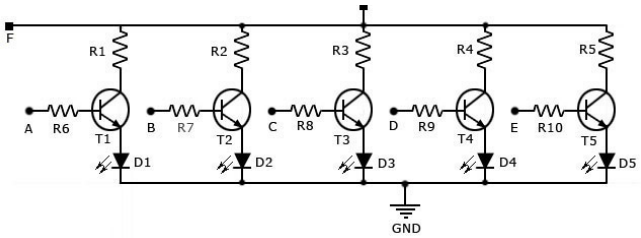
This section consists of a PIC16F877A microcontroller, temperature sensor, water level sensor, LDR sensor, Zigbee wireless module and wireless camera.Here the wireless camera is used for monitoring of crops.The PIC microcontroller is used is used to control the sensor interfaced to it.Each sensor will have its basic principle and function. The block diagram for transmitter section is shown in below.



PERIPHERAL INTERFACING

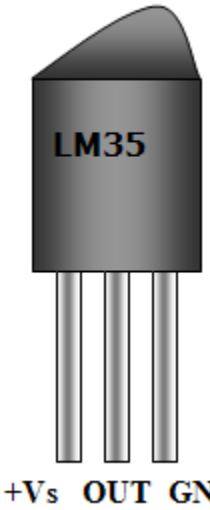
WATER LEVEL SENSOR:

This water level sensor consists of five transistor switches connected with five Led's. The level sensing part of the circuit is built around transistors T1, T2, T3, T4, and T5. The 6v supply is given to the VDD terminal and it is submersed in the water. R1, R2, R3 limit the bases current of corresponding transistors while resistors R4, R5, limit their collector current.



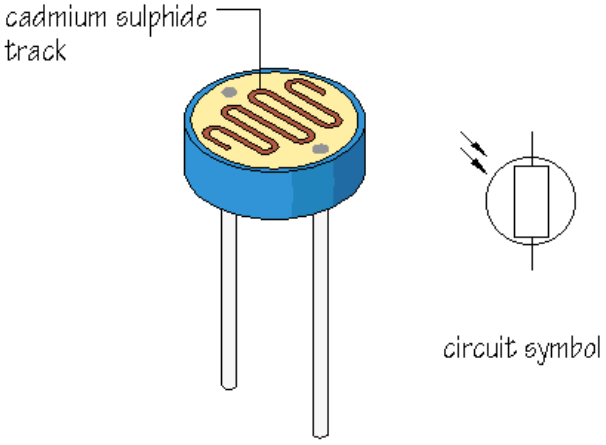
TEMPERATURE SENSOR (LM35):

The LM35 series are precision integrated-circuit temperature sensors. Their output voltage is linearly proportional to the Celsius temperature. The LM35 thus has a benefit over linear temperature sensors calibrated in° K, as there is no need to subtract a large constant voltage from its output to obtain Centigrade reading. It does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°Cat room temperature and ±3⁄4°C over a full −55 to +150°Ctemperature range. Low cost is due to trimming and calibration at the wafer level. TheLM35'slinear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. LM35can be used with single power supplies, or with plus and minus supplies. It draws only 60 μA from its supply, so it has very low self-heating, less than 0.1°C in still air. It is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10°with improved accuracy).



LDR (LIGHT DEPENDENT RESISTOR):

A phototransistor or light dependent resistor is used for the detection of light. The main principle used here is ass the intensity of light increases the resistance of the photo resistor decreases and light glows. The resistance of a photo resistor decreases with increasing incident light intensity, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.



POTENTIOMETER (10KPOT):

A potentiometer informally a **POT** is a three terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be

used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

RTC (REAL TIME CLOCK (DS1307)):

Real-time clock (RTC) counts seconds, Minutes, hours, date of the month, month, day of the week, and year with leap-year Compensation valid up to 2100.

- 56-byte, battery-backed, non-volatile (NV) RAM for data storage.
- Two-wire serial interface.
- Programmable square wave output signal.
- Automatic power-fail detects and switches circuitry.
- Consumes less than 500nA in battery backup mode with oscillator running
- Optional industrial temperature range:-40°C to +85°C
- Available in 8-pin DIP or SOIC.

WIRELESS CAMERA:

Wireless cameras are closed-circuit television (CCTV) cameras that transmit a video and audio signal to a wireless receiver through a radio band. Many wireless security cameras require at least one cable or wire for power; "wireless" refers to the transmission of video/audio. However, some wireless security cameras are battery-powered, making the cameras truly wireless from top to bottom.

Wireless cameras are proving very popular among modern security consumers due to their low installation costs (there is no need to run expensive video extension cables) and flexible mounting options; wireless cameras can be mounted/installed in locations previously unavailable to standard wired cameras. In addition to the ease of use and convenience of access, wireless security camera allows users to leverage broadband wireless internet to provide seamless video streaming over-internet.

ZIGBEE:

ZigBee is a home-area network designed specifically to replace the proliferation of individual remote controls. ZigBee was created to satisfy the market's need for a cost-effective, standards-based wireless network that supports low data rates, low power consumption, security, and reliability The alliance is working closely with the IEEE to ensure an integrated, complete, and interoperable network for the market. The ZigBee Alliance will also serve as the official test and certification group for ZigBee.

