

IoT based Automatic Smart Agriculture System using Google Assistant

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Abstract : The paper aims to look at all farmers problems and to find a solution. Since, IOT is an emerging field and its applications are wide, the paper has included the application of IOT in agriculture as well. The paper aims at helping the farmer by providing data such as motor information and soil moisture sensor, through sensors, which is sent on the website, through esp8266 microcontroller which uses esp8266 chip, on which the farmer can easily see. An automatic water pump connected through a relay has been added to water the crops automatically thus reducing the work of the farmer using soil moisture sensor. We can switch on water pump through Google assistant voice input from all over world. Here we are using Adafruit sensor to store data IFTTT is used to link Google assistant.

Index Terms- Google assistant, IFTTT, ESP8266, Soil Moisture sensor, Adafruit

I. INTRODUCTION

India's real wellspring of wage is from agriculture division and 70% of ranchers and general individuals rely upon the agriculture. In India the vast majority of the irrigation frameworks are worked physically. These old fashioned methods are supplanted with semi-robotized and computerized procedures. The accessible conventional procedures resemble jettison irrigation, terraced irrigation, dribble irrigation, sprinkler framework. The worldwide irrigation situation is arranged by expanded interest for higher horticultural efficiency, poor execution and diminished accessibility of water for agriculture. These issues can be suitably amended on the off chance that we utilize computerized framework for irrigation. In Irrigation Control System Using Android and Google Assistant for Efficient Use of Water and Power. Mechanized irrigation framework utilizes Google Assistant to turn engine ON and OFF.

II. LITERATURE SURVEY

In Google Assistant Based Automated Irrigation Control using IOT based Irrigation System[2].Here its mentioned about using automatic microcontroller based rain gun irrigation system in which the irrigation will take place only when there

will be intense requirement of water that save a large quantity of water. These system brings a change to management of field resources where they developed a software stack called Android is used for mobile devices that include an operating system, middleware and key applications. Mobile phones have almost become an integral part of us serving multiple needs of humans. These system covered lower range of agriculture land and not economically affordable. The System Supports excess Amount of water in the land and uses wifi to send message and an android app is been used they have used a methodology to overcome under irrigation, over irrigation that causes leaching and loss of nutrient content of soil they have also promised that Microcontroller used can increase System Life and lower the power Consumption. There system is just limited to the automation of irrigation system and lacks in extra ordinary features. Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android States and features of their system.

--The system supports water management decision, used for monitoring the whole system with ESP8266-12E Wifi module

--The system continuously monitors the water level in the tank and provide accurate amount of water required to the plant or tree (crop).

--The system checks the temperature, and humidity of soil to retain the nutrient composition of the soil managed for proper growth of plant.

-- Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via SMS using a GSM using android mobile.

In Irrigation Control System Using Android and GSM for Efficient Use of Water and Power. Automated irrigation system uses Google Assistant to turn motor ON and OFF. These Google Assistant may be easily automated by using voice controllers. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. Those valves may be easily automated by using controllers.

Proposed System

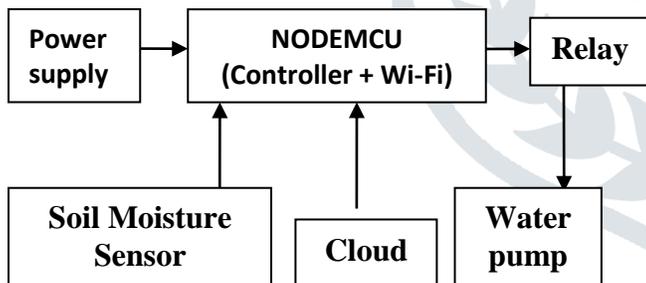


Fig 1: Block Diagram 1

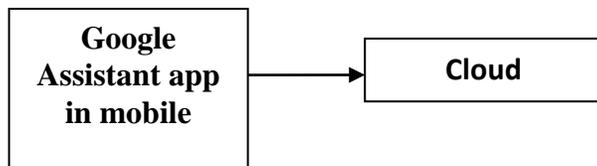


Fig 2: Block Diagram 2

III HARDWARE SPECIFICATIONS

Node MCU

The Node MCU is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines. It includes firmware which runs on the ESP8266 WiFi SOC from Express, and hardware which is based on the ESP-12 module



Fig 3: NODE MCU(ESP-8266-12E)

ESP8266-12E WiFi module

ESP8266-12E WiFi module is developed by Aithinker Team core processor ESP8266 in smaller sizes of the module encapsulates Ten silica L106 integrates industry-leading ultra low power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.



