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IOT BASED SMART AGRICULTURE MONITORING SYSTEM

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Abstract - Smart agriculture is an innovative concept, because IOT sensors are capable of providing information about agriculture fields then act upon based on the user input. Smart agriculture provides various solutions by modernizing the current method of agriculture. Hence we proposed to develop a smart agriculture System that uses advantages of innovative technologies like NodeMCU, IOT and blynk App. The paper aims at making use of evolving technology i.e. IOT and smart agriculture using automation. Monitoring environmental conditions is that the major factor to enhance yield of the efficient crops. In this paper we includes development of a system which may monitor temperature, humidity, moisture and even the movement of water through sensors using NodeMCU board and just in case of any discrepancy send a notification on the app implemented for the same to the farmer's smart-phone using Wi-Fi/3G/4G. The system features a duplex communication link supported a cellular-Internet interface that permits for data inspection and irrigation scheduling to be programmed through an android application. due to its energy autonomy and low cost, the system has the potential to be useful in water limited geographically isolated areas.

Key Words: IoT, Blynk, NodeMCU, Sensors, WiFi etc

1. INTRODUCTION

A Smart agriculture Automation/Monitoring system is simply a system that allows users to have access to electrical control system devices like motor starters and drivers and monitoring number of different parameters in farm area like soil moisture monitoring/ water flow monitoring, (or temperature & humidity of soil etc). These all access is monitored through a basic application connected to the main system through a wireless protocol or MQTT (MQ Telemetry Transport) protocol, there are number of open source IoT platforms like Blynk, Adafruit I/O, Ubidots, Thing Speak etc. through these IoT servers we can simply made a Smart Agriculture Monitoring System.

2. METHODOLOGY

In this paper we will create the main system which is an electronic circuit board based on a NodeMCU board which already has a wifi feature in it and this board will be surrounded by some electronic components like Relays and Sensors, about the sensors we will use the Soil moisture sensor to detect the moisture of the soil (wet/dry) & Water Flow Sensor to monitor parameters such as water flow rate and total water sold to plants etc. About the actuators, we will control water pump through a relay. The relay will be controlled through Blynk IoT Platform which has an android app called Bynk that we have to install from the play store. So in this application we inserted some value displays to read the water consumption and water flow valvues from the sensors and placed some buttons control relay. Blynk is a mobile application which has its own server to process user requests. It is an open source application and anybody can use it in their Automation/Monitoring projects to control devices, monitor sensor data and get a notification by some trigger actions. The Blynk app transmits signals simply by turning ON/OFF buttons in App via internet, the Wi-Fi receiver module receive these signals. Depending on the received character NodeMCU takes various actions to turn ON and OFF (HIGH/LOW) the GPIO pins of the NodeMCU and then from that signal the Relay Driver circuit turn the water pump ON/OFF. And in the same way the sensors sends the data to the microcontroller unit and then via internet those sensor data values are displayed or Alert notifications will be notified in the Blynk android App.

For controlling the water pump at s specific set amount of water we have programmed this system in such a way that if total water flow rate is equals to the the rate of water (which we set in ltrs through app) the water pump get turns OFF automatically.

Hardware.

An Arduino, Raspberry Pi, NodeMCU or a similar development kit.

Blynk works over the Internet. This means that the hardware you choose should be able to connect to the internet. Some of the boards, like Arduino Uno will need an Ethernet or Wi-Fi Shield to communicate, others are already Internet-enabled: like the ESP8266, Raspberri Pi with WiFi dongle, Particle Photon or SparkFun Blynk Board. But even if you don't have a shield, you can connect it over USB to your laptop or desktop (it's a bit more complicated for newbies, but we got you covered). What's cool, is that the list of hardware that works with Blynk is huge and will keep on growing.

A Smartphone: The Blynk App is a well designed interface builder. It works on both iOS and Android.

NodeMCU (esp8266)

NodeMCU is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266.

MCU stands for MicroController Unit - which really means it is a computer on a single chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. They are used to automate automobile engine control, implantable medical devices, remote controls, office machines, appliances etc.

FEATURES

- Open-source Interactive
- Programmable
- Low cost
- Simple Smart
- WI-FI enabled
- Other features of the NodeMCU is it includes 11 digital input/output pins, 1 analogue input pin (3.2V Max), 16MB (128M bit) Flash, an external antenna connector, built in ceramic antenna and houses the new CP2104 US to UART IC. The D1 Pro is the same size as the D1 mini, but is lighter.