Devices. ZigBee is the only standards based technology that addresses the needs of most remote monitoring and control and sensory network applications. The 802.15.4 specification only covers the lower networking layers (MAC and PHY).

PIC16F877A:

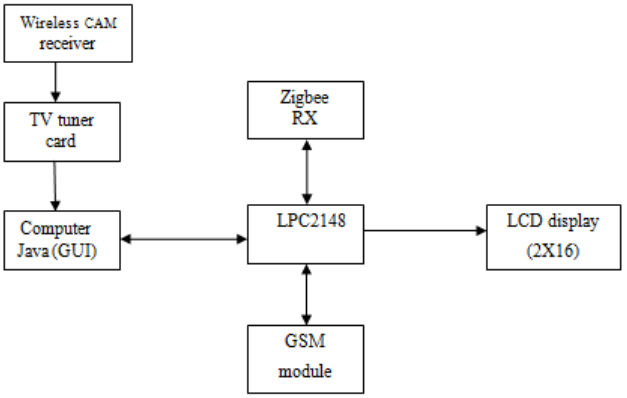
The **16F877A is one of the most popular PIC** microcontrollers. It comes in a 40 pin DIP pin out and it has many internal peripherals. The only disadvantage that you could level at it is that it does not have an internal clock source like most of the other more modern PIC's. One of the main advantages is that each pin is only shared between two or three functions.

FEATURES OF PIC 16F877A:

- It's operating freq is 20Mhz DC supply
- It contains 8k flash program memory
- Data memory of 368 bytes
- EEPROM memory of 256 bytes
- Interrupts: 15
- Number of timers :3

RECEIVER MODULE

This section consists of ARM-7 MICROCONTROLLER (LPC2148), PC (PERSONAL COMPUTER), GSM MODULE, LCD DISPLAY. The following is the block diagram of receiver section.



ARM-7 PROCESSOR (LPC2148):

A microprocessor system consists of a microprocessor with memory, input ports and output ports connected to it externally. A microcontroller is a single chip containing a

microprocessor, memory, input ports and output ports.LPC2148 microcontroller is based on 16/32bitARM-7 with real time emulation and embedded trace support. It is very tiny and consumes low power. It contains 512k on chip memory.

SPECIFICATIONS:

- Crystal freq: 12MHZ
- Crystal freq for RTC: 32.768KHZ
- Operating voltage: 9v to 12v
- 50 pin berg header for external interfacing

GSM MODULE:

GSM means **Global System Mobile Communication**. In this we use GSM module to send message to the farmer intimating that his field was in diseased condition.

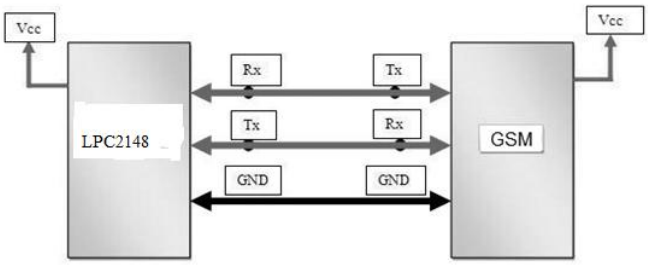
GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

- Receive, send or delete SMS messages in a SIM.
- Read, add, search phonebook entries of the SIM.
- Make, Receive, or reject a voice call.

The MODEM needs AT commands, for interacting with processor or controller, which are communicated through serial communication. These commands are sent by the controller/processor. The MODEM sends back a result after it receives a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to interact with the GSM and GPRS cellular network.

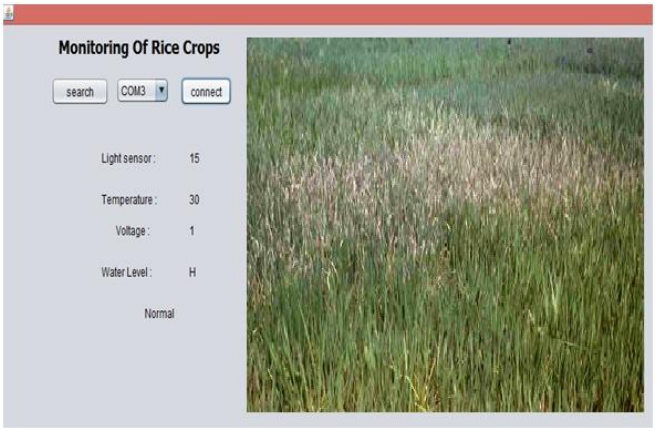
LCD (16X2):

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical, easily programmable have no limitation of displaying special & even custom characters.