Fig. 4: ESP8266-12E Wi-Fi Module

Soil 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. Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher SIG out. Soil Moisture Sensor functioning all you will need is to connect the VCC and GND pins to your Arduino based device (or compatible development board) and you will receive a SIG out which will depend on the amount of water in the soil. One commonly known issue with soil moisture sensors is their short lifespan when exposed to a moist environment. To combat this, we've had the PCB coated in Gold Finishing (ENIG or Electro less Nickel Immersion Gold). We recommend either a simple 3-pin screw pin terminal or a 3-pin jumper wire assembly (both can be found in the Recommended Products section below) to be soldered onto the sensor for easy wiring.

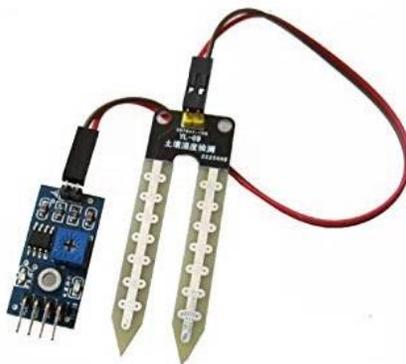


Fig. 5: Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners. Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.

Relay



Fig 6: Relay

Relays are **switches** that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

Water pump

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps



Fig 7: water Pump

. Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform

mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

IV SOFTWARE SPECIFICATIONS

Arduino IDE

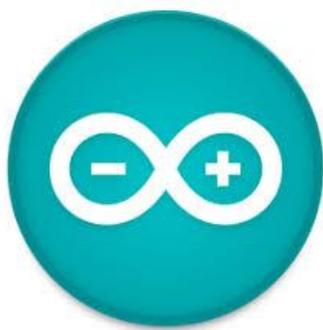


Fig 8: Arduino Icon

The open-source Arduino Software (IDE) makes home automation easy as it is easy to write code and upload it to the board. Its platform independent means it runs on Windows, Mac OS and Linux. The IDE environment is written in JAVA and based on processing and other open source software.

Adafruit IO

Adafruit.io is a cloud service - that just means we run it for you and you don't have to manage it. You can connect to it over the Internet. It's meant primarily for storing and then retrieving data but it can do a lot more than just that!

- Display your data in real-time, online
- Make your project internet-connected: Control motors, read sensor data, and more!
- Connect projects to web services like Twitter, RSS feeds, weather services, etc.
- Connect your project to other internet-enabled devices
- The best part? All of the above is do-able for **free** with Adafruit IO

Google Assistant

Assistant is Google's voice assistant. At launch, it was an extension of Google Now - designed to be personal - while

expanding on Google's existing "OK Google" voice controls. Originally, Google Now smartly pulled out relevant information for you: it knew where you worked, your meetings and travel plans, the sports teams you liked, and what interested you so that it could present you with personal information that mattered.

Google has long killed Google Now, but Assistant very much lives in the same space, fusing these personalized elements with a wide-range of voice control. Google Assistant supports both text or voice entry and is happy to follow the conversation whichever entry method you're using.

IFTTT

IFTTT is both a website and a mobile app. The free service launched in 2010 with the following slogan: "Put the Internet to work for you". It's changed a lot in recent years, however. Currently, with IFTTT, you can connect all your "services" together so that tasks are automatically completed. There are numerous ways you can connect all your services - and the resulting combinations are called "Applets".

Applets essentially automate your daily workflow, whether it's managing smart home devices or apps and websites. So, for instance, if you own the Philips Hue smart lighting system, you could use IFTTT to automatically turn on a light every time you're tagged in a Facebook photo. In another example, you could use IFTTT to automatically email readers when they comment on your WordPress blog.

Software Implementation

1. Arduino IDE is installed.
2. From preferences ESP8266 board package is installed and NodeMCU 1.0 (ESP 12E) module is selected as the preferred board. Adafruit MQTT Library is also included.
3. Baud rate is set to 115200 and com port is selected accordingly.
4. Pins are defined, one for each relay. Since a single motor is used for demonstration purpose, two input pin and an enable pin for the motor are defined.
5. The SSID and Password of Wi-Fi for the internet connection are mentioned in the program.

