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Automated IoT Based Indoor Irrigation

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ABSTRACT

Agriculture is becoming an important growing sector throughout the world due to increasing population. Major challenge in agriculture sector is to improve farm productivity and quality of farming without continuous manual monitoring to meet the rapidly growing demand for food. Apart from increasing population, the climate change is also a big concern in agricultural sector. Thus, rather than performing outdoor irrigation; here a small indoor farming method is performed based on Internet of Things. The smart farming method enables the collection of data and automated farming technique.

Keywords: Agriculture, Farm productivity, Climate change, Internet of Things.

I. INTRODUCTION

For continuous increase in demand and decrease in supply of food necessities, it is important to perform improvement in Production and Food technology. Agriculture is the only source to furnish this. This is an important factor in human society for improving food production. Agriculture plays a vital role in the economy and development of countries like India. Lack and scarcity of water results in decreasing volume of water on earth, which people use for irrigation. Irrigation is defined as the science of artificial application of water to the land or soil i.e, depending on the soil type, plants are irrigated.

II. OBJECTIVE

1. **Real Time Data**: People can visualize water levels and humidity values in real time and remotely to accelerate the decision making process.
2. **Lowered Operation Cost**: Automating processes in irrigation, can reduce resource consumption, human error and overall cost.
3. **Efficient and Saves Time**: The machine-to-machine interaction provides better efficiency, hence; accurate results can be obtained fast. This results in saving valuable time. Instead of repeating the same task everyday, it enables people to so other creative jobs.
4. **Water conservation**: Allows the usage of water only when and where needed.

III. PROPOSED SYSTEM

NodeMCU is being used in this system. Compared to other microcontrollers, NodeMCU:

- Has an integrated support for Wifi network
- Reduced size of the board
- Low energy consumption
- Lower cost

Operating voltage of NodeMCU is 5V. But, this system needs a 12V power supply. Hence, a LM2596 step down power supply module has been used to step-down the power. And, it is mandatory that 12V power should not be given to NodeMCU. And, it is mandatory that 12V should not be given to NodeMCU. And, limit switch 1 and 2 are been used

which are kept at the two extreme sides i.e, on to left and right. When, the moving pipes touches the edge, the limit switch would turn ON. It would sense. And, it would reverse the direction of pipe. DHT11 sensor is placed at the root zone of the plants, sends the sensed value (humidity) to NodeMCU which would be uploaded to the cloud page. And, the data would be monitored form the mobile application. A separate 5V supply should be given to MG996R Servo motor. And, if the sensed humidity value is low, the Relay would turn ON, which in turn make red and blue LED's to be in ON state.