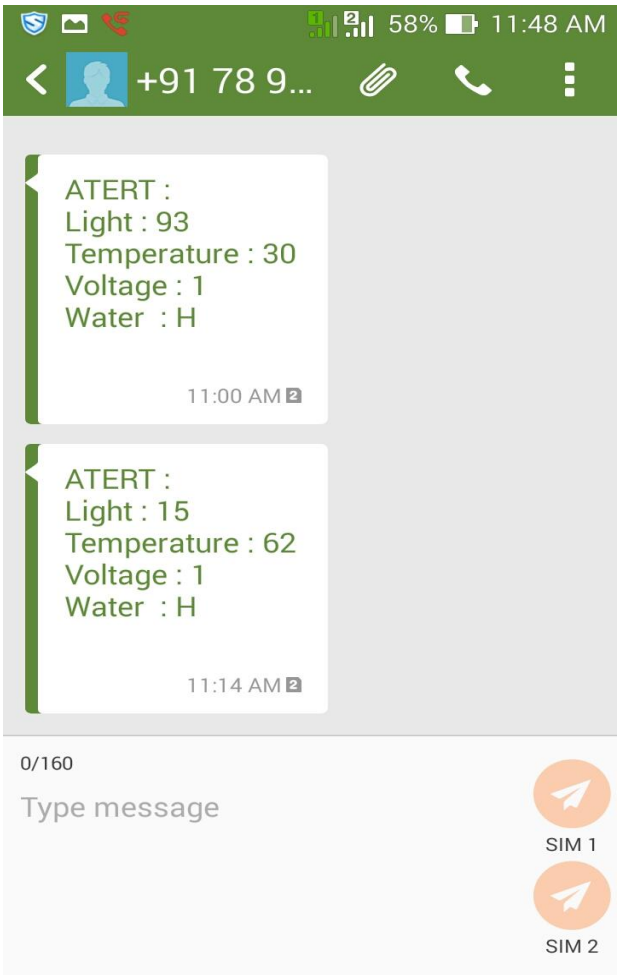


A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

RESULTS:



The above figure is the output observed on the laptop.For this initially we have to select the COM3 port and connect to the receiver kit through UART and USB connector. The video of the field is received and observed using TV tuner card.



The above figure indicates the message sent to the farmer's mobile when there is increase in the temperature and light.

CONCLUSION:

In this project, we demonstrate that up on aiming efficient use of water and electricity in irrigation of agricultural fields. In GSM based controlling of motor we can see that the wastage of water and electricity. However, in monitoring of rice crops using USB camera and wireless sensor network will help to reduce this problem using sensors. In this project we use various sensors like water level sensor, temperature sensor, LDR and rotary 10k pot.The water level sensor will help to sense the level of water and when the water reaches the prescribed level the controller automatically switch off the motor. The temperature sensor is used to sense the temperature of the field. The USB camera used is used to monitor the field such that the growth of the field and disease occurrence of the field can be known. Initially we will place some prescribed sensor values inprogram dumped in the microcontroller whenever the sensor values increases more than that then the message will be sent to prescribe farmer of the field.

REFERENCES

[1] Ilonen J. Kamarainen J. K, Lindh T, Ahola J, Kalviainen H andPartanen, "Diagnosis tool for motor condition monitoring." IEEE Trans. Ind. Application, Vol 41, No. 4, 2005 pp. 963-971.

[2] KuniakiUmino, Yasuhiro Ohyama, Jin-Hua She and Hiroyuki Kobayashi, "Remote Controlled Embedded System", 4th China-Japan International Workshop on Internet Technology and Control Applications, Hunan, China, 21- 26 October, 2005.

[3] A Weaver J Luo, and S Zhang, "Monitoring and Control using Internet and Java", Proc. 25th Annual Conference on IEEE Industrial Electronics IECON‟ 99, Vol. 3, pp 1152-1158, 1999.

[4] Trohandl C, Proske M &Elmeureich W, "Remote Target Monitoring in Embedded System Lab courses using a Sensor Network", Proc. 32nd Annual Conference on IEEE Industrial Electronics IECON 2006, 6-10 Nov 2006, pp 5433-5438.

[5] Tom Guilbert (2000) CamE: rewrite of the xawtv webcam app, [Online]. Available at http://linuxbrit.co.uk/camE/ (verified May 30, 2008).

[6] Norihiro Nakamura (2006) Construction of a field image monitoring system and an application of image recognition technology, Proc. of 4th World Congress on Computers in Agriculture (WCCA), 78-83

[7] Nobuhiro TSUNASHIMA, Morito SHIOHARA, Shigeru SASAKI, and Jyunichi TANAHASHI (2000) Water Level Measurement using Image Processing, computer vision and image media 121-15, 111-117

[8] OpenWrt (2008) OpenWrt: Wireless Freedom, [Online]. Available at ttp://www.openwrt.org/ (verified May 30, 2008)

[9] ATMELAVRATMega32 Datasheet, available online: http://www.atmel.com/dyn/resources/prod_documents/2503S.pdf.

[10] Richard Barnett, Larry O‟ Cull and Sarah Cox, "Embedded C Programming and Atmel AVR", Delmar-Cengage Learning India Pvt. Ltd., 2007 Edition (India).

[11] Ponyprog software, available online: http://www.lancos.com/

[12] DS1307 64 x 8, Serial, I2C Real-Time Clock Datasheet, availableonline: http://pdfserv.maxim-ic.com/en/ds/DS1307.