6. Server ports are defined for Adafruit setup. For security purpose Adafruit also provides a unique key which is defined in the program.

7. An ESP8266 Wi-Fi client class is created by passing in the login and server details for MQTT server secure client access.

8. Feeds are defined for MQTT paths in the form <username>/feeds/<feedname>. A feed may be defined for publishing values or for subscribing to a certain topic. Likewise, sensor feed is defined as publisher and relay and motor feeds are defined as subscribers.

9. Feeds are updated accordingly on Adafruit cloud platform and state of device can be monitored and controlled directly from there.

10. For Google Assistant, just speak out to Google or type out the action that you want to perform. For Facebook Chatbot, open the respective page of the project and type the command. Each service has their layer of security and can be accessed only via user's account. But the user if required can add multiple people on the platform. This adds security of devices that is mostly feared in the field of Internet of Things.

V RESULT AND DISCUSSION

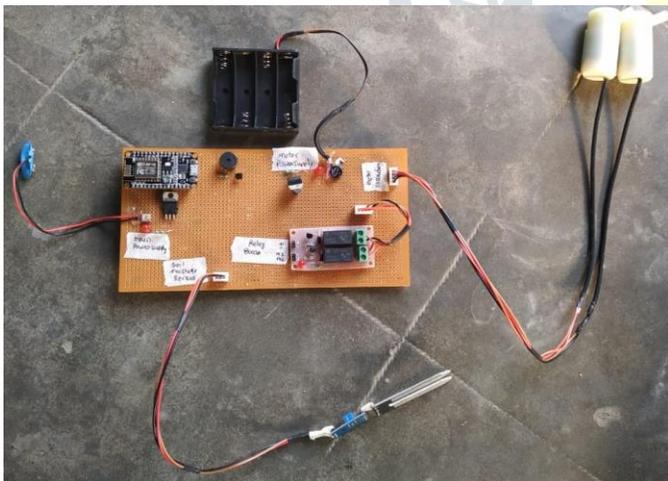


Fig 9: Output Image

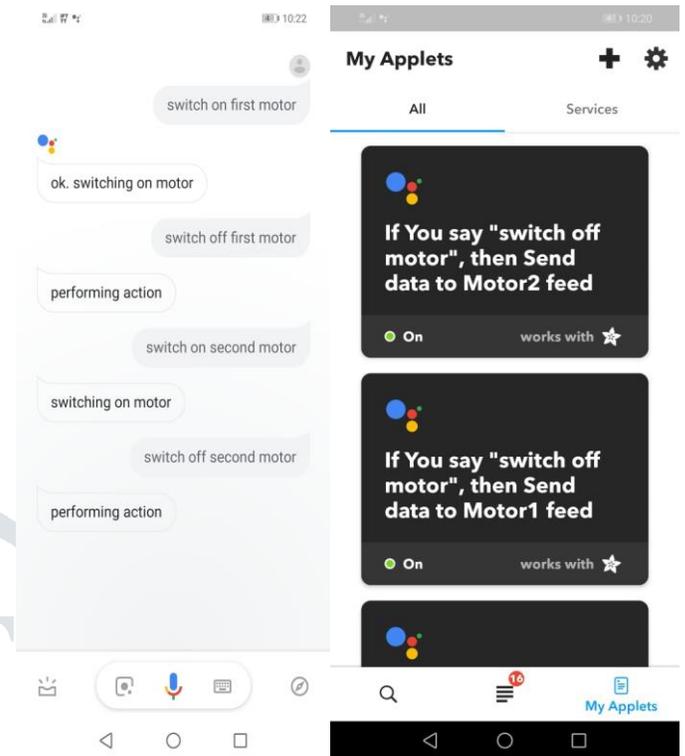


Fig 10: Google Assistant and IFTTT Images

Algorithm

Step 1: START

Step 2: Give Power supply to Circuit

Step 3: Connect the sensor pins to NODEMCU

Step 4: Provide proper WiFi Connection to the NODEMCU board

Step 5: Checking Soil moisture sensor values and

Step 6: Publish the soil moisture Values to adafruit

Step 7: if Moisture sensor(Moisture content reduced)

