International Research Journal in Global Engineering and Sciences. (IRJGES)
ISSN : 2456-172X | Vol. 4, No. 4, December - February, 2020
Pages 14-20 | Cosmos Impact Factor (Germany): 5.195
Received: 02.12.2019 Published: 28.12.2019

GSM Based Automatic Irrigation System for Agriculture

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ABSTRACT: In this modern world agriculture plays a vital role in the development of the country, economy and its people. Agriculture depends allot on the source and supply of water and that becomes a major issue in places which rely solely on the monsoons as their primary source of water, since the monsoons are not evenly distributed all over the country every year. In such cases, the scheduled watering of the crops can get hampered and that might in turn hamper the quality and quantity of crops produced. To overcome this problem, the proposed smart irrigation system can be employed in the field of agriculture. In agriculture, apart from a water source, two more aspects are of prime importance, namely, the moisture content of the soil and its fertility. In this system, based on the soil type and the moisture levels, water will be provided to the agricultural field. At present, there are several techniques available to reduce the dependency on seasonal rain for agriculture. Mostly these techniques use electricity. However, in this paper our aim is to propose a low cost, sustainable solution to the problem of water supply in indoor cultivation, farms and agricultural fields.

KEYWORDS: Agriculture, Crops, Irrigation, Moisture and Soil

I.INTRODUCTION

Proper irrigation is an important feature for growing healthy crops. India is a country where plantation is considered as the Centre of economic revenue. Moreover, the variations of climate change, ancient and inefficient farming techniques end up with improper harvesting.

To keep pace with the population growth and subsequent increase in demand, agriculture techniques have to be smart and advanced. As we are stepping into a world of automation, the workload of the farmers can be reduced by replacing the traditional system with automated system of watering the plants according to its need. This system will be used for every crop with their respective required moisture levels preprogrammed in the microcontroller.

Here, an Arduino board has been programmed to sense the moisture level of the soil. When the moisture of the soil drops below a definite level pre-defined in the arduino, the system will be activated automatically and the plants will be watered, thus ensuring they get proper water at any cost and remain healthy. GSM (Global System for Mobile Communications) executes computerized cellular conference systems. Results are sent from the system to the agricultural manufacturer or the farmer. The coded instruction is sent to the cell phone through which the receiver monitors the plant condition.

Fig. 1

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Fig. 1 bar graphs depicts that there are many solutions towards irrigation problems all over the world but the most prominent and useful of them being crop monitoring, robotics, Automated Irrigation and AI-guided drones. Fig. 1 depicts the expected trends of market share for the different genres of technologies in the global revenue. It is seen that from 2013 through the next 10 years crop monitoring will be the most effective method to mitigate irrigation problems. The market for this generated a revenue of 35% of the global amount in 2016.And it is believed that in future AI-guided drones are going to be the major shareholders in this particular market. This paper is organized as follows: The next section tells us about the Related works. Section III describes the microcontroller overview. Section IV illustrates about materials used. Section V & VI tells us about the algorithm used and experimental results on a benchmark real time dataset. The last section consists of a conclusion, future works and the references.

II MICROCONTROLLER OVERVEIW

Arduino is an open hardware development board (fig 2) which depends on a microcontroller that makes installed programming a lot simpler than conventional strategies. Arduino contain various parts and interfaces together on a solitary circuit board. The other reason for choosing Arduino is mentioned below.

1.Economical: Arduino is easily available in market and hence useful and cheap.

2.Multi-platform software & Simple: Arduino software can run in Windows, Linux, Macintosh OSX, hence more friendly compared to other devices. Coding in this software is much alike C/C++ hence much easier to understand.

3.Open source and extensible hardware: Arduino is reliance on Atmel microcontrollers. The designs for the modules are flowed under a Creative Commons permit, so experienced circuit architects can make their own specific elucidation of the module, take a shot at it, broadening and improving it.

