



Automated Plant Watering System

Kondra Avinash¹, Tammana Karthik²

¹Student, Dept. of ECE, NIIT University, Rajasthan, India

²Student, Dept. of CSE, NIIT University, Rajasthan, India

Abstract —World population is expected to grow by over a third by 2050. This says that market demand for food will continue to grow. Projections show that feeding a world population of 9.1 billion people in 2050 would require raising overall food production by some 70 percent in order to feed the world. There is a gap between current food productivity growth and needed growth. To boost the yield farmers switched to extensive use of chemical fertilizers. Excessive fertilizer usage has its own negative impact like decreased yield, wastage of fertilizer, damage to soil and ground water contamination. Currently farmers mostly rely on guess work, estimation, past experience when deciding the crop that should be grown and the fertilizer that should be used. In this paper we propose a solution that uses technologies like Machine Learning, Image Processing and Internet of things to improvise the farm productivity and at the same time decrease the fertilizer usage. This paper describes the outcomes of a prototype implemented in Rajasthan, India.

Keywords — Cloud, Arduino Programming, IOT

goes waste. Consequently, we utilize this programmed plant watering framework, and this framework is valuable in every single climatic condition.

It is an ESP8266 based programmed plant watering framework that uses a Soil Moisture sensor and IOT to water things from anywhere by just sending a command to the module connected to the wifi network in the house. And the data of the soil gets updated and stored in the cloud.

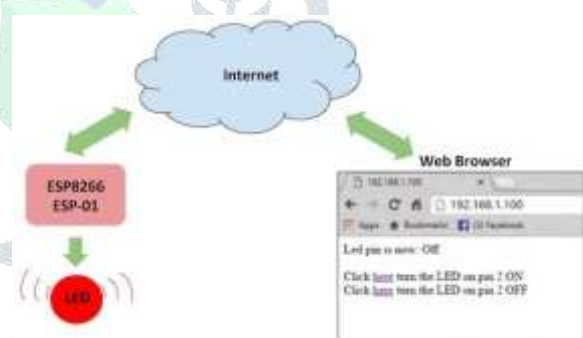


Figure 1: Overview of System

I. INTRODUCTION

In present days, in the field of agriculture farmers are confronting serious issues in watering their harvests. This is because they don't have sufficient thought regarding the accessibility of the force. Regardless of whether it is accessible, they have to manually pump out the water and hold up until the field is appropriately watered, which forces them to quit doing different exercises – which are additionally significant for them, and along these lines they misfortune their valuable time and endeavors. But there is a solution – “An Automatic Plant. Irrigation System “not only helps farmers but also others for watering their gardens as well. This automatic irrigation system senses the moisture content of the soil and automatically switches the water motor when the power is on. A proper usage of the irrigation system is very important because the main reason is the shortage of land reserved water due to lack of rain, unnecessary use of water as a result large amount of water

II. RELATED WORK

In [1], The Author compared different feature extraction algorithms for optical flow tracking. The algorithms taken into were canny edge detector, Harris Corner detector, Good Features to Track (Shi- Tomasi), SIFT, SURF and random seeding. With the help of Gantry test, Vienne's test, Birmensdorf test and Odometry test, the authors analyzed the different advantages each algorithm possessed and their area of applications. Few parameters referred by the authors for these analyses includes simplifying of the implementation, the processing speed, and the ability to extract suitable features for frame-by-frame tracking using optical flow algorithm in all types of test conditions. In [2], The Author described that it is important to note that regardless of the conclusions of Carter (1993), it is written,

“around x nm” because the angle of solar irradiance, the atmospheric, climatic, and pollutant levels in the air, as well as the slope of the ground, time of the day, and season; all became Variable factors in the interpretation of these values. Remote sensing is very sensitive to all environmental factors and is a technically complex field where conclusions are drawn from the information, but the precise understanding of each interpretation is not always fully known.

In [3], Author in the paper portrays precision farming as a fundamentally new domain for computational intelligence and constitutes for a truly interdisciplinary aspect. Agriculture is thus rapidly turning into a knowledge intensive industry concluding the paper, they have posted various challenges in the data mining for agriculture.

In [4], Author describes the urgent need to increase farming production, especially on an increasingly smaller piece of land, as well as the reduction of consuming resources such as water and fertilizers with respect to the environment, makes the use of new technique and methods a first priority. The approach which they took was based on application of machine learning techniques for inducing domain models of agriculture applications, which leads to the process of discovering knowledge (data mining) with the close collaboration of the domain expert (agriculturist) and the machine learning expert.