Step 8: Turn ON the Motor

Step 9: Otherwise

Step 10: STOP the process

UML Diagrams

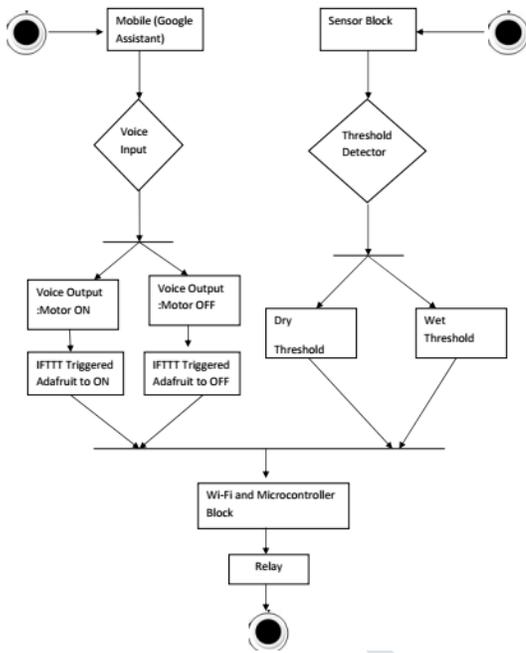


Fig 11 Activity Diagrams

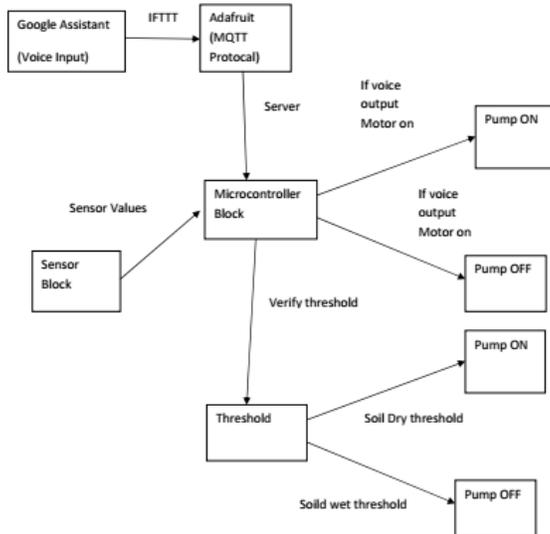


Fig 12 Collaborative Diagrams

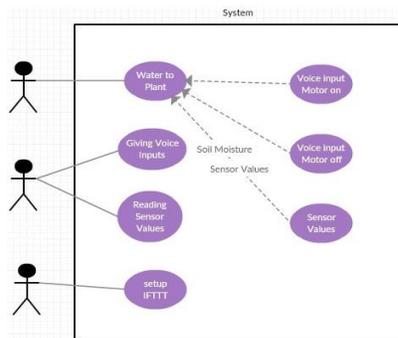


Fig 13 Use Case Diagram

VI Conclusion

A framework to screen dampness levels in the dirt was planned and the task gave a chance to contemplate the current frameworks, alongside their highlights and disadvantages. The proposed framework can be utilized to switch on/off the water sprinkler as indicated by soil dampness levels in this manner mechanizing the procedure of irrigation which is a standout amongst the most tedious exercises in cultivating. Agriculture is a standout amongst the most water-devouring exercises. The framework utilizes data from soil dampness sensors to flood soil which forestalls over irrigation or under irrigation of soil along these lines maintaining a strategic distance from trim harm. The ranch proprietor can screen the procedure online through a site. Through this undertaking it can be presumed that there can be impressive improvement in cultivating with the utilization of IOT and mechanization. Subsequently, the framework is a potential answer for the issues looked in the current manual and unwieldy procedure of irrigation by empowering proficient usage of water assets.

VII. FUTURE SCOPE

In Future, an Intelligent IoT based Automated Irrigation system can be extended not just for irrigating the field with water but also for deciding on spraying appropriate chemicals for proper growth of crop. The same work can be extended by looking into water level in tank before irrigating the field. Lastly the data security and integrity of agricultural data can be secured while transmitting for analysis towards prediction and sending the control signal for actuation.

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