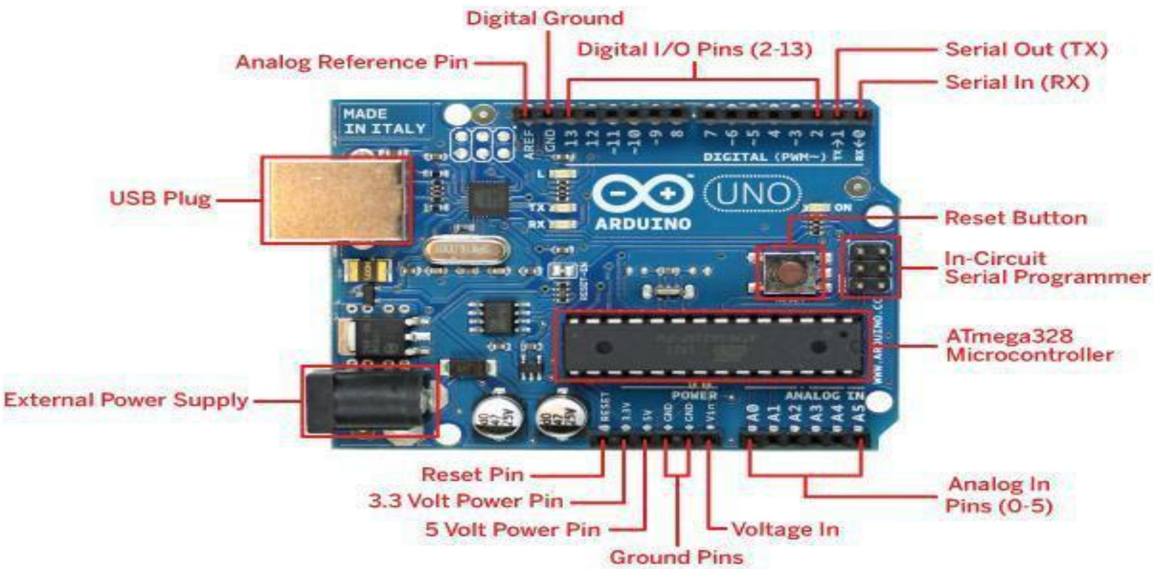

Fig. 2

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MICROCONTROLLER SPECIFICATION

Operating Voltage (OV)	5 V
Input voltage preferred	7 to 12 V
Input voltage range	6 to 20 V
I/O digital pins 14	(6 provides PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 Ma
DC Current for 3.3VPin	50 Ma
Flash Memory (ATmega328) **I**	32 KB (of which 0.5 KB used by boot loader)
SRAM (ATmega328)	2 KB

III.MAJOR COMPONENT DESCRIPTION

In this section, a brief elucidation of the main sensing components used is discussed.

A. Water sensor

A water sensor consists of an electronic brick connector1 MΩ resistor, and several lines of bare conducting wires. It has a working voltage of 5 Volts and an analog interface. There are 3 pins an “S”pin for signal input, “+” and “-” pins for power supply and ground.

Fig. 3 Water sensor

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B. GSM SIM800A board

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.

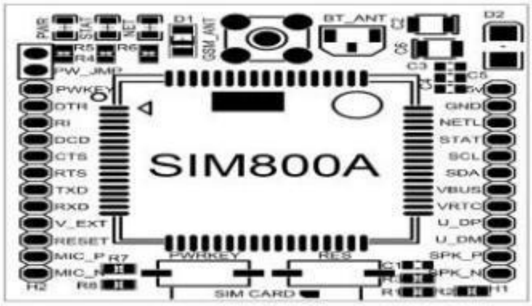

Fig. 4 GSM SIM800A board

C. Moisture sensor:

The soil moisture sensor used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.

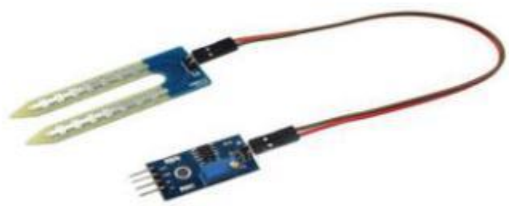

Fig.5 Moisture sensor

D.LCD Liquid Crystal Display:

The liquid crystal display is a flat-panel display which is based on the light-modulating properties of the liquid crystals.

