Plant Monitoring Automation System Based on IoT

A Project for the Completion
Of our DIY Laboratory First Year

By

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Preface

In today's world, we find ourselves involved in many things that reduce our time in taking care of gardens or nurseries or to grow plants in our houses.

This project is going to take care of that in an automated fashion so that one can, without any worry, devote time to their daily activities as well as not fail to raise a plant properly at low-cost at their homes.

Using Internet of Things (IoT) technology implemented in a real-time project, this Miniature version of a Plant Monitoring Automation System monitors every aspect of a plant in an automated fashion.

The Internet of Things (IoT) is a virtual network of various devices (sensors, actuators and system), rather than between end-users (which is referred to Internet of People).

This project implements this network between various environmental control sensors and actuators and System Microcontroller - ATMEGA Chip installed on the Arduino UNO R3. The whole purpose is to monitor a garden or nursery plant, in a full-fledged manner and also enable remote monitoring through NodeRED Interface.

ACKNOWLEDGEMENTS

Firstly, we, the group members, would like to thank the **DIY Laboratory Authorities** and **Professor Bharath Aithal, Professor P. Ganguly, Professor Prasun and all other Professors and Deans associated with this Course**, for giving us the wonderful opportunity of this project to learn the various aspects of "Do It Yourself" and implement it in a real-time problem.

Secondly, we would also like to thank our **Parents and the other E-Commerce facilities** for availing us the components required for this Project in this Pandemic Situation.

Finally, we would like to express our gratitude towards the **Indian Institute of Technology, Kharagpur, faculty and Academic Administration** for providing us this course on building up our skills in hands-on experience.

1. INTRODUCTION

1.1. MOTIVATION BEHIND THIS PROJECT

Plant-growing and maintenance is a hobby for many household members. Buying a plant is simple, but taking proper care of it, watering it on a daily basis, based on its requirements, noting the colour of the leaves for pest-attack becomes quite a hectic job for us.

This Plant Monitoring Automation System comes at a low cost of approximately Rs. 1600, to take care of all these problems and tackle them together. This is the main motivation behind this Project.

Also, buying technical components for monitoring a plant or nursery might be tricky, as many of these components are bulky (therefore, not space-efficient) and costly (therefore, not economical). Even with those components, it becomes a job to still go to the Garden and take a look at the plant atleast once. So, current technology fails to tackle the problems which our Plant Monitoring Automation System easily overcomes.

1.2. Some Important Remarks

It is interesting to note that various other approaches towards developing a Smart Plant Monitoring System were made previously by various researches across the Universities in the United States, Europe and several other places.

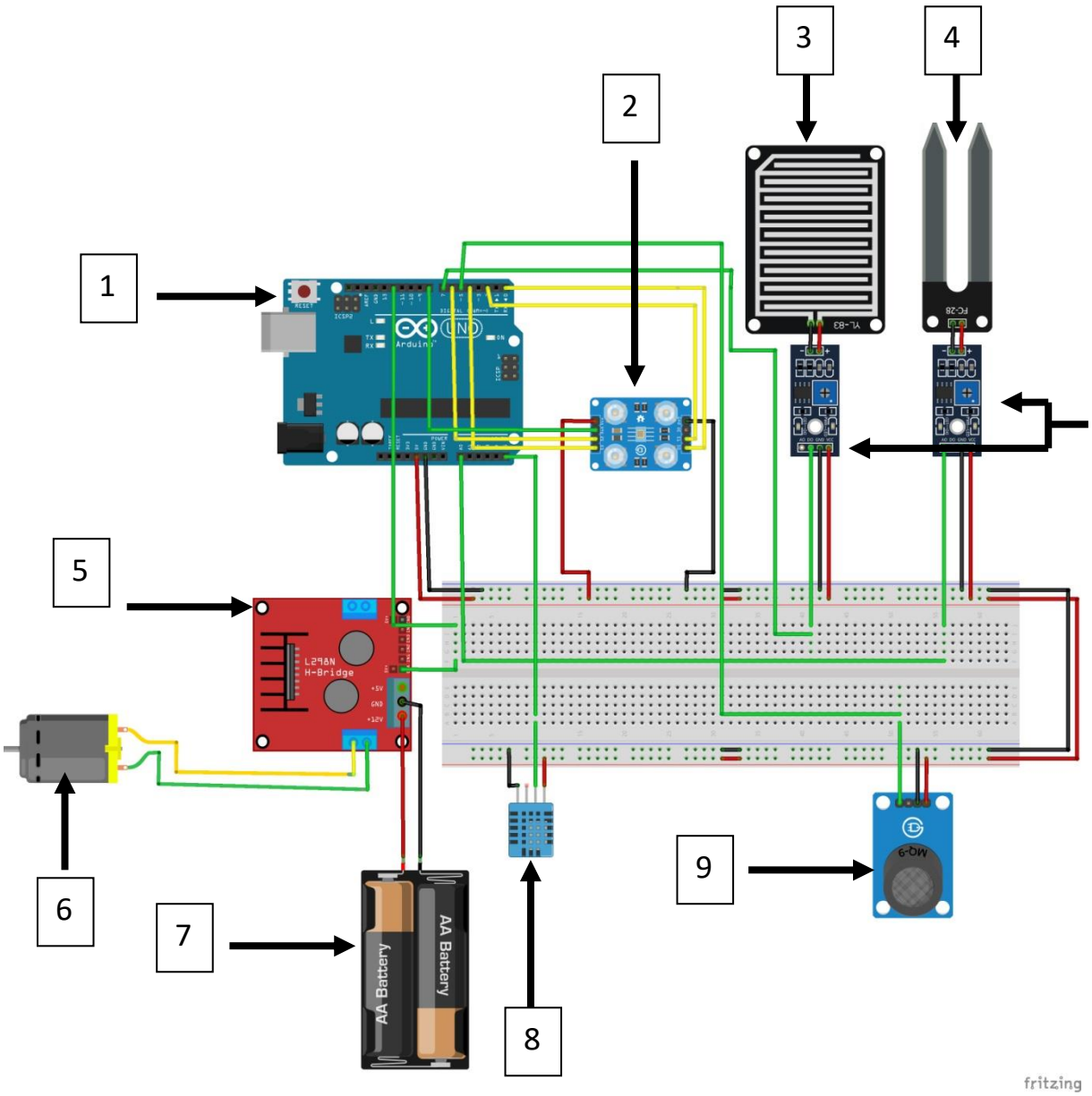
It is very evident from this that the Agricultural Sector is slowly getting upgraded to be electronically controlled and monitored.

