IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, July 2022
Impact Factor: 6.252

IoT- Based Smart Farming

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Abstract: *This paper mainly describes the IoT's scope in the smart farming field and its applications. The main aspiration of the proposed system is to develop a robot that gives a helping hand to farmers by reducing the labor work by implementing the multi-doing tasks like plowing, seed sowing, rolling, cutting, and harvesting, which require a massive amount of human resources. The robot is also developed to check for the soil moisture and water level using their respective sensors for better crop yield. The ESP8266 nodeMCU is used along with a variety of sensors to monitor the actions on the field and the factors influencing it. A Blynk app which is a mobile application is used to remotely control and monitor the field and help in the management and control of the robot in the farm field.*

Keywords: Smart Farming, ESP8266 nodeMCU, 1 channel Relay module, DC driver circuit, Blynk, Sensors, Arduino

I. INTRODUCTION

For many decades now, technologies have been rapidly evolving and developers all over the world are attempting to make this world smarter and simpler with each passing moment to make our daily lives easier and simpler. Iot technology plays a pivotal role in establishing connection between objects. The internet of things is one of the domains in computer science that assists in connecting real-life objects using intelligent networks such as the internet. The primary motivation for working on IoT-based smart farming is to raise public awareness about the expected deterioration of natural resources in the coming years. It is estimated by the United Nations Food and Agricultural Organisation, that by 2050 there is an emergency and the need to produce 70 percent of agricultural resources for the world with a finite amount of exhaustible resources. The project is mainly concerned with implementing smart robots in the agricultural fields to increase better quality crop yield and making robots to do tasks that require massive amounts of manpower which plays a significant role in helping farmers.

II. PROBLEM STATEMENT

The main motivation behind our research is to bring about a improvement in the technical aspects in the existing traditional farming to develop a network-based wireless sensors, efficient decision support system that can manage agriculture-related pursuit by hand over felicitous agriculture facts because of the forecast and rebel water levels there are several distractions for cultivator which is detrimental to cultivating farmers use mobile applications manually or autonomously which check the water level and also the soil ph level farmers will discover it extra comfortable and useful as just consequence agriculture requires much time to perform and it is also known as a time-consuming method

III. LITERATURE REVIEW

We have referred multiple research papers to carry out this project for fabricating the smart farm robot we briefly took some of the ideas from various authors who had made recent research regarding this. We learned that the smart vehicle or tractors are emerging and evolving making the processes of farming less time-consuming saving manpower and energy and also increasing the production of crop yields annually. Specialists in this area of research have addressed that sensors are widely used in this field of study and analyses they believe that these sensors play a vital role in managing irrigation systems in the agricultural field various other sensors are also implemented to work based on their designs. We have taken a bit of the theory and implemented our methodologies based on their analysis and surveys.

IV. PROPOSED SYSTEM

The system proposed consists of a soil moisture sensor, Dc driver motor, One channel relay module, Water pump and Power supply. The sensor is the interface for sensor data acquisition. The dc driver motor aid in the motion of the robot

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and performing various agricultural activities. The water from the pump will switch on automatically at the moment, water level falls below the point. The farmer can switch on the motor using the online smartphone application. The data acquired from sensors are transmitted to the blynk server using wireless communication with the wifi module of ESP8266. The smartphone application helps to inspect and control the field from anywhere.

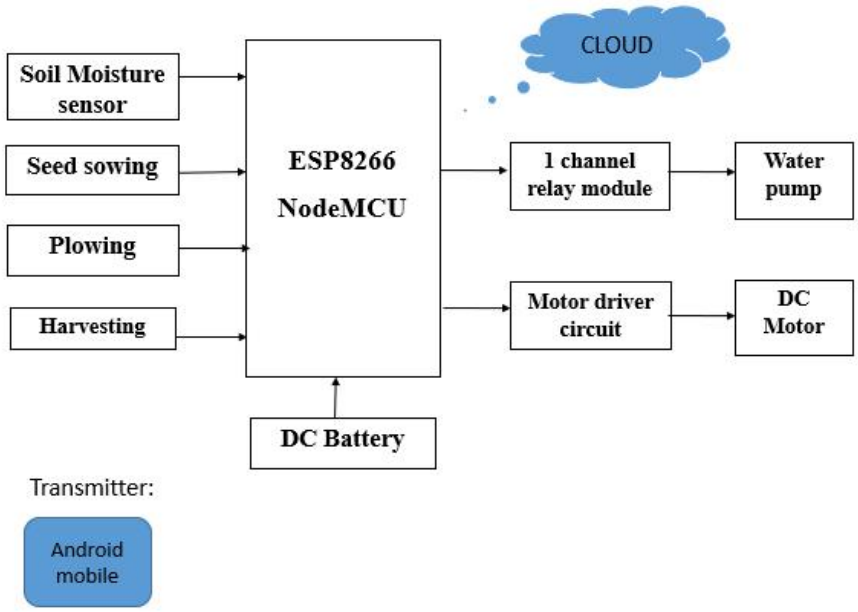

Figure 1: Typical Representantion of Proposed System

V. METHODOLOGY

In this project, the consecutive section tries to demystify the key methodologies and prerequisites which is fragmented into multiple subsections to achieve the end goal. The aim of this section is to define the key components used in the smart farm-based system with all the resources needed for implementation it also encompasses the working mechanisms involved in this project . Some of the important components used in this system are ESP8266 node microcontroller unit dc driver circuit one channel relay module, soil moisture sensor, water pump, dc motor, blynk application and Arduino IDE.