III. COMPONENTS REQUIRED

A. ESP8266

ESP8266 is a bit sized WIFI module enabled microprocessor. It can host an application on its own. This esp8266 is a self-controlled WIFI module that consists on TCP/IP protocols which makes this to connect to our wifi module easily. Esp8266 contains a total of 30 pins in which some of them are used for giving input and taking output from the module. These pins are called as General-Purpose Input Output pins (GPIO). And some other pins are used for providing power supply for module. ESP-12E is the WIFI module that present in ESP8266 is a 32-bit Microprocessor that operates on 80-160MHz clock frequency. It consists of 128KB RAM and 4MB external memory used for storing program uploaded to it. ESP8266 has WIFI transceiver in it, so it not only connects to WIFI network but can also provide a network of its own allowing other devices to connect with it. ESP8266 operates at 3V-3.6V and 80mA. It also having a voltage regulator in it to keep voltage at steady value of 3.3V. It can supply up to 600mA. Usually, power supply takes place through USB port but there is pin called Vin which can take input directly from external source. ESP8266 contains two buttons called RESET and FLASH. Reset button is used to reset the ESP8266 module and Flash is used to download program from module. It contains a Led connected to D0 pin of board. The board consists of converter called CP-2102. This converter converts USB signal to serial and allows computer to program and communicate with ESP8266. It consists of 17 (GPIO) pins that are divided into both sides of the board. These 17 pins can be used to all duties like: UART interface – which is used to load code in serial way and (TXD0,RXD0,TXD2,RXD2 and TXD1) are used for this purpose, PWM pins – these pins are used to control motors and controlling of led, SPI,I2C and I2S interface – SPI and I2C interfaces are used to connect all sorts of sensors with ESP8266 and I2S is used for adding sound to the project, SDIO pins – these are called as Secure Digital Input /Output pins and used to interface SD cards directly to board. These 17 pins are having multiplexing feature i.e a single pin is

used for many applications. And the remaining pins are GND and 3.3V.

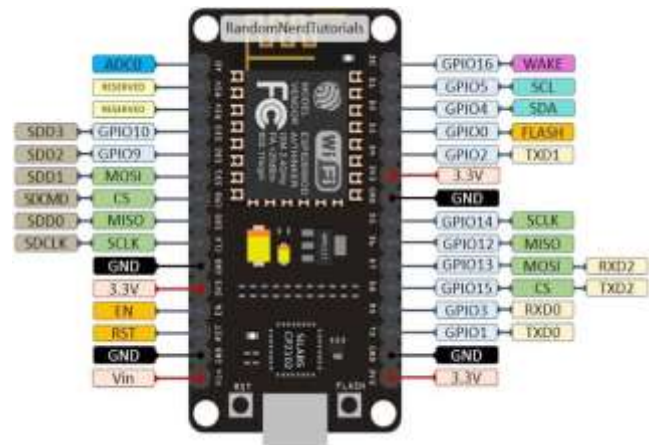


Figure 2: Esp8266

B. MOTOR DRIVER



Figure 3: Motor Driver

L293d Motor Driver consists of L293 IC. It is 16 pin IC, it consists of 4 ground pins, 2 enable pins, 1 VCC pin, 1 ss pin, 4 input pins, 4 output pins. To run the L293d Motor Driver we have to supply it a 5v supply which has to give at the VCC pin, for output of the Motor Driver we can give the supply between range of 9v – 36v. One 16 pin motor driver can run two motors simultaneously. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. We know that voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. As we already know, in a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. There are two Enable pins on l293d. Pin 1 and pin 9, for having the option to drive the motor, the pin 1 and 9 should be high. For driving the motor with left H-connect you have to set pin 1 to high. And for right H-Bridge you need to empower the pin 9 to high. In any case either pin1 or pin9 goes low, at that point the motor in the relating segment will stop working. It resembles a switch. The maximum working voltage for VSS motor supply is 36V.