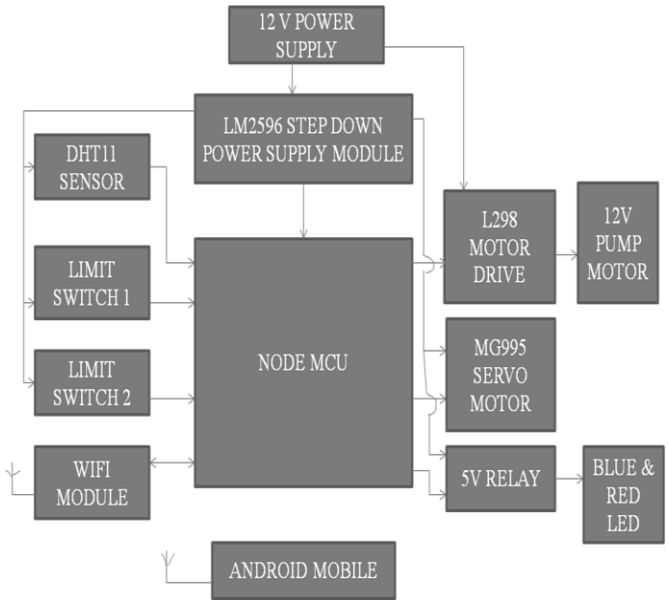

Figure1: System Model

IV. IMPLEMENTATION

STEP 1: Materials and Tools

- 8*3-Way Corner Elbow PVC Fitting Connector(for ½")
- 4* 245 mm long of ½" PVC pipes
- 4*163 mm long of ½" PVC pipes
- 4*320 mm long of ½" PVC pipes
- 1* 200 mm long of 3/8" PVC pipes
- GT2 6mm wide belt approximate 1 meter
- 1* MG995 servo motor
- 1* Priming Diaphragm Pump Spray Motor 12V
- 1* L298 N dual H bridge motor driver board
- 1* NodeMCU
- 2*MX1382-02 Microswitch
- Electrical wire
- Dupond wire
- Jack connector
- 12V power adapter
- Silicone rubber tube approximate 2 meter
- 2* 60mm*60mm*3mm thick acrylic sheets
- 2*Motor gears
- 5V relay board
- 5*10k resistor
- 5*10 ohm resistor
- Blue and Red led's

STEP 2: To Prepare Smartphone and Computer

- Install Arduino IDE. We can download it from Arduino website.
- Install Arduino core for ESP8266 WiFi chip.
  Install Blynk library for Arduino IDE.
  Download Blynk App for smartphone.

STEP 3: Create IoT Automatic Plant Watering System App

- Open Blynk App and create a Blynk account
- Create new pStep7: Setting and Uploading our Sketch
- Project and give it a name i.e., IoT Plant Watering, then select the hardware to NodeMCU
- Press the "Create" button then we will get Auth Token to our E-mail. This Auth token would be used in the NodeMCU code.
- Add widgets to the project and set them up.

STEP 4: Make Watering Tube

- Drill 1 mm holes, 20 mm apart from others in 3/8" 200 mm long pipe leaving 40 mm at each end; these holes are water vent.
- Drill a 5/16" hole in the middle on the other side of the pipe; the water from the rubber band will pass this hole.
- Seal two ends of the pipe with epoxy putty.

STEP 5 : Prepare Linear Slide Part

- Attach the tube to the linear slide part(Gear) with epoxy glue

STEP 6: Assembly Frame

- **Make the base:** Attach two 163 mm long tubes and two 320 mm long tubes to four 3-way corner elbows, putting 10 mm of the end of each tube into the 3-way corner elbow.
- **Make the top part:** Attach one 163 mm long and two 320 mm long tubes to two 3-way corner elbows.
- Insert the linear slide part
- **Finish the top part:**
    - Attach two 3-way corner elbows to one 163 mm long tube.
    - Attach it to the top part.
- **Adjust the linear slide part:**
    - Move the linear slide part.
    - Adjust the frame until the linear slide part moves smoothly.
- Assembling the gears
- Adding the Belt
- Inserting Rubber Tube
- Connecting Limit Switch
- Soldering Wires to Pump Motor
- Grouping Electronic Modules
- Wiring
- Installing the Limit Switch
- Setting Up Water Pump

STEP 7: Setting and Uploading the Sketch

- Open "IoT_Watering_System.ino" using Arduino IDE
- Enter your Auth Token that you get when you create your IoT Plant Watering project in Blynk App.
- Enter a network name that you want to connect and its password.
- Save it.
- Connect your NodeMCU using the USB cable.
- Open our sketch that we have already edited using Arduino IDE.
- Select board and port in Tools menu
- Click the Upload button.

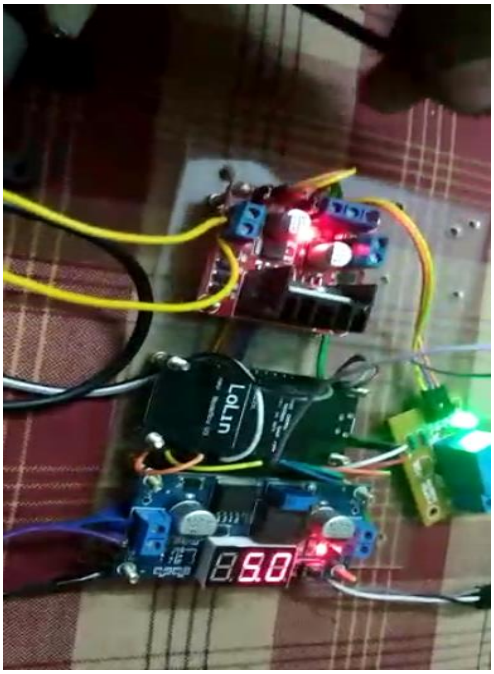

Figure 2 : Hardware connections

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