Smart Agriculture Fertilizer Spraying Robot

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Abstract—Nowadays, we are looking for the farmer is facing many problems in farming and it is consuming more time to manage the time in the land. Nowadays, many new technologies are introduced in the farming field which reduces the time and workload of farmers. In this paper, a smart agriculture fertilizer spraying robot is developed. The Internet of Things (IoT) is playing a major role in reducing manual labor. It is helpful to combined robots with agriculture which is capable of moving around the field for spraying fertilizer like a farmer. Them, NodeMCU controls the robot for spraying fertilizer and an ultrasonic sensor is used for obstacle detection coming in the front of the divider of land.

Keywords: NodeMCU, Android Phone, Arduino ide, water pump, spray nozzles

1. Introduction

Since IoT sensor provides information about agriculture fields and then act on it bases on user input, smart agriculture is a novel concept. The creation of a system that can monitor heat, level of water, moisture, and even movement if any occurs in the field that may affect the crops in agricultural fields is a feature of this paper. The use of NodeMCU in new technologies and implementations is becoming extremely common around the world, and it is an important goal to achieve in agriculture as well. Agriculture is the subject of several studies. The majority of projects indicate the use of a wireless sensor network to collect data from various sensors located at various nodes and send it via wireless protocol. The knowledge about different environmental factors is provided by the collected data. Monitoring environmental variables is not a complete solution for increasing crop yield. There are a variety of other variables that have a greated impact on productivity. As a result, automation in agriculture must be applied to address these issues. To address all of these issues, an integrated framework must be developed that considers all factors influencing productivity at each level. However, due to a vatriety of problems, full automation of agriculture is not possible. Despite the fact that it is being introduced at the research level, it is not being provided to farmer as a commodity so that they can profit from the resources. Its extraordinary feature is to make your farm smart and intelligent through use of IoT(NodeMCU) to save time, save human resource and to get good results in reduce efforts. This system will be a helping hand for the spraying fertilizer in large area.

2. Related Work

Abdullah Tanveer, Abhishek Choudhary.[1] suggested that farming can be achieved with the help of new technology to increase crop growth. We will measure temperature, light, humidity, and soil moisture in this project. The focus of this paper is on automated control features using cutting-edge electronics technology such as a microcontroller and a GSM phone line. Since the project is automated, it needs less manpower.

Mr. V. Gowrishankar[2] Suggested that robot is powered by the IoT In an agricultural area, Agribot has seeded and sprayed pesticides.

P.Usha, V. Maheswari[3] Formulated that The robot device is being used to establish a method of cultivating agricultural land that does not require the use of human labor. The aim of the paper is to save manpower, time, and money while increasing productivity.

Nikesh Gondchawar1[4] The newer scenario of declining water tables, drying rivers and tanks, and an uncertain climate present an urgent need for proper water utilization, which is described in this paper.

(Amrita Sneha[5] this paper aims to create a robot that can perform tasks such as automatic ploughing and seed dispensing. It also offers manual control when required and uses humidity sensors to keep track of the humidity. The AVR At mega microcontroller is the main component here, and it oversees the entire operation.

3. Proposed Methodology

The flowchart of proposed methodology for Smart Agriculture Fertilizer Spraying Robot is shown in **Fig. 1.**

