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IOT And Solar Panel Based Automated Irrigation System

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Abstract - The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation. Even if the farmland has a water-pump, manual intervention by the farmers is required to turn the pump ON/OFF whenever needed. Hence, by using ARDUINO microcontroller we can help the farmer to turn ON/OFF the motor without his physical presence in the field. This project has real time sensing and control of an irrigation system. When the condition of water in the agricultural farm is abnormal then the system automatically switches ON/OFF. Based on the soil moisture, through relay the pumping motor will automatically switch on or off which saves the water and on the other hand the plant can get most appropriate water level which increases the productivity of the crop.

Key Words: IOT, Solar Panel, Agriculture, Arduino

I. INTRODUCTION

The objective of irrigation is to keep measure on food security and the aim of automatic irrigation control system is to minimize the intervention of the human operator (gardener) in irrigation activities.

The automatic irrigation control system is used to achieve this aim. This control system is built around ATMEGA328 microcontroller programmed using Arduino software. Inputs are the signals from two sensors namely soil moisture sensor using hygrometer module, water level sensor using the Op-amp was configured here as comparator. The microcontroller processes the input signals by using the control software embedded in its internal ROM to generate the output signals to control a water pump that irrigates the garden. The project can be applied in agricultural area of any type where water is readily available for irrigation.

There are many regions which suffer from inadequate rainfall. For such regions automation plays a key role in the world economy therefore, engineers struggle to come out with combined automatic devices in order to help humans in its activities so that the system automatically processes itself without any human intervention. So, we would like to develop an automatic irrigation system. Basically, the project consists of electrical part and mechanical part. The electrical part consists of photovoltaic, which is used to generate electrical power and the power is stored in the rechargeable battery. The mechanical part consists of pump, which is used to pump out the water from the water source. The parameters in the project are soil humidity condition, water level condition, the position of the Sun. The solar system is used to generate the power and it provides the power to the entire system as the solar system is much cheaper than the electrical system. It is a versatile source of renewable energy that can be used in any application. The system consists of hardware and software and, finally, the integration of the two parts to provide the results. The hardware system consists of the sensors, and drivers. In hardware design, we need all the components that are necessary to accomplish the project, and these components are solar panel, DC motor, Arduino Uno, water pump, sensors.

II. LITRATURE SURVEY

Y. P. Patil [1]: In this paper author proposed the automatic system based on ARM and for communication GSM technology

is used. Automatic irrigation technique irrigated using wireless sensor network i.e. Zig-bee and internet technology. Soil moisture sensor, temperature sensors placed in root zone of plant.

Karan Kansara [2]: In this author proposed an Irrigation Control System Using Android and GSM for Efficient Use of Water and Power. Automatic microcontroller-based rain gun irrigation system in which the irrigation will take place only when there will be a need of water as a result it saves a large amount of water as it is avoiding wastage of water. Android is used for mobile devices that include an operating system.

Prof. Rupali S. Sawant [3]: In this author proposed a microcontroller based automatic irrigation system. In this paper 8051 microcontroller series are used. The system consists of soil moisture sensor, temperature sensor, humidity sensor and solar panel. On the input side there are three. Soil moisture sensor will check the moisture of the soil as per the crop which is to be cultivated. When the moisture level of the soil goes above or below the set value, it will direct the microcontroller whether it should pump the water or not. Humidity sensor will check the temperature of the surrounding

Nagarajapandian[5]: In this the author proposed automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the dampness content of the earth. In the domain of farming, utilization of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference. This automated irrigation project, the soil sensor senses the moisture content by giving input signal to an Arduino board which operates on ATmega328 micro-controller, is programmed to collect the input signal of changeable dampness circumstances of the earth via dampness detecting system. Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays a major role in producing the output.

The following block diagram explains the working of our project as follows:

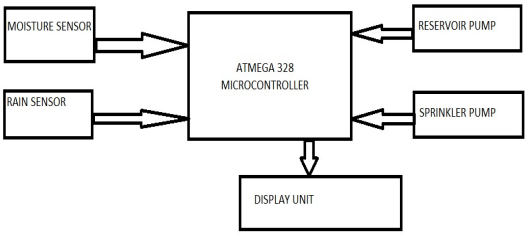


Fig.1 BLOCK DIAGRAM

- The ATMEGA 328 microcontroller is the hub or center of direction and redirection of signals.
- The moisture and rain sensor are connected to the microcontroller along with the reservoir and sprinkler pump.
- A display unit is attached in the form of a LCD.
- The signals from the sensors are transmitted and converted via transducers into electrical signals and sent to the microcontroller which further directs the pump.