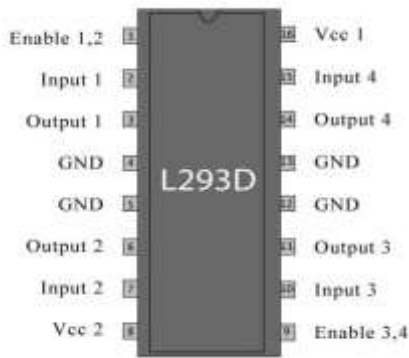


Figure 4: L293D IC

C. MOISTURE SENSOR

The Soil Moisture Sensor is a sensor used to degree the volumetric content material of water within the soil. The Soil Moisture sensor measures the volumetric content material of water no longer directly with the assist of some different phenomenon of soil like dielectric consistent, electric resistance, otherwise interplay with neutrons, and alternative of the moisture content.



Figure 5: Soil Moisture sensor

The relation most of the calculated property as well as moisture of soil need to be adjusted & may exchange based on ecological factors like temperature, form of soil, otherwise electric conductivity. The microwave emission that's reflected can be influenced with the aid of the moisture of soil in addition to mainly used in agriculture and far off sensing inside hydrology. These sensors typically used to check volumetric water content, and every other group of sensors calculates a brand-new belonging of moisture within soils named water capability. Generally, these sensors are named as soil water capacity sensors which include gypsum blocks and tensiometer. The FC-28 soil moisture sensor consists of four-pins, 1) VCC pin is used for electricity 2) A0 pin is an analog output 3) D0 pin is a digital output 4) GND pin is a Ground. This module also includes a potentiometer that will fix the threshold cost, & the cost may be evaluated by means of the comparator-LM393. The LED will switch on/off primarily based on the edge value. This sensor especially utilizes capacitance to gauge the water content material of the soil (dielectric permittivity). The working of this sensor can be finished by putting this sensor into the earth and the reputation of the water content material inside the soil can be said within the form of a percentage. The specification of this sensor includes the following. 1) The required voltage for working is 5V 2) The required modern-day for running is <20mA 3) Type of interface is analog 4) The required running temperature of this sensor is 10°C~30°C. The IC LM393 has two internally in-built operational amplifiers that are

internally compensated with frequency. These ICs are for the most part intended for acting their distinctive works utilizing a single power gracefully. It can also execute its capabilities nicely with break up power deliver. The supply of current-drain does now not rely on the quantity of the electricity deliver. One of the maximum vital capabilities of this IC is, it consists of floor in its commonplace mode enter voltage. The packages of this IC specifically encompass numerous fields in actual lifestyles, and additionally commercial, ADC (analog to digital converters), electric structures powered by the battery, time-delay turbines restriction comparators, etc. The LM393 is a twin independent accuracy voltage integrated circuit. These ICs comprises two independent voltage comparators to operate from a best electricity deliver greater than a wide variety of voltages. Working with materials is likewise doable so long as the variant a number of the two supply voltages is two volts to 36 volts, & VCC is minimal 1.5 volts finer than the i/p voltage. The foremost functions of this IC mainly include the following. 1)Single voltage supply tiers from 2.0 V dc closer to 36 V dc 2)Split deliver range will be from +1.0 V dc or -1.0 V dc to +18 V dc or -18 V dc 3)Little Supply Voltage of Current Drain Independent is 0.4 mA 4)The enter bias modern is low that is 25nA 5) Input offset current is low that is 5nA 6)Both the range of differential input in addition to Power Supply Voltage are equal 7) The output voltage is properly-appropriate by means of ECL, MOS, DTL, TTL, & CMOS Logic Levels 8)Electrostatic discharge bolts on the inputs to decorate the tool roughness without troubling its overall performance.

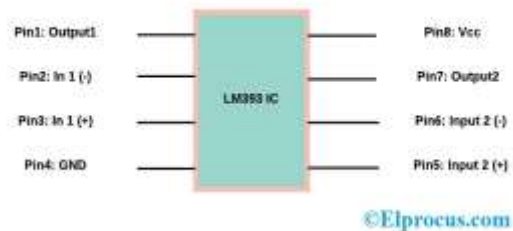


Figure 6: LM393 IC

The LM393 IC could be a low-power, single supply, low-offset voltage, double, differential comparators. Generally, a typical comparator IC is a tiny voltmeter enclosed with switches. It is used to calculate the voltages at two dissimilar terminals and contrasts the dissimilarity in voltage quantity. If the voltage of the first terminal incorporates a high-voltage than the second terminal, the switch will activate. But, if the first terminal has a low-voltage than the second terminal, the switch will deactivate.