5.1 ESP8266

The ESP8266 node mcu is cheap in cost has inbuilt Wi-Fi module which aids in connecting the Blynk mobile application to the multi-purpose robot system. The microcontroller not only connects to the internet and collects data from sensors but it also assists in controlling the robot to perform movements via the Blynk app the motion of the robot is primarily driven by the use of dc drivers and dc motors for performing agricultural activities. The ESP8266 connects to the internet via a Wi-Fi network and sends data to the Blynk server with the help of authentication token and password defined in the driver code. Finally, the data collected by the node mcu is displayed in our Blynk app.

5.2 Soil Moisture Sensor

It is the main tool for collecting the data from the soil and also to check for the water requirements and whether the crops or the plants are in need of water or not.We have taken a general sensor which is typically comprised of two pad-like structures which have quite an amount of resistance between them.

We know that water is a good conductor, So the amount of water between these pad-like structures acts as a conductivity detector. It is clear that when the soil contains high condensation and when there is a high mass of water it is decided that the conductivity is high hence the sensor gives elevated values resulting in high levels in the moisture content.

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5.3 DC driver Circuit

It is the chip in the device, takes a low current as input and change this low current signal to a high current signal to output a mechanical energy.

5.4 DC Motors

Motors process input signals through currents of high levels of amperes via battery systems of considerable capacity which outputs the motion.

5.5 Power Supply

Power is essential for the device to function the power is provided to the ESP8266 through a USB power line. A 9 volts power is sent across the motors for the motion of the agribot.

5.6 One channel Relay Module

The microcontroller is connected to relay, which in turn connected to water pump. This module helps in controlling the water pump on the basis of the sensed data of the senors.

5.7 Arduino IDE

This is an iot based platform which helps in the compilation and running of code programed in embedded c this idea is free and open -source which is easy to install with any operating systems with their respective configurations the ide plays a major role in feeding the code to nodemcus and Arduino uno board

5.8 Embedded C

To work on projects that are based on embedded systems, the knowledge in Embedded C is the key. This language is made up of C language and programmed based on the hardware designs. Embedded C enables microcontrollers to perform specified actions. We have come across many electronic devices in our daily lives, some of them includes smart phones, washing machines, dish washers and cameras are controlled using Embedded C.

5.9 Blynk Application:

This application is composed of three constituent: Blynk app Interface, Blynk Servers and Blynk Libraries.

- **Blynk app**: the gui design of Blynk application bridges the technology gap that is faced by users. The internal technical aspects like accomplishment are covered this app assists users with widgets and buttons for monitoring the systemic movements and other specifications defined.
- **Blynk Server**: this aids in authorizing the contact amidst hardware and the phone one can by the way monitor the hardware via mobiles
- **Blynk libraries**: It makes the application simple by providing inbuilt functions and modules and packages which makes code optimized and efficient.

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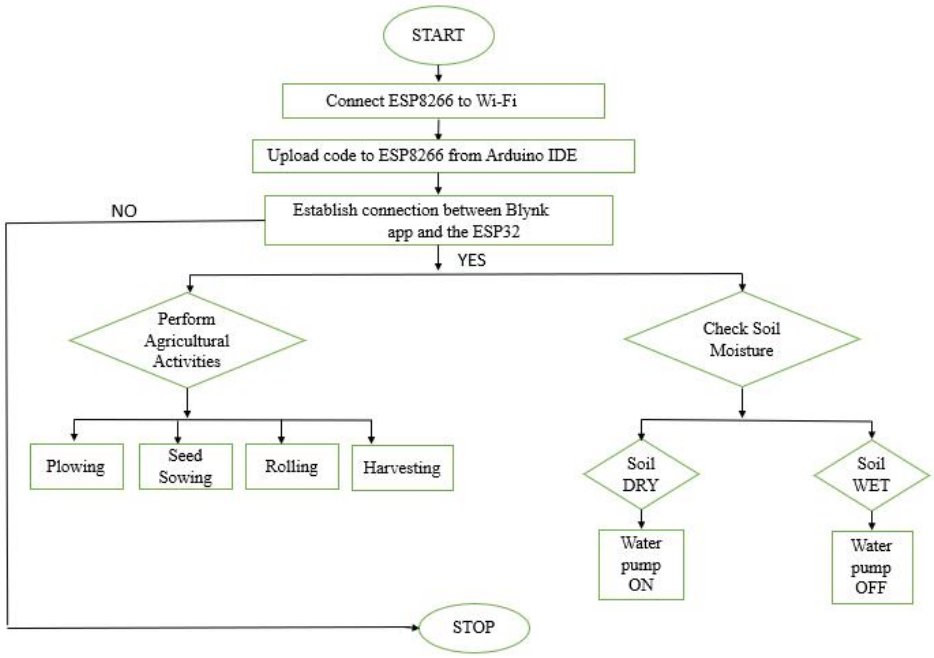

