A Synopsis on

Smart Irrigation System

Submitted in partial fulfillment of the requirements
of the degree of

Bachelor of Engineering

in

Information Technology

by

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CERTIFICATE

This is to certify that the project Synopsis entitled ***"Smart Irrigation System"*** Submitted by ***"Ashwini Salunke(15104016),Kavita Patel(15104038),Yatin Kalra(16204012), Deepak Sharma(16204025)"*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Information Technology.***to the University of Mumbai,is a bonafide work carried out during academic year 2018-2019

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Declaration

We declare that this written submission represents our ideas in our own words and where others ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

India has a huge population and its requirement for water increases each year as the demand for food increases hence management of water resources to sustain this massive population is of high importance. The agricultural sector, an important sector of our economy accounts for a good percentage of our nations GDP and of the exports. With advancement in technology we can establish a system that automates the irrigation process such that there is efficient usage of water and create an ease of work load for the farmers. With embedded technology and Internet of Things, in this work we have designed IoT based automated irrigation system for the Indian scenario. Our system is able to deliver optimal water to the plants based on moisture, light and temperature levels which are obtained through sensors. The farmer will be able to monitor the parameters through the mobile app which is integrated with cloud storage. By analyzing and comparing previous years data and our current data we are able to efficiently find a way to save water.

Introduction

Water is a vital resource for living creatures, each living creature uses water per its desires, because of this importance of water in our lives, it is highly necessary to use this resource as effectively and optimal as possible. There are several sectors that come under water consumption; the biggest sector is the agricultural sector which amounts to about 70water consumption. Climate change is a major factor for the unpredictable weather and rainfall patterns.As many of the farmers depend on the monsoons which occur for about four months of the year, changes due to this unpredictable nature of weather harm the crop yield and tend to incur losses. Farmers have stated several times that the monsoon rains have become increasingly unpredictable over the past twenty years, both in the timing of the rainfall and the total amount of rainfall peryear. This makes it difficult for farmers to decide which crops are best to plant in which season order to get the highest yields during that particular season. Technology advancement has played an important role in solving the insufficiency of water, techniques like drip irrigation system, sprinkler systems, automated irrigation systems, network based systems which work on automation of irrigation. Though there are all these different advancements in technology farmers prefer continuing with their traditional irrigation procedures thus this requires some amount of convincing. Efficient system is to be proposed to minimize the water wastage.

Objectives

Our goal in this project is to help the farmers with their crop yields by using efficient methods for helping them during the drought season due to deficient rainfall, preventing over flooding of the field due to excess rainfall, decreasing the work load for the farmers on a day to day basis, periodically updating the status of soil parameters and any malfunctioning of the mechanical systems like pumps/motors can be pin pointed and finally to help the farmers figure out which crop is best suited for a particular season.

To save water in the water consumption for irrigation. Real-time control of what happens on the irrigation net system. Optimization of personal resources in troubleshooting. Creating a water control system for the irrigation of cities, parks, golf, agriculture, large hydraulic lines.

Literature Review

There have been many studies done on the area of smart irrigation system to provide an easy and efficient method to automate the irrigation process. The different studies done are aimed towards irrigation its inefficient water consumption, absence of remote farm monitoring and lack of useful inference. In this project we have discoverd an efficient method to integrate sensors with Arduino and come up with an automated irrigation system. The following are a few studies that we have referred to:

Rajalakshmi.P and Mrs.S. Devi Mahalakshmi developed a system using sensors to monitor the crops. The use of wireless transmission of sensor data from the field and storing it on a database along with control through mobile application proposed a proof of concept to automate the irrigation system.In their system the use of NRF24L01 for wireless transfer of data is different from our system where data is transferred through our Wi-Fi module ESP8266 and then uploaded to cloud.

Joaqun Gutirrezet developed an automated irrigation using solar power for organic that are geographically isolated. Their work on internet controlled duplex communication system holds a good decision making concept for adaptation to several different scenarios. The internet link is provided where access through mobile devices are established. Our system concentrates on cloud storage and GSM technology to water the crops efficiently.

In this project we have referred paper entitled "IoT Based Control and Automation of Smart Irrigation System" is presented at "Proceeding International conference on Recent Innovations is Signal Processing and Embedded Systems (RISE -2017) 27-29 October,2017" by Monica M , B.Yeshika , Abhishek G.S , Sanjay H.A ,Sankar Dasiga .

