INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATIONS AND ROBOTICS
ISSN 2320-7345

RENEWABLE ENERGY AGRICULTURE MONITORING SYSTEM USING FUZZY BASED PID CONTROLLER

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Abstract: - Solar energy is one of the renewable energy sources, which is significantly contributing to the sustainable energy supply, used for automatic agricultural monitoring system. The objective of this paper is to propose a novel environment information monitoring and controlling system for agricultural operations which are constantly technology driven due to labour shortages, increase in labour cost, and trends in new and advanced technology applications. Our solution aims to be a good replacement of manually module checking which is not recommended because of time-consuming, less accuracy and potentially dangerous to the operator. This paper deals with the automatic agricultural monitoring system for measuring the agricultural challenges such as temperature, water level and PH. With the help of the sensors and IOT, the frequent updation of field environment can be made automatically. Simulation for agriculture monitoring system is performed using proteus software. The fuzzy controller is considered to overcome the controller complexity and hence the hardware implementation of automatic agricultural monitoring system is based on fuzzy based PID controller programmed under Labview platform.

Keywords*:* IOT, Labview, fuzzy based PID controller, Technology-Driven

1. Introduction

We have the technology to bridge the gap between water usage and water wastage. Technology used in some developed countries is too expensive and complicated for a common farmer to understand. Our paper is to give cheap, reliable, cost efficient and easy to use technology which would help in conservation of resources such as water and also in automatizing farms. We proposed use of temperature and moisture sensor at suitable locations for monitoring of crops.

Different types of sensors such as temperature, soil moisture and relative humidity senses the data in agricultural environment and provide it to microcontroller, interfaced with the wireless module. A pair of transmitter and receiver wireless module helps in transmitting and receiving the data using a serial communication protocol UART. Data are displayed on LCD unit to monitor the system.

The current work aims to develop a low cost soil temperature and moisture monitoring system that can track the soil temperature and moisture of the field in real time and thereby allow water to be Dripped on to the field if the soil temperature goes above and/or the soil moisture falls below a prescribed limit depending in the nature of crop grown in the soil. The sensors take the inputs like moisture, temperature and provide these inputs to the microcontroller. The microcontroller converts these inputs into its desired form with the program that is running on it and gives outputs in the mode of regulation of water flow according to the present input conditions. Traditional or old-type farming involved much more manual labour and for longer hours than the modern methods of today. Farmers were highly dependent on climate and weather. In traditional agricultural system the farmer needs to monitor the field condition every hours or minutes for the control of irrigation.

This paper finds the application in domestic agricultural field. In civilian domain, this can be used to ensure faithful irrigation of farm field, since it have the option of finding out irrigation data in particular area. In some of the irrigation system irrigation scheduling is achieved by monitoring soil, water status with tension meters under drip irrigation by the automation controller system in sandy soil. It is very important for the farmer to maintain the content in the field. In this the design of a Micro-controller based drip irrigation mechanism is proposed, which is a real time feedback control system for monitoring and controlling all the activities of drip irrigation system more efficiently.

Irrigation system controls valves by using automated controller allows the farmer to apply the right amount of water at the right time, regardless of the availability of the labour to turn valves. Some irrigation systems are used to implement efficient irrigation scheme for the field having different crops. The system can be further enhanced by using fuzzy logic controller. The fuzzy logic scheme is used to increase the accuracy of the measured value and assists in decision making. The green house based modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually. For this IOT is used to report the details about irrigation.

