IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 9, September 2021

DOI: 10.17148/IARJSET.2021.8976

Microcontroller Based Luminance Control System for Smart Irrigation

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Abstract: A microcontroller-based Green House control unit is used to automate the control and tracking of equipment and quantities such as screening installations, heating, cooling, illumination, temperature, soil moisture level, and other quantities/conditions in a Green House, obviating the need for human monitoring. It incorporates and automates by turning on or off all tracking devices in the home, as well as providing tips for solutions when the need occurs, with an improved functionality. This is thanks to MCU technology's ability to be quickly changed and re-modified while remaining portable. There is even a warning circuit to draw the Supervisor's attention. The aim of this research is to determine the efficacy and functionality of a green house control system. In a smart irrigation scheme, the Atmega16 is the operating device.

Keywords: - Microcontroller, DC , Sensor and Relay Driver

1. INTRODUCTION

In the area of agriculture, the most crucial aspects are: first, obtaining knowledge regarding soil productivity, and second, determining the moisture content of soil. A farmer will begin sowing seeds after calculating these two variables. In this article, we include a brief overview of various methods for measuring soil fertility in order to assess crop productivity. We're measuring the constituents of soil (potassium, phosphorus, and nitrogen) using two devices. Following the measurement of fertility, we propose an automated drip irrigation device regulated by a microprocessor that measures soil moisture. One of the motivations for this research is to use computing techniques to provide a barrier to wastage in order to not only have further financial gains and energy savings, but also to help the environment and water cycle, which in turn ensures a sustainable future. We discussed how we used various technology in the design, creation, and installation of an automated water pump controller to embed a control device [1]-[5].

To maximise water use for agricultural crops, an automatic irrigation system was created. In the root zone of the plants, the device has a distributed wireless network of soil-moisture and temperature sensors. A gateway device often takes care of sensor input, activates actuators, and sends data to a web application. To monitor water quantity, an algorithm with temperature and soil moisture threshold values was built and programmed into a microcontroller-based gateway. Photovoltaic panels operated the device, which had a duplex communication connection centered on a cellular-Internet interface that enabled data inspection and irrigation scheduling to be configured through a web page. The automated device was monitored for 136 days in a sage crop area, and water savings of up to 90% were achieved as compared to conventional agricultural irrigation practices. Over the last 18 months, three replicas of the integrated device have been successfully used in other locations [6]-[10]. The device has the ability to be effective in water-scarce, geographically remote areas due to its energy independence and low cost. The issue of calculating the moisture of agricultural soils using a precise, on-site, real-time approach is addressed in this paper. The goal is to measure moisture by calculating the pace of sound in the medium; the key challenge is to establish a specific relationship between the two. The Brutsaert's model for elastic waves in porous media is used for this, taking into account various types of soil that are often used in agriculture. For a broad variety of agricultural soils in various physical settings, the authors have extracted the speed-moisture curves, the conditions for the curves' actual validity, and the appropriate sound frequency for conducting the calculation. As a consequence, the findings of the paper will be used to develop a low-cost, reliable moisture sensor for farmers [11]-[15]. A concept for an irrigation device based on a variable rate automated microcontroller. Solar power is the only source of energy used to fuel the whole device. Sensors are installed in the paddy area, which continuously feel the water level and send a message to the farmer telling him of the water level. Farmers may obtain knowledge regarding the water level without having to enter the paddy fields. A farmer can monitor the motor based on the water level by transmitting a message from his cellular phone, also from afar. However, if the water level rises to a dangerous level, the motor can start without the farmer's permission to maintain the correct water level in the site. A full hardware implementation of this

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proposed automatic irrigation device is discussed at the end of this article. In the field of agriculture, proper irrigation is critical, and it is well understood that drip irrigation is both cost-effective and productive. In a traditional irrigation scheme, the farmer must adhere to an irrigation schedule that is different for each grain. The aim of this paper is to use Zigbee to have more convenience in the agricultural sector. The paper explains how a wireless sensor network can be used to create a low-cost, wirelessly regulated and tracked irrigation system. The evolved irrigation system eliminates the need for flooding irrigation to be done by hand. In irrigated agricultural cropping systems, efficient water control is important [16]-[22].

