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Arduino Based Smart Irrigation System and Smart Street Light System

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ABSTRACT: In our fast-paced environment of the modern scientific period, electrical energy is extremely important. New research and The aim of these developments is to save this non-renewable electrical energy. At the moment, street lights are mounted using both "electrical energy" and "compact fluorescent light," both of which have very significant electricity consumption. In this essay, the author uses solar energy, LEDs, and sensors to reduce the amount of electricity used for street lighting. The automation of street lighting systems and the effective use of street lights are the subjects of this work. This non-renewable electrical energy is being conserved through fresh research and inventions. Today's street lights are mounted and use "electrical energy" in addition to "compact fluorescent light," both of which have very significant electricity consumption. By utilising solar energy, LEDs, and sensors for street lighting in this essay, the author is attempting to save electricity.

KEYWORDS: Iot server platform , Light intensity, power saving, water irrigation, streetlight

I. INTRODUCTION

In order to exchange data, items, machinery, automobiles, and other electronic devices are linked to a network. This practise is known as the "Internet of Things" (IoT). In order to link items and gather data, the Internet of Things (IoT) is being used more and more. The Internet of Things is therefore vital for agriculture. The project's goal is to develop a smart agriculture network that is integrated with the internet of things. In order to deal with Malaysia's unpredictable weather, technology is integrated with an irrigation system [1].

Both the economy and the existence of the Indian people depend on agriculture. The goal of this project is to develop an embedded-based irrigation and soil monitoring system that will lessen the need for manual field monitoring and

deliver data via a mobile app. The technique is designed to assist farmers in boosting agricultural productivity. The equipment used to inspect the soil includes a pH sensor, a temperature sensor, and a humidity sensor [2]. The creation of an efficient IoT-based smart irrigation system is another essential requirement for farmers in the agricultural sector. A low-cost, weather-based smart watering system is created by this research [3].

India is a nation where agriculture is extremely important. In order to maximise yield per unit of area and hence produce optimum production, it is crucial to water the plants carefully. Irrigation is the technique of giving plants a specified amount of water at a particular time [4]. Indians rely heavily on agriculture as a source of income, and it has a significant impact on the country's economy. In order to increase output and produce products of greater quality, crop development is crucial. Therefore, crop beds with optimum conditions and the right amount of moisture can significantly affect productivity [5].

To modernise and boost crop yield, a Raspberry Pi-based autonomous irrigation IOT system has been proposed. This project's main purpose is to produce crops using the least amount of water possible. Most farmers waste a lot of time in the fields in order to focus on water available to plants at the appropriate time. Water management should be improved, and the system circuit's complexity should be minimised. Based on the data collected from the sensors, the suggested system determines the amount of water required. Two sensors detect the humidity and temperature of the soil, as well as the humidity, temperature, and length of sunshine each day, and send the data to the base station [6].



The proposed system in this study is built on the Internet of Things and uses real-time input data. Over a wireless sensor network, a smart farm irrigation system uses an Android phone to remotely monitor and regulate drips. Between sensor nodes and base stations, Zigbee is utilised to communicate. A web-based java graphical user interface is used to process and present the server's real-time observed data. Field irrigation system wireless monitoring eliminates human interaction and enables for remote monitoring and control using an Android phone [7].

Irrigation is a dynamic system that is heavily reliant on outside influences. This article describes a method that uses a custom-built mathematical model to handle data from wireless sensors on Google Cloud, resulting in a smart system. An IoT-enabled design that can scale up to big farms. According to Holistic Agricultural Studies, around 35 have been damaged by animals and people. This intelligent system uses Tensor flow and deep learning neural networks to recognise animals depending on their threat level, as well as human intruders who are not authorised on the farm, and to alert the farmer immediately. An android application is included with the device, which allows for remote access and surveillance through live video streaming [8].

The purpose of this study is to develop a smart agricultural system that utilises cutting-edge technologies such as Arduino, Internet of Things, and wireless sensor networks. Through automation, the research tries to take use of emerging technologies such as the Internet of Things (IoT) and smart agriculture. The capacity to monitor environmental factors is a critical component in increasing crop efficiency. The purpose of this study is to develop a system that can monitor temperature, humidity, wetness, and even the movement of animals that might damage crops in agricultural areas using sensors, and then send an SMS notification as well as a notification on the app developed for the same to the farmer's smartphone via Wi-Fi/3G/4G if there is a discrepancy [9].