2. Block Diagram

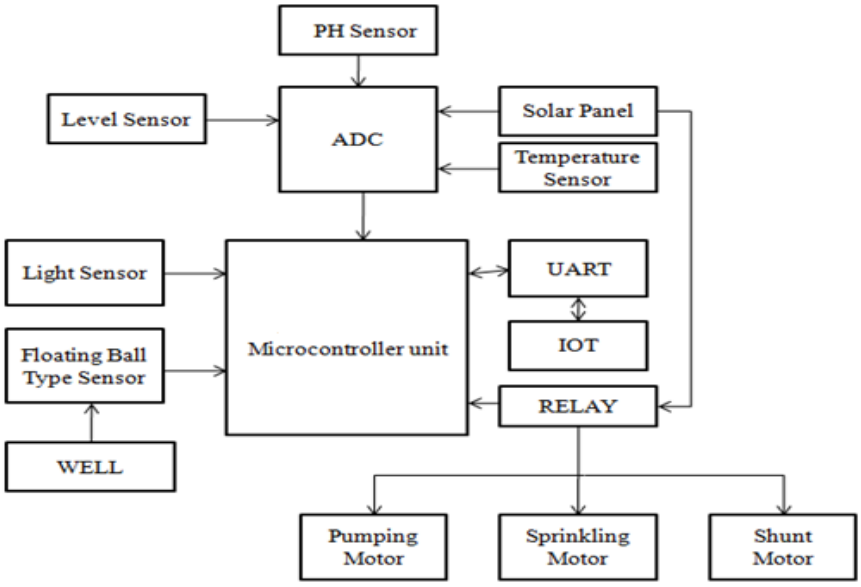

Figure 1: Block Diagram of Agriculture Monitoring System

Microcontroller is connected with level sensor, temperature sensor, PH sensor and light sensor. The environment challenges like temperature, water level, PH are easily monitored using these sensors. Solar energy is one of the renewable energy sources, which is significantly contributing to the sustainable energy supply, used for automatic agricultural monitoring system. With the help of the sensors and IOT, the frequent updation of field environment can be made automatically.

2.1 ATMEGA8 Microcontroller

The ATMEGA8 is a low power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATMEGA8 achieves throughputs approaching 1MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.

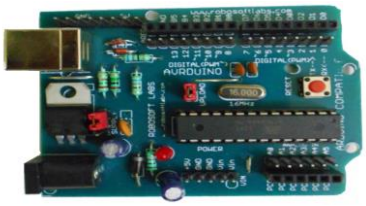

Figure 2: ATMEGA8 Development Board with ATMEGA8 Microcontroller

Features of ATMEGA8

- High-performance, Low-power Atmel, AVR 8-bit Microcontroller
- Advanced RISC Architecture
- High Endurance Non-volatile Memory segments
- Peripheral Features
- Special Microcontroller Features
- I/O and Packages
- Operating Voltages
- Speed Grades
- Power Consumption at 4Mhz, 3V, 25°C

2.2 USBASP

USBASP is a USB in-circuit programmer for Atmel AVR controllers. It simply consists of an ATMEGA88 or an ATMEGA8 and a couple of passive components. The programmer uses a firmware-only USB driver; no special USB controller is needed.

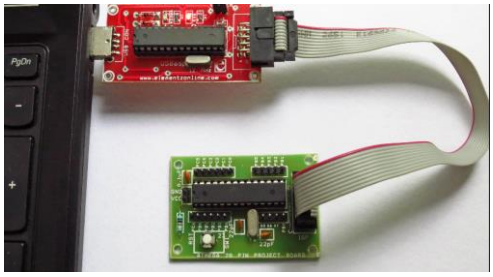

Figure 3: USBASP Interfacing with ATMEGA8 Microcontroller

USBASP programmer will painlessly transfer hex programs to most ATMEL AVR microcontrollers. It is more reliable than most other AVR programmers available. Entire AVR programmer has been built with using common parts and fits in the case of the serial connector. This AVR programmer is compatible with AVR dude GUI software.

Features

- Works under multiple platforms namely Linux, Mac OS X and Windows.
- No special controllers are needed.
- Programming speed is up to 5kBytes/sec.
- SCK option to support targets with low clock speed (< 1,5MHz).
- Planned: serial interface to target (e.g. for debugging).

The USBASP is a serial programmer having Serial Peripheral Interface for programming. The programmer consists of 10 pin standard serial connector for connecting to the target board for programming. The USBASP consists of the ATmega8 IC which can be connected through USB port.

2.3 IOT SIM800

SIM800 is a complete Quad-band GSM/GPRS solution in a SMT type which can be embedded in the customer applications.SIM800 support Quad band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. With tiny size of 24*24*3mm, it can fit into slim and compact demands of customer design. Featuring Bluetooth and Embedded AT, it allows total cost savings and fast time-to-market for customer applications.

Key Features

- AT command interface
- Quad-band and Dual-band variants
- Make and receive voice calls
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- USB Connector for Firmware Updating

3. Results and Discussion

The below snapshot about the implementation of agricultural monitoring system.