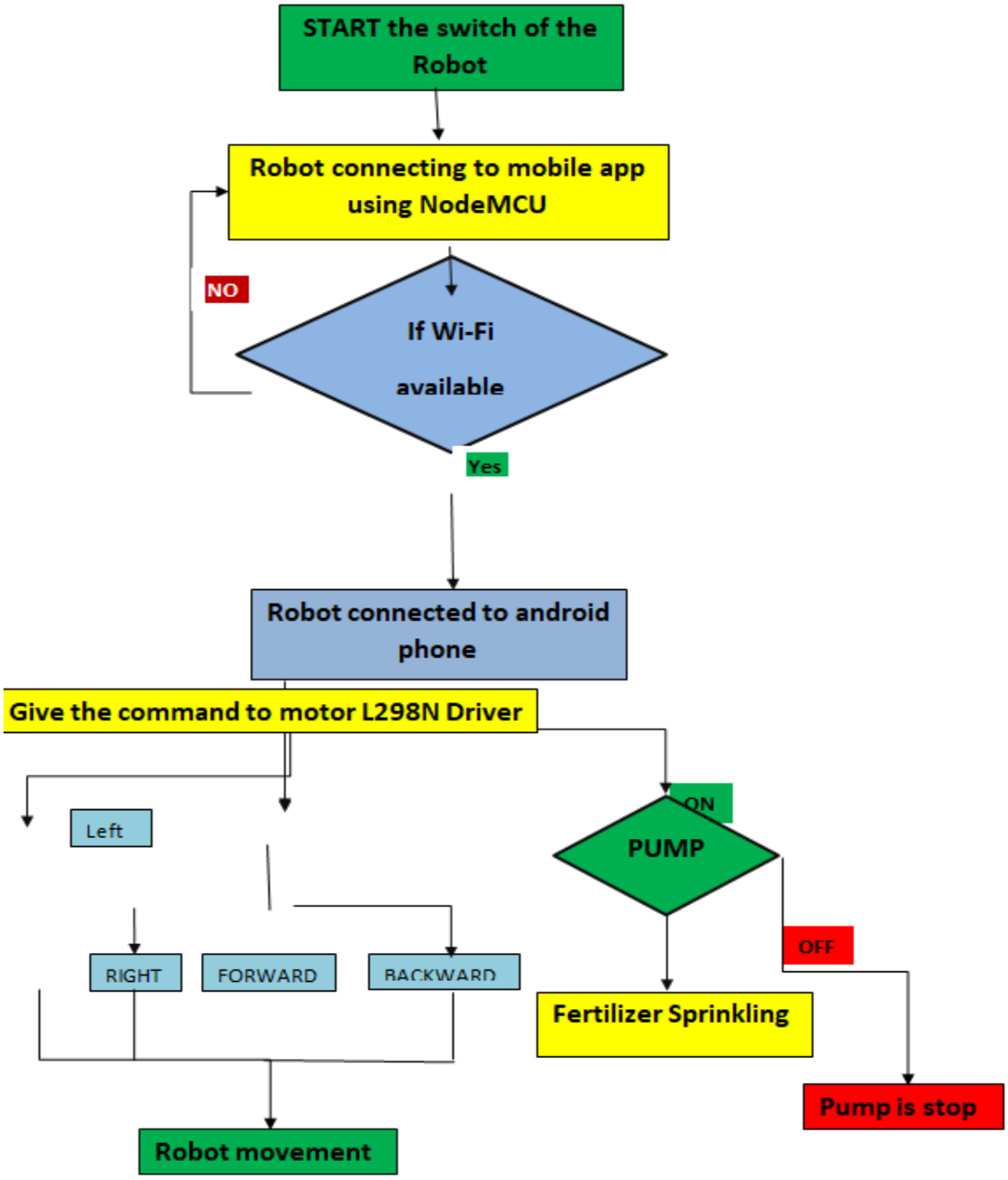

Fig. 1: Flowchart of proposed methodology for Smart Agriculture Fertilizer Spraying Robot

The steps involved in proposed methodology are enlisted as follows.

3.1 Fertilizer: - A fertilizer is ordinary or synthetic material that can help plants grow and reproduce by providing essential nutrients. Nitrogen(n) is required for leaf growth; phosphorus (p) is required for fruitroot, and flower development; and potassium (k) is reuired for water stems growth[6]. Any nutrient deficiency or excessive application can be extremely detrimental to the plant's health. More significantly, heavy fertilizer use not only causes financial losses, but it also has negative consequences for the soil and atmosphere, poisoning ground water depleting soil quality, and leading to global climate change. Overall , crops consume less than ½ of nitrogen fertilizer added, with the rest being released into the atmosphere or lost by runoff. Unbalanced fertilizer usage causes a nutrient deficit in the soil as well as the global environment, as agricultural activities are said to be responsible for about 81% of global deforestation [7]. Fertilization in smart agriculture assists in the better prediction of nutrient amounts, reducing there effects on the environment. Fertilization necessitates site-specific soil nutrient level measurements based on a variety of variables, including crop type, soil type, soil absorption capacity, product yield, fertility type and utilization rate, wether, and so on. The explanation for this is that measuring soil nutrient levels is not only costly but also time consuming, as it usually necessitates the analysis of soil sample at each site. To better represent this debates, the key inputs, processes, and resultant outputs of smart agriculture are summarize.