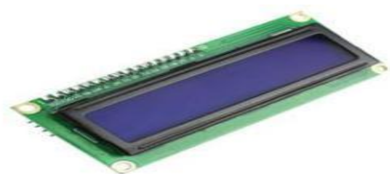

Fig. 6 LCD Liquid Crystal Display

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IV. RESULTS

The result analysis tells us about the following details:

i. The GSM module senses the data and sends the message to the registered mobile number as sown in Fig.7
ii. The LCD display unit functions to display the monitored condition of the plant real time as referred in Fig.8.
iii. The device is being tested indoor upon aloe- vera plant pot in an early eventide phenomenon shown in Fig 9.

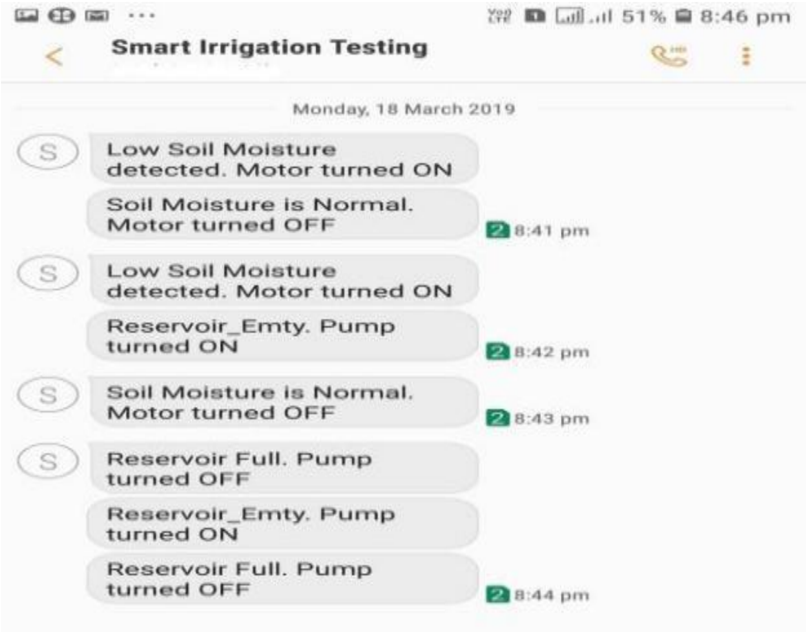

Fig. 7 shows the received SMS to the registered mobile number.

Fig. 8 depicts Automatic Mode when the pump is on state

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Fig. 9 Illustrates the setup being tested indoor in an Aloe-Vera plant pot

V. FUTURE WORKS

This proposed prototype is just a first step towards opening a new world of automated plant irrigation system. The various factors like soil moisture, climate conditions, soil pH, optimum temperature and solar receptivity can be taken these datasets can be uploaded to run machine learning algorithms and the optimum input and the outputs generated. This can be more efficient when connected with a cloud computing network for constant update along with real time changes of instructions. The sensors can collectively provide accurate information for optimum growth and the whole process can be automated with machine learning. This future prototype can be equipped with more sophisticated sensor which can monitor large area of land thus achieving higher productivity with less cost and manual labor. Further, we can train a deep learning model on image processing algorithms to include some more features such as predict the species of crop or the quality of crop based on its picture. We can further automate the system by training the model with previous data for the various soil types, their properties and the crop yield trends. This will help us to analyse and improve the proposed system. We can further train on data on the climatic conditions of a region over the past years to predict a probable heavy monsoon or a drought and warn the farmers beforehand.

VI. CONCLUSION

In the present era, the farmers use irrigation technique which involves a lot of manual labour. The farmers irrigate the land at regular intervals, a process that consumes more water and results in wastage of water. Moreover, due to dependence on monsoon in countries like India, irrigation more than often becomes difficult due to shortage of water. Hence, we require an automatic system that will precisely monitor and control the water requirements in the field to increase the efficiency of the irrigation process. Installing automated irrigation monitoring system saves time and ensures judicious usage of water.

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