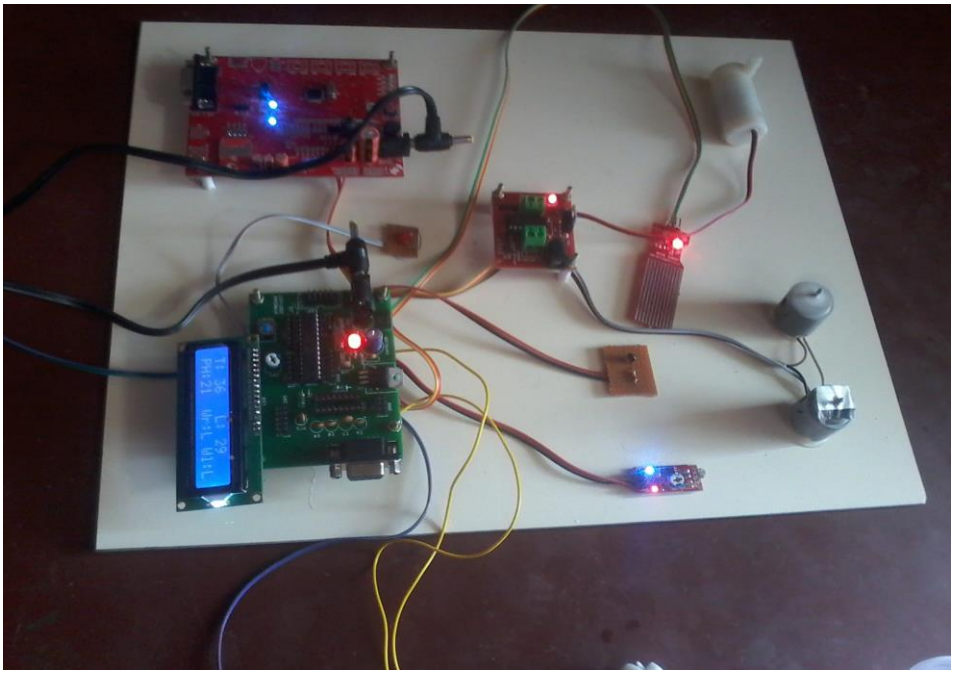

Figure 4: Implementation of Agricultural Monitoring System

The below figure shows graphical outputs of various sensors.

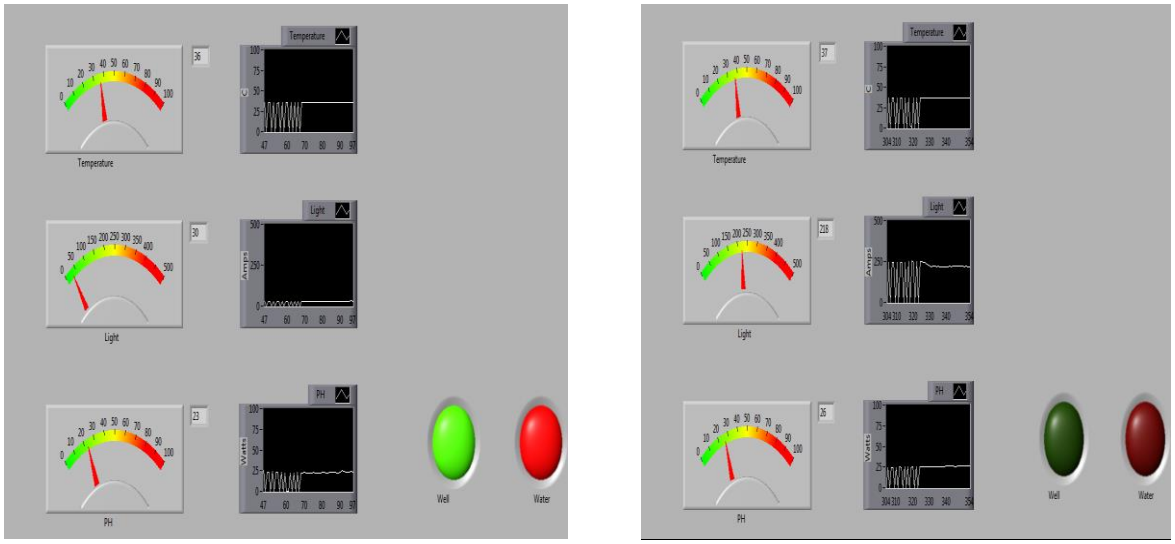

Figure 5: Graphical results obtained from Labview

The below figure shows IOT monitoring of agricultural system

Figure 6: IOT monitoring of agricultural system

4. Conclusion & future work

In this paper hardware implementation of agricultural monitoring system is explained with help of labview software and IOT technology. By this system, abnormalities in the field are noted and correction is made easily. In this system prototype of automatic agriculture monitoring system is developed with the help of Labview software and IOT technology. Labview software is used to monitor and control the various sensor output and motor operation. IOT technology is used to monitor the agriculture system. This system can be extended by using IOT technology to control the field environment in addition to monitoring.

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