3.2 NodeMCU: -The ESP8266 (NodeMCU) is used. The ESP-12E module on the development board contains an ESP8266 chip with a TensilicaXtensa 32-bit LX106 RISC microprocessor that supports RTOS and runs at 80 to 160 MHz adjustable clock frequency[8]. It also has 128 KB of RAM and 4 MB of Flash memory (for program and data storage), which is more than enough to handle the big strings that make up web pages, JSON/XML data, and everything else we throw at IoT devices these days [9]. The ESP8266 includes an 802.11b/g/n HT40 Wi-Fi transceiver, allowing it to link to a Wi-Fi service and communicate with the Internet, as well as create its own network for other devices to connect to. This expands the capabilities of the ESP8266 NodeMCU.

3.3 NodeMCU Power Requirement: Due to the ESP8266's operating voltage range of 3V to 3.6v, the board includes an LDO voltage regulator to keep the voltage stable at 3.3V. It can reliably supply up to 600mA, which should be more than enough when ESP8266 pulls as much as 80mA during RF transmissions. The output of the regulator is also broken out to one of the sides of the board and labeled as 3V3 [10]. This pin can be used to supply power to external components. The ESP8266 NodeMCU is shown in**Fig. 2**.

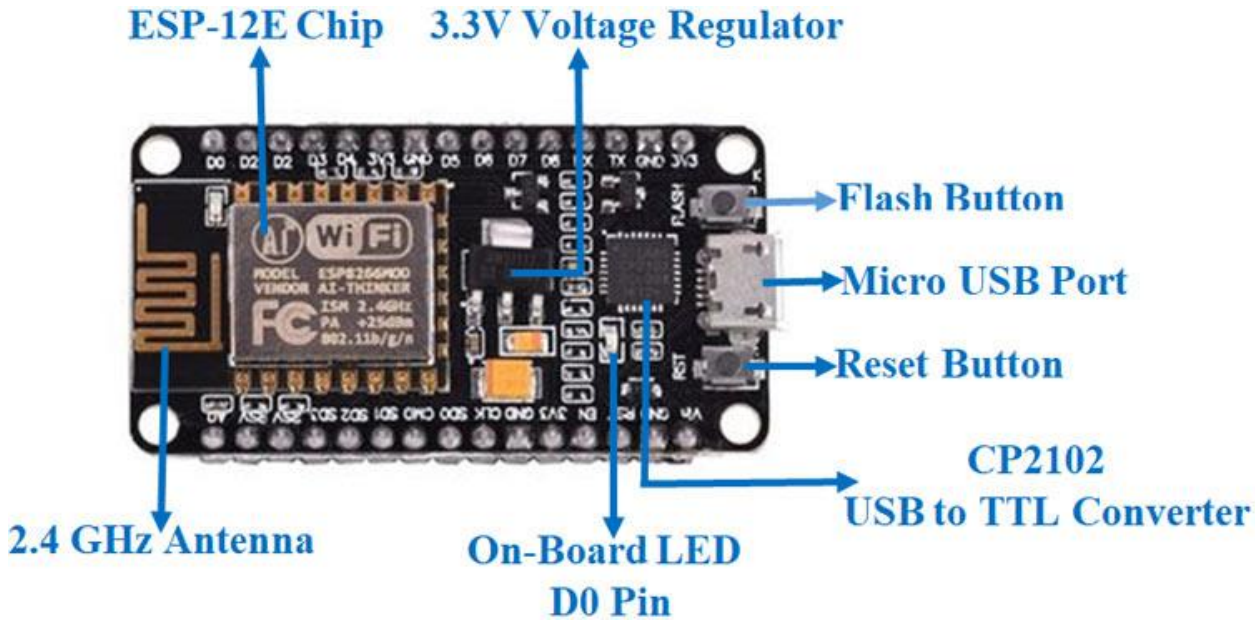

Fig. 2: is describe the NodeMCU pins

The on-board Micro-B USB connector provides power to the ESP8266 NodeMCU. If you have a controlled 5V voltage source, you can use the VIN pin to power the ESP8266 and its peripherals directly.

4. Experiment Results

We are connecting the device with 12 volt dc battery which can supply the power to our device and this power supply is going through NodeMCU and NodeMCU is control the all devices though can are connecting. Here L298N hybrid motor driver ic are used for supply the proper manner voltage and which are control the DC motor as well as water pump. NodeMCU have inbuilt microcontroller ic and that Ic are connected to the Wi-Fi module inbuilt in NodeMCU module [11].AT that time incest are eating the tree that why many farmer are not getting the required food and that device is help to destroy the insect in the field. The agriculture robot's base frame is made up of four wheels linked by four arms, with DC motors driving both the rear and front wheels. The fertilizer is sprayed with a sprayer fitted with a water pump. Wi-Fi technology is used to monitor the entire activity of the robot for fertilizer spraying and robot movements through a smart phone in fig 3 (show android app). NodeMCU is the brains of the proposed scheme. The NodeMCU is interfaced with a Wi-Fi module, DC motor, and a water pump to provide various operations such as robot movements and fertilizer spraying in fig 4 (robots are fully control by android phone). The system's entire function is powered by an Android smart phone's Wi-Fi module [12]. The robot can drive in four directions thanks to Wi-Fi technology's wireless communication: front, back, right, and left. To drive the robot forward, backward, stop, left, and right, various commands can be used.in fig no.3,And the Internet of Things system makes farmer work easier and more efficient, and it is beneficial because even though the computer covers a wide area, it functions as if it were a farmer.