In the *International Journal of Advanced Research in Science and Engineering (IJARSE),* Vol. 7, Special Issue No. 3, April 2018, IoT Based Smart Plant Monitoring System was adopted as a significant project.

All this motivated us to choose this sector of Technology to create our Project and improve on it, with lower cost, and simpler arrangement on a simple piece of board.

2. MODEL EXPLANATION

2.1. CAD MODEL



LEGEND:

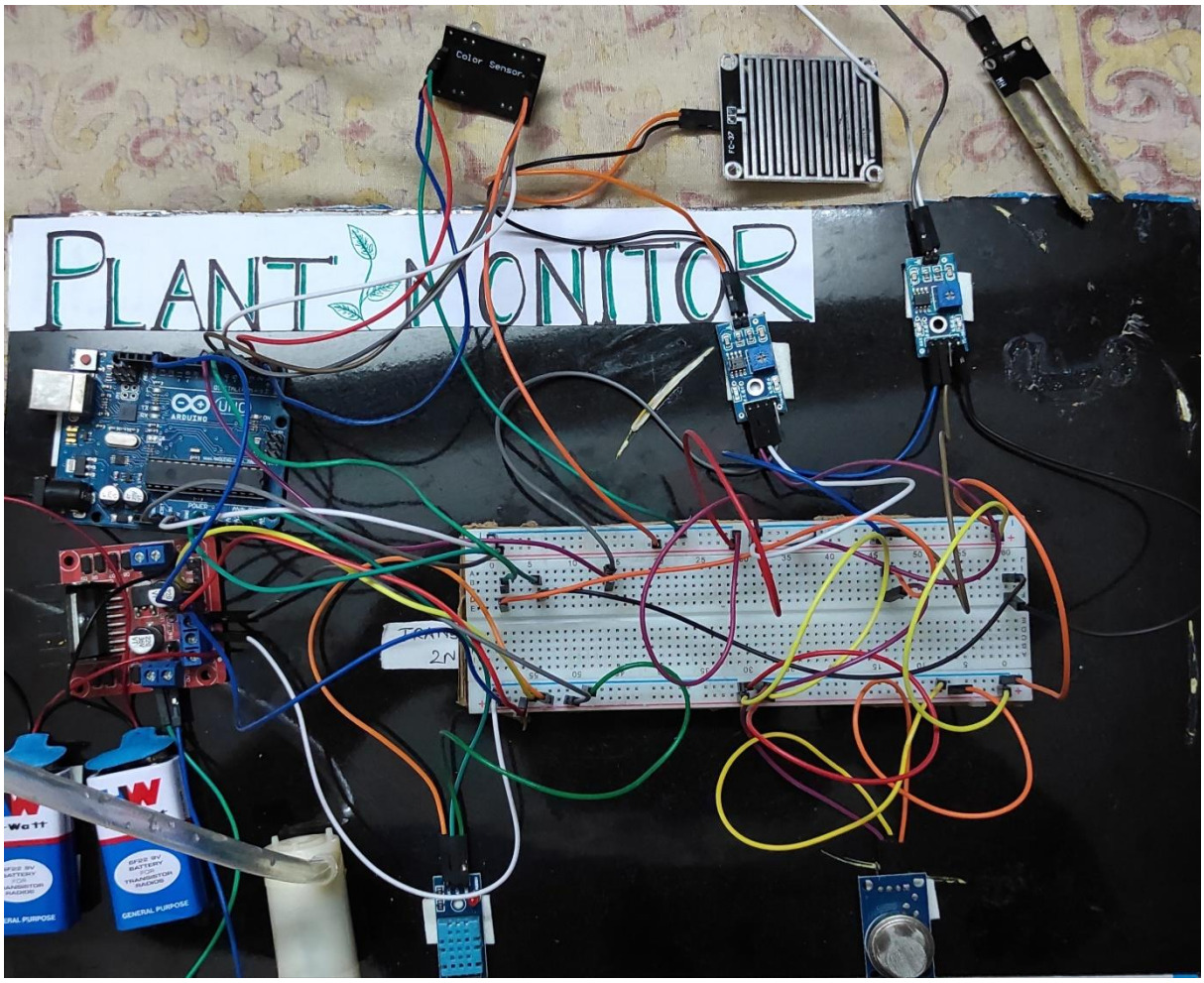
1. **Arduino UNO R3**
2. **TCS-230 Color Sensor**
3. **Raindrop Sensor**
4. **FC-28 Soil Moisture Sensor**
5. **L298N Motor Driver**
6. **DC (3-6)V Water Pump Motor**