Figure 2: Flowchart of the proposed system

VI. SYSTEM ANALYSIS

6.1 Circuit Diagram

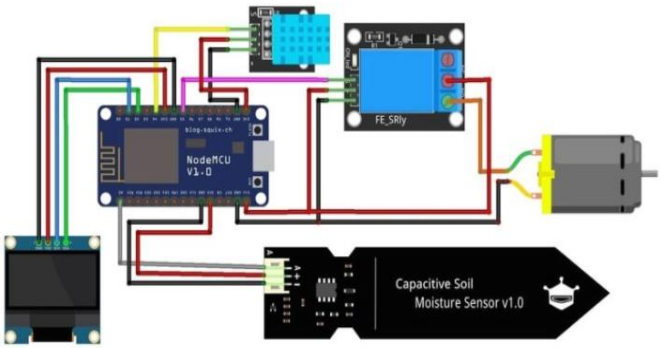

Figure 6.1. Connection of ESP8266 NodeMCU with other components

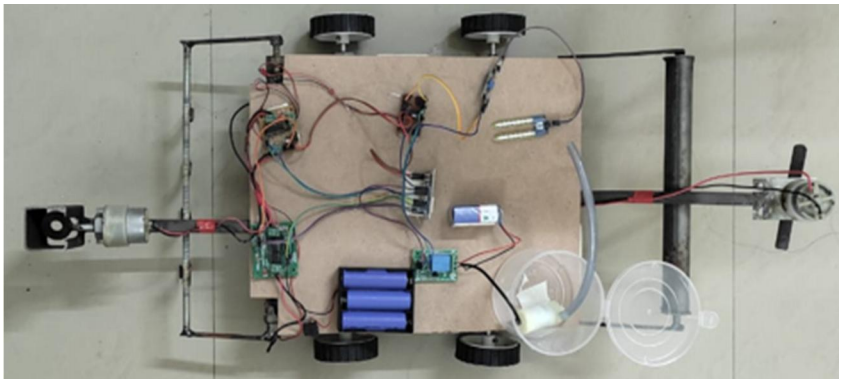

Figure 6.2. Top view of the proposed multi-purpose smart farm system

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VII. RESULT AND DISCUSSION

The images shown below displays the notifications that are sent on blynk app. The Figure 7.1. depicts that the soil is dry and immediately triggers the relay, which turn on the water pump. The Figure 7.2. notifies that the soil is wet, which turns off the water pump.

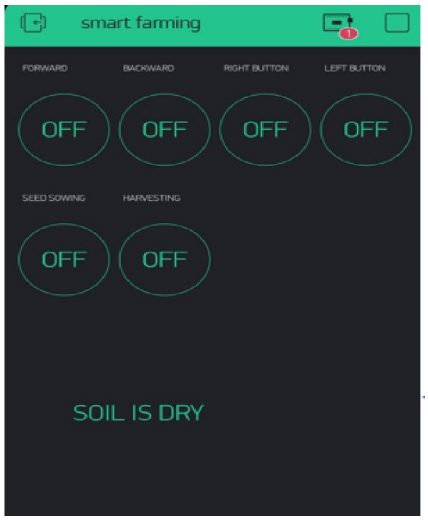

Figure 7.1: Displays that soil is dry

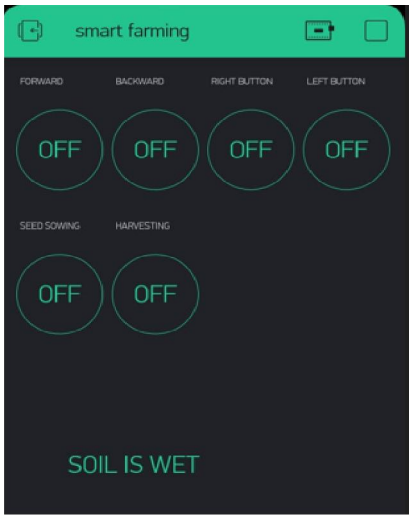

Figure 7.2: Displays that soil is wet

VIII. CONCLUSION

We have now understood the role of Iot in Smart Farming and how a robot was fabricated using the above mentioned methodologies and working principle of the robot which focused on describing how it was controlled and monitored using a Blynk mobile app.

It is most important to understand the application of IoT in Farming, since food is the universal source of energy to all life forms, and this area needs more emphasis because there is need for continuous food production for growing population.

There are both pros and cons associated in this application. The pros being reduced labor work, cost effective with increased food productivity and optimized manual work. The cons being that it cannot fully eliminate the complexities that arise in agricultural farm, there are times when there are wrong analysis of weather conditions and other drawbacks and setbacks due to lack of societal developments. However, experts and researchers strongly believe that the new inventions and development in this area of application would benefit in the field of agricultural sector.

IX. FUTURE SCOPE

The proposed system could be taken to the next level using Iot in agricultural field. The application of the multi-purpose robot system can be applied to large acres of field, by using the solar panels as power source, which is economic-friendly.

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