III. COMPONENTS USED IN THIS PROJECT

- ARDUINO UNO
- DC MOTOR
- ARDUINO NANO
- SOLAR PANEL
- ATMEGA 328
- LM 7805
- L293D
- WIFI MODULE (for IOT)

The components used are explained briefly as follows.

a. ARDUINO UNO

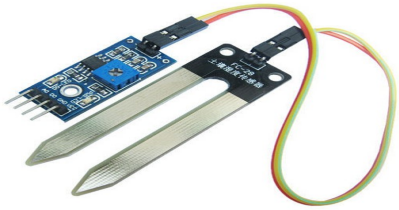
A microcontroller board, contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip.

It simplifies the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation.

It is open source hardware; anyone can get the details of its design and modify it or make his own one himself.

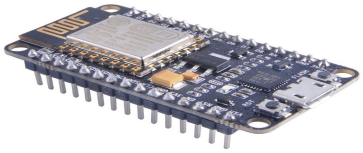
b. MOISTURE SENSOR

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level (else the output is at low level). By using this sensor, one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.



c. WIFI MODULE

The Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The WIFI is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each WIFI module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a WiFi Shield offers (and that's just out of the box)! The WIFI module is an extremely cost-effective board with a huge, and ever growing, community.

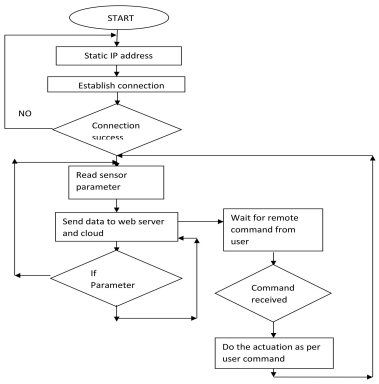


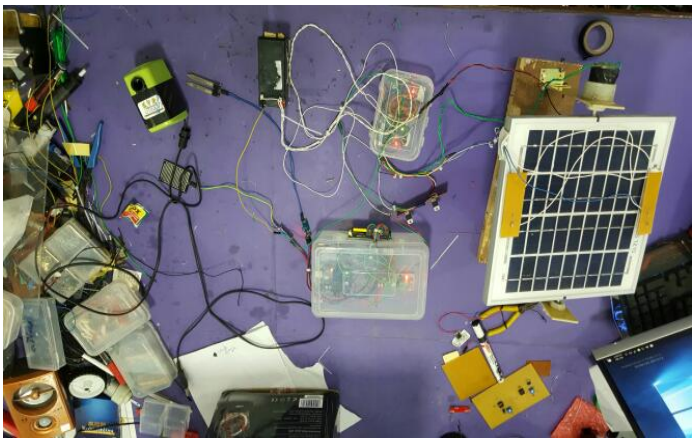
d. SOLAR PANEL

Specification
Power: 10w
Volatge: 12v
Output tolerance: ±3%

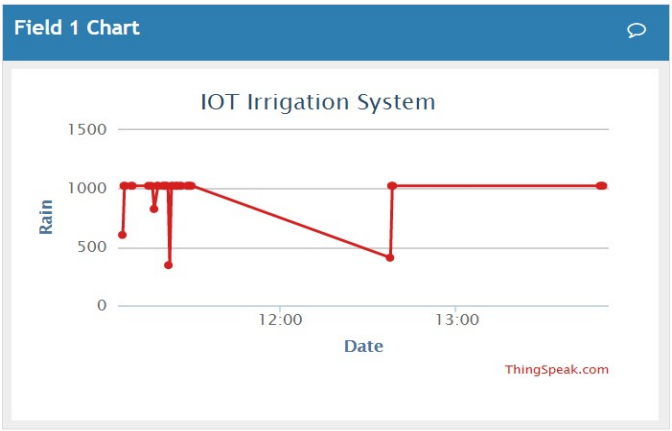
IV. SYSTEM DESIGN AND IMPLEMENTATION

The proposed model of irrigation system is as shown in the figure. The model consists of different sensors like rain sensor, soil moisture sensor. Initially, the ARDUINO connects to the internet through Wi-Fi module (ESP8266). When the connection is established the parameters of sensors like p1, p2 etc. will be read. The threshold levels for the required sensors are set as t1, t2, t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analyzed anywhere any time. If the sensor parameters are greater than the threshold level then the respective actuation is done for the controlling of the parameters and output devices.