2. EXISTING SYSTEM

In all agricultural seasons, an automated irrigation management device has been installed to enable the automatic supply of sufficient water from a reservoir to field or domestic crops. One of the goals of this project is to see if human influence can be eliminated from irrigation while simultaneously optimizing the usage of water. The technique used is to constantly measure the moisture level in the soil to determine if irrigation is required and how much water is required in the soil. To provide the required volume of water to the soil, a pumping system is used. The job is divided into four subsystems that make up the automated irrigation control system: power source, sensing unit, control unit, and pumping subsystems. A moisture sensor was used to model the electrical resistance of the soil; a controlled 12 volts power supply device was built to power the system; an operating amplifier and timer were used to execute the control circuit; and a small dc-operated motor was used to build the pumping mechanism, which consisted of a submersible low-noise micro water pump. Device reaction experiments were conducted to assess how long it took the system to irrigate potted samples of various soil types with varying degrees of dryness. The findings revealed that sandy soils need less water for irrigation than loamy soils, whereas clay soils need the most.

Plant development necessitates a sufficient amount of water. Plants need extra water when irrigation is insufficient. We recognise that when people go on holiday, they do not water their gardens and that they often neglect to water them. As a consequence, there's a risk the plants could be harmed. Sensors are available on each sector, but they are not allowed until there is water on the field. Sensors detect the requirement until the field is dry before the sensors are deactivated again. If there are several signals for water requirements, the microcontroller can priorities the first signal obtained and irrigate the fields accordingly. This automatic plant watering systems have been shown to use 47% more water on average than non-automated sprinkler systems (i.e. hose and sprinkler), which can be attributable to the propensity to set irrigation controls and not readjust with changing weather conditions. Irrigation control technology that increases the productivity of water application is now usable. Soil moisture monitors, in particular, may help to minimize the amount of unwanted irrigations. A soil moisture sensor is installed in the plant's root region, and a gateway device processes the sensor's data and sends it to a web application. One algorithm was created to calculate temperature and soil moisture sensor threshold values, which was then programmed into a microcontroller to monitor water quantity. A photovoltaic panel was used for fuel. Another feature was the usage of a cellular-Internet interface, which enabled data inspection and irrigation scheduling to be configured through a web page. As opposed to a conventional watering machine, the automated system saved 92 percent of the time. Three replicas of the automatic device have been successfully used for one year and six months in other locations. This model creates a smart switching system by combining sensor technology with a microcontroller. The model depicts the basic switching system of a water motor/pump utilizing sensors from every section of the field and a soil moisture sensor to detect moisture in the soil. Finally, the soil moisture level was shown on an LCD.

The automatic irrigation device was created to constantly monitor the soil moisture level. When the desired degree of soil moisture is reached, the machine reacts properly by watering the soil with the same amount of water required and then shutting off the water source. The soil moisture content reference standard was designed to be adjustable for the three most typical soil samples. The automated device was developed using ARM (Advanced RISC Machine) technology and GSM (Global System for Mobile Communication) technology for communication. The irrigation device ensures sufficient irrigation in a certain region in real time. In a paddy area, a soil moisture sensor is mounted in the root zone to detect water levels. The ARM7TDMI centre and GSM were used to construct the device. GSM is a critical component of this device. GSM is used to connect with the device. GSM is a connection between an ARM processor and a centralized device that operates via SMS. The temperature and field conditions are detected in real time by this device. The basic series of AT (Attention) commands is used to monitor the information sent to the user via SMS and GSM modem. These commands are used to manage the bulk of the GSM model's features. Irrigation was automated utilizing a wireless sensor network, such as Zig-bee, and internet technologies. The concept was born out of a need to enhance the irrigation infrastructure and lower the cost of irrigation water. Sensors are mounted in the farm and constantly feel and capture data. This data is stored at the centre display and then sent to a data collection interface before being broadcast to the wireless sensor node. This information system was automated and controlled through the internet.
Arduino is a project and user group that develops and produces Microcontroller-based 18 instruments for creating digital interfaces and interactive artefacts that can feel and manipulate the physical world. The AVR is based on Harvard's