Problem Definition

The typical irrigation system may operate on a timer or schedule. A more advanced system might use sensors to determine if it is raining to prevent watering. These systems are still inefficient though because there are better times to water than others. They can also potentially over-water a lawn if the irrigation system waters during one part of the day and then there is rainfall in another part of the day.

Potential Solution: The Smart Irrigation system could add feed forward control instead of the typical feedback control. Through an interface to weather data, calibrated to the location where it is installed, the smart irrigation system can determine the best days to water during the course of a week. It could also determine total water volume / rain fall to prevent over-watering. The controller program and settings can be defined and/or modified through a web interface.

Challenges: The anticipated challenges for this project would be finding a way to interface to weather forecast information to the control unit. It might also be difficult to capture the rainfall volume.

Proposed System Architecture/Working

Our system consists of three sensors namely, soil moisture sensor, luminosity sensor and the temperature sensor

1.The soil moisture sensors value varies according to the moisture level on the field.

2.The temperature sensor records the temperature of the surroundings.

3.The luminosity sensor is used to measure the intensity of light falling on the plant.

Each of these sensors are designed to have a threshold value which we obtained on a trial and error basis, these threshold values are divided into different levels in our code.

The sensors are interfaced to the Arduino Uno which isa 14 I/O Pin, ATmega328 based microcontroller. The design made such that if the moisture sensor senses moisture less than the set threshold value then the plant is watered.

The GSM module is interfaced with the Arduino to establish cellular communication between the system and the user. Live data is sent through the GSM module to the user via text message after insertion of the sim card into the GSM module, The data contains the motor, pump and the sensor conditions, this helps the farmer to keep track of his field and know if there are any malfunctions. We have also established the control of the motor through Bluetooth. A generic application is downloaded and in case of any manual requirement to operate the motor, we can make use of this.

The Wi-Fi Module used here is to transmit all the data to the cloud. Sparkfun offers 50mb of cloud storage for a particular user, we use this portal to upload our data at regular intervals of 45 seconds.

1)Soil moisture sensor: A soil moisture sensor measures the amount of moisture content that is present in the soil, this is of great importance for the irrigation system. A generic soil moisture sensor operating at 3.3v-5v, consisting of an on board LM393 comparator is used here. The volumetric content of the soil is represented in percentages which we have then converted to four levels L0-L3, Zero being driest and three being flooded. When the soil moisture happens to be L0, the motor turns on and the water is pumped to the plant.

2) Temperature sensor: The LM35 is an integrated circuit temperature device with an output that is linearly proportional to the Centigrade temperature. The LM35 device does not require any external calibration or trimming to provide accuracy of 14C and 3/4 C at room temperature and externally respectively.

3) Luminosity sensor: The LDR sensor is a photo resistor whose resistivity works on EMR. These are made up of semiconductor materials having high resistance sensitivity to light. The resistance of the LDR decreases when light falls on it and is increased when the light is low.

4) Arduino uno: The Arduino uno is a microcontroller board based on the ATmega 328P datasheet. It has 14 digital I/O pins, 6 analog pins, a power jack, USB connection, reset button, and an ICSP header[10]. The main purpose of the usage of Arduino here is to interface all the sensors and actuators conveniently. The Arduino is where all the code is dumped. The Arduino is interfaced with the Wifi module and Bluetooth Module.

5) Relay and pump: The relay is used to turn on and off the pump according to the moisture level of the soil. It is controlled by interfacing it to a microcontroller, in this case the Arduino uno. The pump is triggered on and off by the relay.

6) GSM module: The GSM Module used works with the SIM900 Quad-band solution which

is embedded in the customer applications. In india we use 900MHz for communication of SMS, Data and Fax. The GSM module consumes low power and hence is widely used. The GSM Module is interfaced to the Arduino Uno and transmits the sensor data to the user via text message and any malfunction observed will also be sent.

7) Bluetooth Module: The HC-05 is an easy Bluetooth device working designed for transparent wireless serial connection setup. Serial port has a data rate of 3mbps with complete 2.4GHz radio transreciever and baseband.