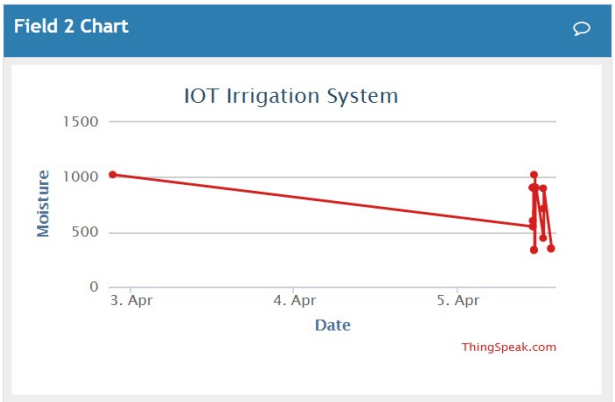




GRAPH



Graph: Rain conditions over date



Graph: Moisture conditions over Date

CONCLUSION

The process control design meets all of the objectives set forth while satisfying the constraints. The step by step processes in the design of a microcontroller-based irrigation control has been presented in this project.

ARDUINO microcontroller is programmed to automate irrigation process and the result are satisfactorily executed and verified with physical prototype.

The automated control is implemented here to avoid damage of crops due to surplus or deficit usage of water. The already existing system uses simple water pumps to supply water to the crops as and when required by manual control. Another disadvantageous method is the discontinuous monitoring of the water level by using GSM (global system for mobile communications) technology. But, the proposed system uses automatic control by using continuous monitoring.

It is also important to mention that the entire system was implemented using readily available components and no formal training is necessary to operate the system for past users of manual irrigation. This project particularly is significant in view of the fact that our nation INDIA is at the moment of commercializing agricultural activities which automated irrigation is a key to its success.

REFRENCES

[1]. International Journal of Scientific Research and Management Studies (IJSRMS)Kriti Sisodia, Mohd Azharuddin, Mohd Monis, Richa Yadav, Manjari Sharma U.G. Scholars, Dept. of E&C Engg., MIT Moradabad .

[2]. Jia Uddin, S.M. Taslim Reza, Qader Newaz, Jamal Uddin, Touhidul Islam, and Jong-Myon Kim, Automated Irrigation System Using Solar Power 2012 IEEE.

[3]. R.Suresh, S.Gopinath, K.Govindaraju, T.Devika, N.SuthanthiraVanitha, "GSM based Automated Irrigation Control using Raingun Irrigation System", International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014.

[4]. Pavithra D. S, M. S. Srinath, "GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) Vol 11, Issue I, Jul-Aug 2014,

[5]. Design and Implementation of Automatic Irrigation Control System
Oborkhale,Lawrence I (Ph.D.)1, Abioye, A. E.2, Egonwa B. O.3,Olalekan T. A. Electrical/Electronic Engineering Department, MichaelOkparaUniversityof Agriculture,Umudike,AbiaState.Nigeria.
Electrical/Electronic EngineeringDepartment, AkanuIbiam Federal Polytechnic, Unwana.Ebonyi State.Nigeria Electrical/Electronic Engineering Department, University of Ilorin, Ilorin, KwaraState. Nigeria.

[6]. ARDUINO programming notebook by brian w. evans.

[7]. Arduino Microcontroller Guide W. Durfee, University of Minnesota

[8]. www.wikipedia.org

[9]. Venkata Naga Rohit Gunturi, "Micro Controller Based Automatic Plant Irrigation System", International Journal of Advancements in Research & Technology, Volume 2, Issue4, April-2013.

[10]. Attema, Evert, Pierre Bargellini, Peter Edwards, Guido Levrini, SveinLokas, Ludwig Moeller, BetlemRosich-Tell, et al 2007. Sentinel-1 - the radar mission for GMES operational land and sea services. ESA Bulletin 131: 10-17.

[11]. Bircher, S., Skou, N., Jensen, K.H., Walker, J.P., & Rasmussen, L. (2011). A soil moisture and temperature network for SMOS validation in Western Denmark. Hydrol. Earth Syst. Sci. Discuss., 8, 9961-10006. [12] Marthaler, H.P., W. Vogelsanger, F. Richard and J.P. Wierenga, 1983: A pressure transducer for field tensiometers. Soil Science Society of America Journal, 47, pp. 624–627.