Pin	Function	ESP-8266 Pin
TX	TXD	TXD
RX	RXD	RXD
A0	Analog input, max 3.3V input	A0
D0	IO	GPIO16
D1	IO, SCL	GPIO5
D2	IO, SDA	GPIO4
D3	IO, 10k Pull-up	GPIO0
D4	IO, 10k Pull-up, BUILTIN_LED	GPIO2
D5	IO, SCK	GPIO14
D6	IO, MISO	GPIO12
D7	IO, MOSI	GPIO13
D8	IO, 10k Pull-down, SS	GPIO15
G	Ground	GND
5V	5V	-
3V3	3.3V	3.3V
RST	Reset	RST

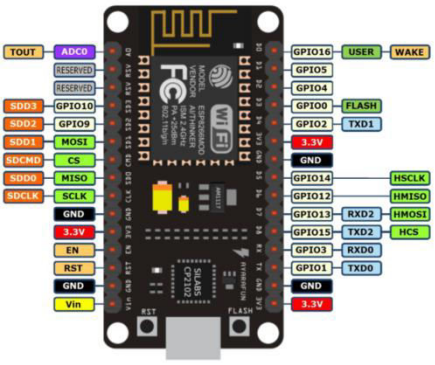

Figure: Pin diagram

3. MODELING AND ANALYSIS

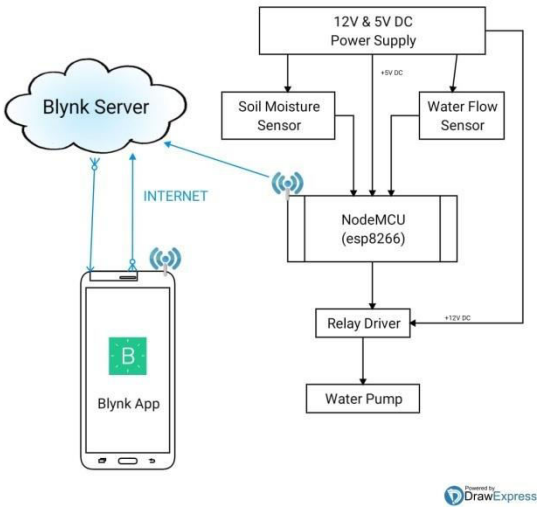

Figure 1: Block Diagram

4. RESULTS AND DISCUSSION

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things.

There are three major components in the platform:

Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide.

Blynk Server - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi or NodeMCU.

Blynk Libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.

Now imagine: every time you press a Button in the Blynk app, the message travels to space the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.

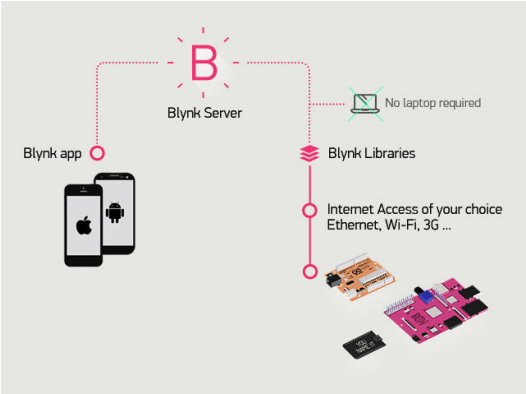

Figure 2.1 Blynk App

Features:

- Similar API & UI for all supported hardware & devices
- Connection to the cloud using:
  - WiFi
  - Bluetooth and BLE
  - Ethernet
  - USB (Serial)
  - GSM
- Set of easy-to-use Widgets
- Direct pin manipulation with no code writing
- Easy to integrate and add new functionality using virtual pins
- History data monitoring via History Graph widget
- Device-to-Device communication using Bridge Widget
- Sending emails, tweets, push notifications, etc.
- New features are constantly added!

Figure 2.2: Smart Agriculture Automation Using Blynk App

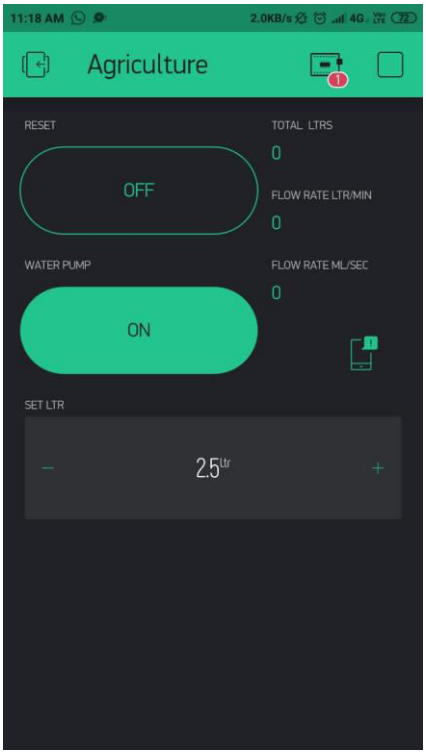

Figure 2.3: Industrial Automation Using Blynk App

5. CONCLUSIONS

The project has been experimentally proven to work successfully. We can control the parameters of the AC components using the Blynk app. Experimental work has been carried out carefully. The result shows a solution for remote Monitoring & turn on/off control over appliances and higher flexibility is indeed achieved using IoT.

Using this project as a framework, it will give immediate access to information about the physical world and the objects, leading to innovative services and solutions and leading to an increase in efficiency and productivity. In the near future the Internet and wireless technologies will connect different sources of information such as sensors, mobile phones and cars in an ever tighter manner. The number of devices which connect to the Internet is – seemingly exponentially – increasing. These billions of components produce consume and process information in different environments such as logistic applications, factories and airports as well as in the work and everyday lives of people.

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