8) Wi-Fi Module: The ESP8266 is a low cost Wi-Fi module which ads functionality to the existing Arduino unovia the UART serial connection. This module is reprogrammed in such a way that the data from the sensors are transmitted to the cloud storage provide by sparkfun every 45 seconds.

9) Arduino IDE: The Arduino Software is an open source software that can be downloaded from the Arduino website, this is used to write codes and upload it on to the board. The Arduino software supports Windows, Linux, and Mac etc and is written in Java. All sensors and actuators are controlled by varying the code.

10) Sparkfun: Sparkfun is a free open source service which pushes all the data of the sensors to cloud. Sparkfun provides 50mb of space to store and analyse data. To access this, one must create a stream and after receiving the public and private key on the hardware we have created a string with the data obtained from the sensors.

Architecture

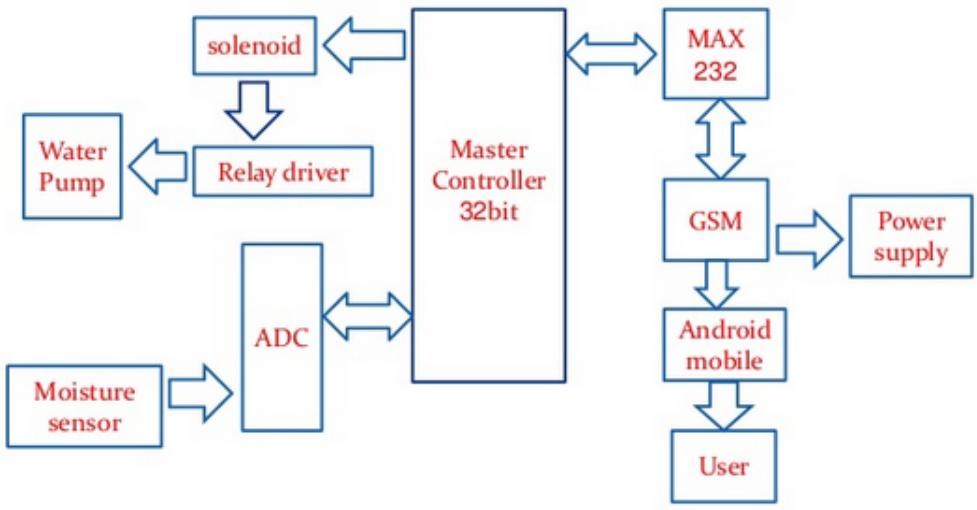

Figure 1: smart irrigation system

Summary

The irrigation system on automation uses optimal resources to improve the efficiency of the irrigation. This system can be implemented in places that face water shortage to improve agricultural sustainability. In this project a prototype includes sensing element node and data storage. The sensing element node is deployed on the field for sensing the soil parameters such as temperature, moisture, luminosity and humidity. According to the soil parameters the automation is achieved by turning the motor on and off using the threshold values embedded in the code. The status for the same is alerted to the users through messages using GSM. The same principle is also extended to access the data from cloud using sparkfun. Collecting the data of the groundnut crop from 2015-2016 and comparing it to the other data obtained hence we can say that we have successfully conserved water.The functionality of the system on various tests is said to be successful and can be used to analyse different crops.The extension of this project can be the use of solar panels in the project to run the motor to save energy, which we are working on now.

References

[1] P. Rajalakshmi and S Devi Mahalakshmi IOT Based Crop- Field Monitoring And Irrigation Automation Intelligent Systems and Control (ISCO), 2016 10th International conference.

[2] Joaqun Gutirrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel ngel Porta-Gndara Automated Irrigation System Using a Wireless Sensor Network and GPRS Module IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, VOL. 63, NO. 1, JANUARY 2014

[3] Sanket Salvi , Pramod Jain S.A , Sanjay H.A, Harshita T.K , M. Farhana , Naveen Jain4 , Suhas M V Cloud Based Data Analysis and Monitoring of Smart Multi-level Irrigation System Using IoT International conference on I-SMAC, 978-1-5090-3243-3/17/31.002017$IEEE$

[4] Review Paper based on automatic irrigation system IJAICT Volume 1, Issue 9, January 2015, Doi:01.0401/ijaict.2015.09.01 Published on 05 (02) 2015