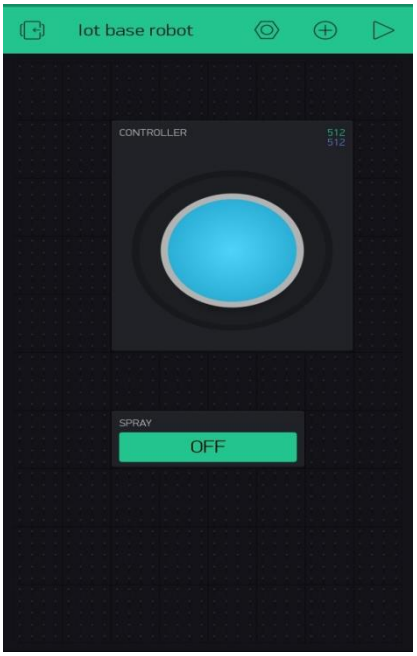

Fig. 3Robot controller app

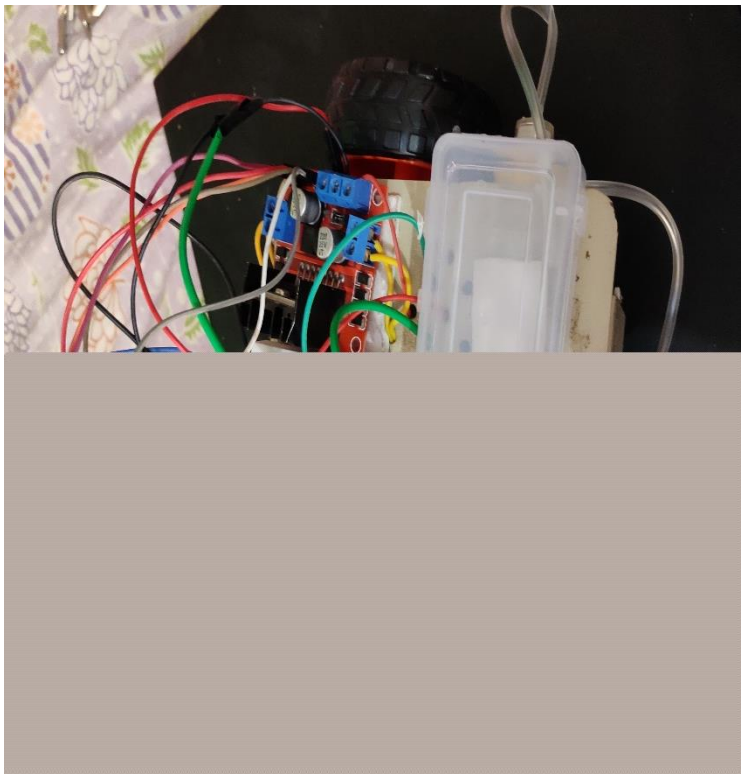

Fig. 4 Robot and it's fully control by phone.

It also has more than 500 liters of fertilizer in the robot and can spray an area of more than 5 kilometers2.There are many device like drone etc. which are more expansive compare to poor farmer that cannot effort drone devices. We are introduce our robot that is cheaper compare to anther devices and we can used in the place of fuel, solar panel and is free of cast energy generation device. That is helpful the poor farmer.

5. Conclusion

The hardware components have been successfully assembled, and the robot has been able to communicate with the NodeMCU. The ability to control the robot's motion through Wi-Fi and an Android applet has been achieved. As a result, the two control modules for the robot have been successfully tested and demonstrated.While controlling a robot with Bluetooth limits the range of communication distance, it is a smart and simple way to direct a robot. One of the simplest ways to control the motion of a robot is to use the internet. Since it necessitates the user's access to the specified guide. People would find it easy to use. In comparison to another unit, this is less expensive.

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