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modified architecture. It's an Atmel-designed single-chip microcontroller with an 8-bit RISC processor. One of the first microcontroller families to use on-chip flash memory (32KB) for software storage was the AVR (Alf (Egil Bogen) and Vegard (WollanRISC)'s processor). 16-bit implementations are handled by AVR microcontrollers. With only a single cycle order. The AVR design guarantees quick code execution while using the least amount of power necessary, thanks to the ATmega's low power, high efficiency RISC CPU, revolutionary Pico Power technology, and a rich feature set. The unit runs on 7-12 volts and uses a single clock cycle to execute all-powerful orders. Throughputs of 1 MIPS per MHZ are achieved by the computer. 20 MHz is the operating frequency. A liquid crystal display (LCD) is a flat, thin display unit with any amount of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel is made up of a column of liquid crystal molecules suspended between two translucent electrodes, as well as two polarizing filters with perpendicular polarity axes. Light going into one would be blocked by the other if there were no liquid crystals in them.

3. PROPOSED SYSTEM

The proposed device includes an automatic irrigation process that detects the earth's dampness content and switches the pumping motor ON and OFF. The use of effective irrigation methods is critical in the agricultural industry. The use of these methods has the advantage of reducing human intervention. The soil sensor senses the moisture content of the soil by sending an input signal to an ATmega16 board, which runs on an ATmega16/32 microcontroller and is configured to collect the input signal of changeable dampness conditions of the ground through a dampness sensing device in this automated irrigation project. The ATmega16 is used to power the whole machine. The monitoring device is attached to the input units, which include temperature, soil moisture, and light sensors. The performance of the regulating device is entirely dependent on the input sensor unit. The controller's output components, such as DC pumps, DC fans, and lamps, are connected to the controller through the relay motor. Our proposed approach is driven by an ATmega16 microcontroller. The ATmega16 is an 8-bit CMOS microcontroller with a low power consumption built on the AVR enhanced RISC architecture. The ATmega16 achieves throughputs reaching 1 MIPS per MHz by performing powerful instructions in a single clock cycle, enabling the device to be programmed to optimize power consumption versus processing speed.