7. 12 V External Supply for running the Motor Driver and Pump at 5.67 V optimally

8. DHT Temperature and Relative Humidity Sensor

9. MQ-135 Air Quality (AQ) Sensor

2.2. ACTUAL MODEL



As we can see from the two models, the Actual Model has been made very similar to the CAD-Simulation Model we had initially designed.

Overview of the working of the Model

1. The Sensors (2,3,4,8,9 on CAD Model) respond to stimuli and convert them into electronic pulses (Digitally or Analogically) and feed them into the Arduino Board Microcontroller, ATMEGA Chip.
2. The ATMEGA Chip on the Arduino UNO R3 (1) analyses the data and coordinates the different data to activate the pump or send an alert message into NodeRED Dashboard automatically.
3. The Motor Driver (5) and the Water Pump (6) accordingly gets activated if soil and environmental conditions turn dry.
4. The Colour Sensor (2) also checks if the leaves are undergoing any pest-activity or not and raises alert accordingly.
5. The entire set-up forms a virtual network of sensors, actuators and system, thus implementing, Internet of Things (IoT) Technology in a real-life problem.

3. CONCLUSION

In conclusion, we would like to say that we have almost successfully developed our Smart Plant Monitoring IoT System, and it works as demonstrated in the video.

Thus, this entire set-up can be implemented in regular lives for serving its purpose. Also, this is one of the beginning stages into Computer-Manipulated Agriculture and Agronomy.

All components of our System, including the sensors, actuators and system work successfully and properly.

4. COMPLEX RESULTS AND CALCULATIONS

1. COLOR SENSOR DATA

The Color Sensor fed data in terms of pulses of voltages (mainly between 25 and 72), that we had to map between 0 and 255 accordingly to show the correct value of frequency (not of the colours, but of the Pulses).

The RGB data received was then manipulated to identify fresh-green leaves, dry leaves and pest-consumed leaves.

2. MOTOR DRIVER POWER

The L298N Motor Driver is powered externally by the 12V Battery Supply and internally by the Arduino Board.

The ordinary voltage drop across this Motor Driver = 2V
Voltage Drop in working Condition = 6.75 V, due to the Arduino Board taking some of the supply and the Current Sensing Pin

So, voltage available for Motor = (12-6.75) V = 5.25 V

This is the optimum voltage for running the pump motor which was rated around (3-6)V

5. REFERENCES

1. http://www.ijarse.com/images/fullpdf/1523549158_309IJARSE.pdf (Inspiration for our Project)
2. https://forum.arduino.cc/ (For asking questions on Arduino and related Modules)
3. https://fritzing.org/ (For preparing our CAD Model)
4. https://www.arduino.cc/ (For general trivia on Arduino and related Modules)