They waste a lot of water and may even make people sick by causing fungus growth in the soil due to too much moisture. Due to the scarcity of water, an automated irrigation system is essential for water conservation and, as a result, agricultural profitability. Irrigation consumes around 85% of the world's total accessible water resources. This need is projected to increase in the coming years as the population grows. To meet this need, we must employ creative methods that lower the quantity of water utilised in irrigation. Sensors in the automated system monitor the availability of water to the crops, and watering is done as needed through controlled irrigation. Because of its practically limitless storage and processing capabilities, as well as its fast flexibility, cloud computing is an intriguing solution to the massive amount of data generated. The objective is to focus on factors like as temperature and soil moisture [10]. Water management currently global problem to all of us to tackle them in near future we need to plan it smartly. As we are living in modern world filled with lots of useful sensors from which we can designed systems with water saving capabilities [11].

II. LITERATURE SURVEY

Shiny Rajendrakumar, Prof. V K Parvati, Prof. Rajashekarappa [12] Agricultural Irrigation is very important for the production of crops. Many methods have developed to save water in different ways. In traditional irrigation systems we require an operator or farmer to put water on crops but he does not come to know which crop require how much amount of water to get proper amount of yields. Irrigation means planting the crops by water. There are so many traditional irrigation methods, but all these methods consume large amount of water. Automated irrigation is the method which saves the water from up to 97% as compared to traditional methods. By using these modern methods like ICT productivity can be improved without unnecessary wastage of water. Here we are concentrating on IoT ie.

[13] the author experimented, the energy reducing system by automatically switching ON and OFF the street lights. Where there is an object movement, the sensor will capture it and make it automatically ON and OFF. These systems are more energy-efficient, reliable, and reduce cost. This architecture is to sense the object and to act accordingly. The sensor used to sense the object is an IR sensor, IR LED is used to transmit infrared rays

[14] the author experimented, an energy-efficient Zig Bee-based outdoor light monitoring and control system which can monitor and control the outdoor lights more efficiently. These laps regularly monitor the intensity of the sunlight by using a sensor and based on it, the MCU decides ON or OFF lamps. The microcontroller used here has Wi-Fi, programmed like any other GPIO, SPI, 12C, UART, 12S, and 802.11b/g/n. The light sensors are connected to MCU through the 12C interface and observe light status. It measures the brightness of sunlight and acts accordingly.

[15] the author experimented, a circuit contains a sensing component known as LDR, followed by Relay, the input is given from the direct supply and the relay converts them to a required voltage and then the switching ON the street lights takes place. As per the analysis, Street lights are On from 6:30 pm to 7:00am and hence there occurs a wastage of energy. The bulb used here includes 150w and the power consumed per day is 39kwhr. Hence, the bill generated per



month is 3150. The smart system includes, 0% utilization state from 7 am to 7 pm and 55% utilization as a result of the diminishing procedure utilized state from 2 am to 6 am. The main aim is to preserve the consumption of power that is being used in normal streetlights.

[16] the author experimented, a wireless control monitoring system each street light must be equipped with different types of sensors that are connected to a microcontroller to monitor its environment with regards to its working needs like light intensity, current capacity, voltage load and temperature which are collected and transferred by the means of ratio frequency communication. The system has a transmitter and a receiver, where the transmitter is almost placed 500m away from the receiver so that first the transmitter detects the presence of road user and sends data to receiver then light will ON and in case transmitter fails to detect the road, the receiver detects the road user by itself and the light will be ON. Then the light will go to the OFF position when no road users are using the road. The transmitter side of the street light system is constructed using Raspberry pi, LoRauart module, and ultra sensor. The receiver side of the street light system is constructed using Raspberry pi, LoRauart module, Lidar Lite V3, PIR sensor, and a LED light. The Arduino tends to make the light ON at the proper time.

[17] the author experimented, the solution for energy saving is intelligent lighting. Control and energy management system in public lighting management. It recognizes remote ON/OFF and dimming of light, by using the light-dependent resistor. LEDs will only light up if you align the legs accurately. The long leg is often positive and connected to a digital pin on the Arduino board. The short led is GND. Arduino structures and creates single- board microcontrollers and microcontroller units for building advanced gadgets and aggregate items that can detect and control.

III.HARDWARE ARCHITECTURE & PROPOSED SYSTEM

The system consists of LDR, IR sensor, Iot server, Arduino microcontroller, ATmega328P microcontroller, LED lights, Relays, LED display, soil moisture sensor, water pump motor and few basic electronic components like Resistors and Connecting wires etc.

ATmega328 microcontroller

An open source prototyping platform The ATmega328 processor is the centre of the so-called power jack, an ICSP header, six analogue inputs, six digital inputs, a USB connection for programming the on-board microcontroller, and a reset button. 14 digital input/output (I/O) pins are also present. It has everything necessary to support the microcontroller and runs on a 16MHz crystal oscillator. Iot server

Data can be used by a system called Adafruit IO. Our emphasis is on simplicity and enabling straightforward data transfers with minimal coding needed. Client libraries for our REST and MQTT APIs are included with IO. Ruby on Rails and Node.js are the foundations of IO. IO by Adafruit is presently in beta. You can sign up for the beta at io.adafruit.com if you'd want to participate.