IV. WORKING

First, we will be connecting the moisture sensor with esp8266. As the moisture sensor detects the moisture content in the soil and sends the data to esp8266, ESP reads the given code and decides to which action to be performed, here moisture content value is compared with predefined threshold value and if it requires watering of plants then ESP sends the data "1" to the motor driver, which means to high the motor driver and the motor pump that is connected to the motor driver gets activated and watering is done to the plant. If there is no requirement of watering the plant then esp8266 sends data "0", which means motor driver to be off

and not to start the motor pump. If watering is done then the moisture sensor waits 5 seconds and after that again starts detecting the moisture content in the soil otherwise the sensor collects the data continuously. In this project we are also including an IOT platform where the data gets stored so that the user can check the previous data. With the help of Thing speak IOT Platform.

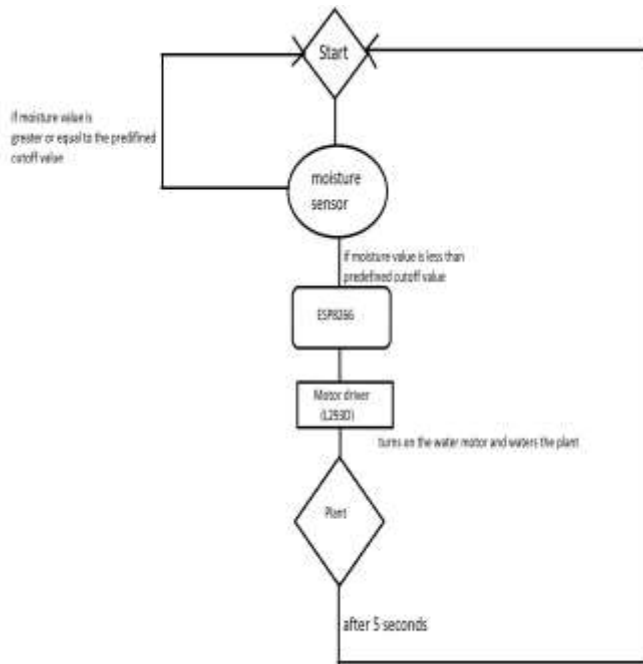


Figure 7: Flow chart of system

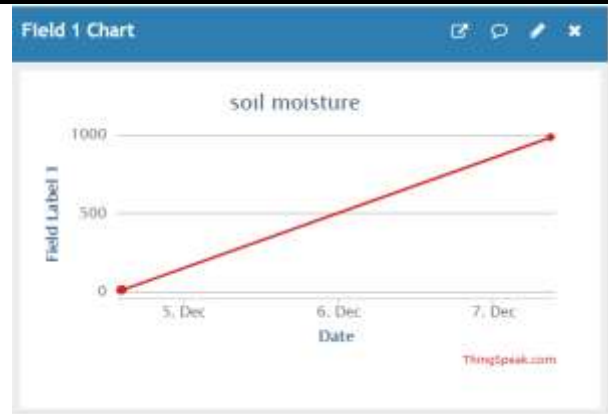


Figure 9: Result of the sensed moisture by sensor



Figure 10: Result of the sensed moisture by sensor

A. CIRCUIT

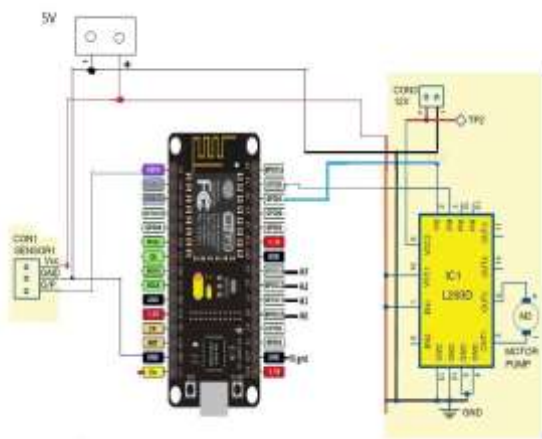


Figure 8: Circuit Diagram of system

V. RESULTS

The below displayed values in the graphs shows us the values that were captured by the moisture sensor while sensing the moisture content of soil.

VI. CONCLUSION

Finally, the “AUTOMATIC PLANT WATERING SYSTEM” has been designed and tested successfully we have developed this plant watering system with microcontroller, controlling the whole watering system idea. It has been observed that dampness (moisture) sensor is sensing the moisture content in the soil and watering the plants when the given condition was satisfied. In simple terms we can say that the proposed methodology is watering the plants when required with the help of motor.

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