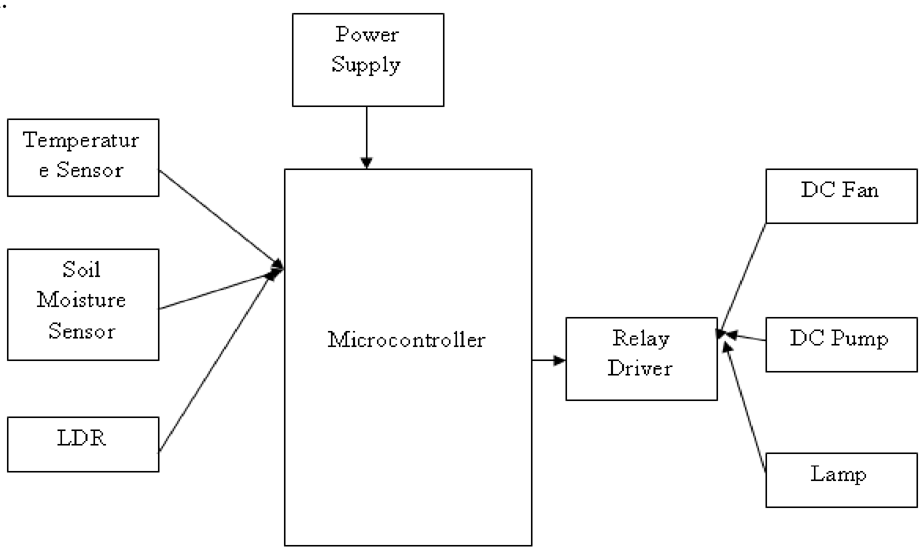

Figure.1. Block Diagram of Proposed System

The Atmega16 processor can operate at a maximum frequency of 16MHz. The volumetric water content of soil is measured by soil moisture sensors. Since direct gravimetric measuring of free soil moisture necessitates the removal, drying, and weighting of a sample, soil moisture sensors implicitly calculate the volumetric water content by utilizing another property of the soil as a surrogate for the moisture content, such as electrical resistance, dielectric constant, or neutron interaction. A sensor is a system that reacts to an input quantity by producing a functionally similar response, which is usually in the form of an electrical or optical signal. The sensitivity of a sensor refers to how often the sensor signal varies as the calculated amount changes. A semi-conducting substance is a light based resistor (rather like Silicon). As light is shone on an LDR, energy is injected into the semiconductor, and is consumed by covalently bound electrons. The atoms' bonds are broken by this force. Inside the LDR, the electrons become delocalized and free to pass about. Relays are used where a low-power signal is used to operate a circuit (with full electrical separation between the control and regulated circuits), or where many circuits may be controlled by a single signal. In high-temperature a setting, a DC fan is used to cool the plants is shown in Figure 1.
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single clock cycle, enabling the device designed to optimize power consumption versus processing speed. The AVR core has 32 general-purpose working registers and a large instruction set. The Arithmetic Logic Unit (ALU) is explicitly attached to all 32 registers, enabling two separate registers to be reached in a single instruction performed in a single clock period. The resulting design is more code effective than traditional CISC microcontrollers, with throughputs up to ten times faster. The ATmega16 has the following capabilities: 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for boundary-scan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte oriented USART. The CPU is turned off in Idle mode, but the USART, Two-wire interface, A/D Converter, SRAM, Timer/Counters, SPI port, and interrupt mechanism remain operational. The Oscillator is frozen in the Power-down state, which disables all other chip functions before the next External Interrupt or Hardware Reset. The Asynchronous Timer continues to operate in Power-save mode, enabling the consumer to have a timer base while the rest of the system sleeps. To reduce switching noise during ADC conversions, the ADC Noise Reduction mode switches off the CPU and all I/O modules except the Asynchronous Timer and ADC. The crystal/resonator Oscillator runs in Standby mode while the majority of the unit sleeps. This makes for a fast start-up and low power consumption. Both the primary Oscillator and the Asynchronous Timer begin to work in Extended Standby mode. Atmel's high density nonvolatile memory technology is used to make the computer. The On-chip ISP Flash enables the programmed memory to be reprogrammed in-system using an SPI serial port, a nonvolatile memory programmer, or an AVR core-based On-chip Boot programmed. To download the application software into the Application Flash drive, the boot programmer may use any gui. If the Application Flash section is being modified, the software in the Boot Flash section can begin to operate, allowing for true Read-While-Write activity. The Atmel ATmega16 is a versatile microcontroller that combines an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip to offer a highly scalable and cost-effective solution to many embedded control applications. C compilers, macro assemblers, application debuggers/simulators, in-circuit emulators, and test kits are all available for the ATmega16 AVR.
Soil moisture sensors track the amount of water in the soil. Many soil moisture sensors make up a soil moisture probe. A Frequency domain sensor, such as a capacitance sensor, is a popular form of soil moisture sensor in commercial usage. Another monitor, the neutron moisture gauge, makes use of water's neutron moderator properties. The capacitance between two electrodes embedded in the soil can be used to calculate the moisture content of the soil by calculating its impact on the dielectric constant. The dielectric constant is directly proportional to the moisture content of soils where the majority of the moisture is in the form of free water (e.g., sandy soils). To calculate the dielectric constant, the probe is usually granted a frequency excitation. The probe's readout is not proportional to water content and is determined by soil type and temperature. A submersible pump (also known as a sub pump or an ESP) is a system with a hermetically sealed motor that is tightly attached to the pump body. The entire assembly is immersed in the pumped fluid. The biggest benefit of this form of pump is that it avoids pump cavitations, which an issue is caused by a large height differential between the pump and the fluid surface. Small-scale DC Jet pumps may bring fluids to the surface, while submersible water pumps bring fluid to the surface. Jet pumps are less powerful than submersible pumps. There can only be one result as IC designers aim to fit more transistors operating at higher speeds into smaller packages: fire! When you combine this with the reality that these high-power ICs are being designed into ever-smaller boxes, you have a serious thermal management problem. A DC fan is one that is driven by a DC engine. DC magnets, a stator with copper windings to provide an electric field, and electronics make up the system. In high-temperature settings, a DC fan is used to cool the plants.