Table 1: Technical Specifications

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader

SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Arduino microcontroller

The hardware and software prototyping platform form Arduino is free and open-source. An LED may be turned on or a motor can be started using an Arduino board. Inputs, like light from a sensor or pressure from a finger on a button, can be transformed into outputs by Arduino boards. We can send a series of instructions to the microcontroller on your board to tell it what to do. LCD display A compact, flat electronic display called a liquid crystal display (LCD) uses the ability of liquid crystals to regulate light (LCs). IR sensor The infrared area of the electromagnetic spectrum is that section of it with wavelengths that are Around 0.75 m to 1000 m, which lies between wavelengths longer than those of visible light and shorter than those of microwaves. Soil Moisture Sensor

The soil moisture sensor is used to calculate the volumetric water content of the soil. Because of this, it's the ideal location for biology, horticulture, botany, agricultural science, soil science, and environmental science experiments. Determine the optimal soil moisture levels for various plant types with the soil moisture sensor.

Based on the Arduino microcontroller, the Smart Irrigation System employed in this study. This prototype records the moisture level in the ground. Crops can change the soil moisture level from a predetermined value. The irrigation system is turned ON/OFF if the soil moisture varies within the anticipated range. The irrigation system will begin if the soil is dry, and start watering the plants using a pump. The C programming language serves as the main underpinning for this project. Pins 2 and 3 serve as the respective input pins for a DC motor and switch during simulation. It is possible to use this approach extensively for farming, which may turn out to be even more beneficial. Due to the current situation To preserve water, the best irrigation schedules should be developed, especially in farms.

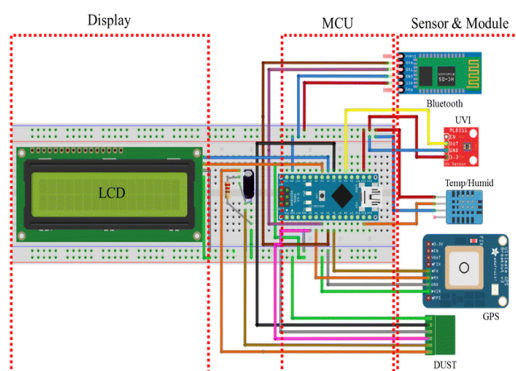


Figure1: Circuit and connection diagram

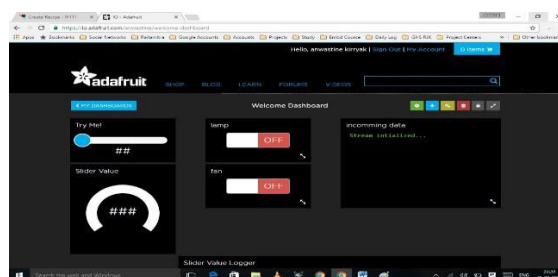


Figure2: Iot server

Data can be used by a system called Adafruit IO. Our emphasis is on simplicity and enabling straightforward data transfers with minimal coding needed. Client libraries for our REST and MQTT APIs are included with IO. Ruby on Rails and Node.js are the foundations of IO. IO by Adafruit is presently in beta. You can sign up for the beta at io.adafruit.com if you'd want to participate.



Figure 3: Prototype of the Proposed System

Approach to smart street lights

Building a smart street light system with the ability to operate autonomously and be remotely monitored (for work processes and electrical characteristics) using esp8266 and IoT is the specific goal of this project. This smart street light system's capacity will help make energy usage more efficient and make maintenance simpler.

This study is presented in the form of a 3-LED tiny Smart Street light. Current, voltage, IR, infrared, and LDR sensors are all installed in each lamp. All sensors are interconnected to read the state of the environment. Data from sensors is shown on a 16x2 LCD screen, on a smartphone, and via the Internet of Things.

IV. CONCLUSION

The Project 'Smart Irrigation System' is used for the optimization use of water in agricultural field without the intervention of farmer by using soil moisture Sensor that senses the moisture content of the Soil using Microcontroller that turn ON/OFF the pump automatically according to the need of water for irrigation and hence helpful in saving water. This system is quite affordable and feasible. This system of irrigation is also helpful in the region where there is scarcity of water and improves their sustainability. And can also be adjusted according to the need of varieties of crop to be irrigated.

A microcontroller called Arduino has been used to research and simulate the idea. The simulation has also taught me how to programme and use an Arduino microcontroller. The investigation of energy-saving systems in diverse applications is part of this project. The automatic street light control system's design and simulation were masterfully executed. The main benefits of this system are the reduction in labour requirements and energy consumption. The only upfront expense is for developing and installing it. Therefore, by utilising less conventional energy, this technology will have a significant positive impact on society (generated by hydraulic power stations).

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