A fluorescent lamp, also known as a fluorescent bulb, is a low-pressure mercury-vapor gas-discharge lamp that produces visible light by fluorescence. An electric current in the gas excites mercury vapors, which emits short-wave ultraviolet radiation, which allows the lamp's phosphor coating to shine.

Figure.2. Hardware KIT

ISSN (O) 2393-8021, ISSN (P) 2394-1588

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DOI: 10.17148/IARJSET.2021.8976

In comparison to incandescent lamps, fluorescent lamps transform electrical energy into usable light even more effectively. Since fluorescent lamps need a ballast to control the current through the bulb, they are more expensive than incandescent lamps, although the reduced energy expense usually balances the higher initial cost. Compact fluorescent lamps, which are used as an energy-saving option in households, are now available in the same common sizes as incandescent lamps is shown in figure 2.

4. CONCLUSION

Since it can protect crops from untimely weather, hail stones, and temperature, the whole system can function like a crop insurance device. It would also make it easier to make proper water usage since the soil wet amount varies from crop to crop, which the soil wet sensing feature will account for. Since the whole device would be driven by solar energy that can be stored in reusable batteries, there would be no need to consider electricity demand over the solar arrays lifespan. Furthermore, the whole device is monitored by an atmega16 microcontroller. By automation, the project would increase vegetable production thus lowering power consumption. In the future, the system's power supply would be planned to provide long-term, reliable power from solar panels, making the system self-sufficient.

REFERENCES

[1] R.Ramani, S. Valarmathy, Dr. N Suthanthira, S. Selavaraju, M.Thiruppathi, R.Thagam, ―Vehicle Tracking and Locking Based GSM and GPS‖, Issue Date: Sept 2013

[2] F. M Franczyk, and J.D. Vanstone, ―Vehicle Warning System‖, Patent number: 73639, Issue Date: 22 Apr 2008.

[3] William Stalling, ―Wireless Communication and Networks‖, 2nd edition, prentice hall of India, 2005

[4] Krishna Kant, ―Microprocessor and Microcontroller‖, Eastern Company Edition, New Delhi 2007

[5] Kunal Maurya, Mandeep Singh, Nellu Jain, ―Real Time Vehicle Tracking System using GSM and GPS technology- An Antitheft Tracking System‖, International Journal of Electronics and Computer Science Engineering, ISSN 2277-1956/VIN3-1103-1107

[6] Kai-Tai Song, Chih-Chieh Yang, of National Chiao Tung University, Taiwan, ―Front Vehicle Tracking Using Scene Analysis‖, Proceedings of the IEEE International Conference on Mechatronics & Automation 2005.

[7] R.S Gaonkar, ―Microprocessor Architecture Programming and Application‖, Wiley Eastern Limited, New Delhi

[8] Chen H., Chiang, Y. Chang, F.H. Wang, Toward Real-Time Precise Point Positioning: Differential GPS Based on IGS Ultra Rapid Product, SICE Annual Conference, The Grand Hitel, Taipei, Taiwan August 18-21, (2010)

[9] Vikram Kulkarni & Viswaprakash Babu, ―embedded smart car security system on face detection', special issue of IJCCT, ISSN (Online): 2231-0371, ISSN (Print):0975-7449,volume-3, issue-1

[10] El-Medany,W.;Al-Omary,A.;Al-Hakim,R.;Al-Irhayim,S.;Nusaif,M.,"A Cost Effective Real-Time Tracking System Prototype Using Integrated GPS/GPRS Module," Wireless and Mobile Communications (ICWMC), 2010 6th International Conference on,vol.,no.,pp.521,525,20-25 Sept.2010

[11] Fleischer, P.B.; Nelson, A.Y.; Sowah, R.A.; Bremang, A., "Design and development of GPS/GSM based vehicle tracking and alert system for commercial inter-city buses," Adaptive Science & Technology (ICAST), 2012 IEEE 4th International Conference on , vol., no., pp.1,6, 25-27 Oct. 2012

[12] Le-Tien, T.; Vu Phung-The, "Routing and Tracking System for Mobile Vehicles in Large Area," Electronic Design, Test and Application, 2010. DELTA '10. Fifth IEEE International Symposium on , vol., no., pp.297,300, 13-15 Jan. 2010

[13] Abed khan M.E.(Student), , Ravi Mishra, ―GPS – GSM Based Tracking System‖ SSCET, CSVTU, Bhilai, India International Journal of Engineering Trends and Technology- vol.3,no.,pp,161-164, 2012

[14] El-Medany, W.M.; Alomary, A.; Al-Hakim, R.; Al-Irhayim, S.; Nousif, M., "Implementation of GPRS- Based Positioning System Using PIC Microcontroller," Computational Intelligence, Communication Systems and Networks (CICSyN), 2010 Second International Conference on , vol., no., pp.365,368, 28-30 July 2010

[15] Iman M. Almomani, Nour Y. Alkhalil, Enas M. Ahmad, Rania M. Jodeh ―Ubiquitous GPS Vehicle Tracking and Management System‖, IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT) 2011

[16] Lita, I.; Cioc, I.B.; Visan, D.A., "A New Approach of Automobile Localization System Using GPS and GSM/GPRS Transmission," Electronics Technology, 2006. ISSE '06. 29th International Spring Seminar on , vol., no., pp.115,119, 10-14 May 2006

[17] Shu Wang, Jungwon Min and Byung K. Yi,"Location Based Services for Mobiles: Technologies and Standards", IEEE International Conference on Communication (ICC), Beijing, China, 2008.

[18] S. Sahitya, N. Swetha, ―Real Time Vehicle Tracking Using GPS and GSM‖, International Journal Of Research in Computer And Communication Technology, ISSN (O) 2278-5841

[19] C.Jisha Chandra, L.suganya, J.Manjushreekumari, R.Nagarajan and S.Kannadhasan, Effective Implementation of Efficient Data Collection in WSN, International Research Journal of Engineering and Technology, Volume 8, Issue 3, March 2021, ISSN: 2395-0056

[20] Lita, I.; Cioc, I.B.; Visan, D.A., "A New Approach of Automobile Localization System Using GPS and GSM/GPRS Transmission," Electronics Technology, 2006. ISSE '06. 29th International Spring Seminar on , vol., no., pp.115,119, 10-14 May 2006

[21] Shu Wang, Jungwon Min and Byung K. Yi,"Location Based Services for Mobiles: Technologies and Standards", IEEE International Conference on Communication (ICC), Beijing, China, 2000

[22] J.Manjushreekumari, C.Jisha Chandra, L.suganya, R.Nagarajan and S.Kannadhasan, Security of Wireless Communication Systems in the MIMO and Beamforming Techniques of 5G Networks, International Journal of All Research Education and Scientific Methods, Volume 9, Issue 3, March 2021, ISSN No: 2455-6211