Project Report: Smart Agriculture with IoT

Introduction

In our project we designed a system for monitoring air temperature, air and soil humidity and brightness of a plant-house. We send the data that we collect through ESP8266 (Wi-Fi module) to https://thingspeak.com/channels/622685 for monitoring. Also we created a twitter account and liked it to our Thingspeak channel, in this way our system tweets extreme changes in temperature, humidity and brightness automatically. One can access the twitter account via the following link https://twitter.com/sagwiot.

Sensors and specifications

To construct our system, we used an Arduino Uno board and a prototype shield to make a stable circuit. We used 3 sensors one of them is DHT11, which is a temperature and humidity sensor. It is an advanced sensor unit that outputs a calibrated digital signal and it is highly reliable and stable in long term studies. It includes a 8 bit microprocessor and produces fast and quality response. It measures temperature with an error of 2°C between 0 and 50 ° C and it measures moisture with a 5% RH error between 20-90% RH. For measuring soil humidity we used a soil moisture sensor which is a sensor that you can use to measure the amount of moisture in the soil or the level of a liquid on a small scale. Moisture meter probes are used by immersion in the measurement environment. Due to the resistance of the soil or the liquid immersed in it, a voltage difference occurs between the probe tips. The amount of moisture can be measured according to the magnitude of this voltage difference. As the humidity in the soil increases, the conductivity increases. Sensitivity adjustment can be made with the trimpot on the circuit board. As for our last sensor we used LDR for detecting the brightness. It has an operating principle which is inversely proportional to the light intensity. In other words, as the light intensity increases, the resistance value decreases, as the light intensity decreases, the resistance value increases. LDR acts as a switching function with the change of its resistance values. In another way, it acts as an optical sensor.

Communication

For transmitting our data to Thingspeak server we used an ESP8266 Wi-Fi Serial Transceiver Module which supports TCP/IP protocol. It can be monitored via this link anywhere in the world: https://thingspeak.com/channels/622685 . Also the system can

tweet automatically some extreme situations as high and low temperature, soil humidity and brightness in this link: https://twitter.com/sagwiot . The ESP8266 has an internal antenna. This way, it can connect to the Wi-Fi network in the environment and send and receive data packets.

Power management

To power our circuit we used 6 18650 li-ion batteries. The first 3 of them are serially connected and the other three are also serially connected. Then these two serially connected structures are parallel connected to produce 11.1 V. One of the 18650 li-on batteries can produce 3.7 volts and 1300 mAh capacity. 3 parallel connected solar panels charge batteries with 12V and 125 mA. In this way, the system is sustainable and doesn't need an external power supply. To stabilize the voltage to 5 volts and also to power sensors and Arduino independently, we used a LM7805 voltage regulator. Our circuit schematic is shown below.

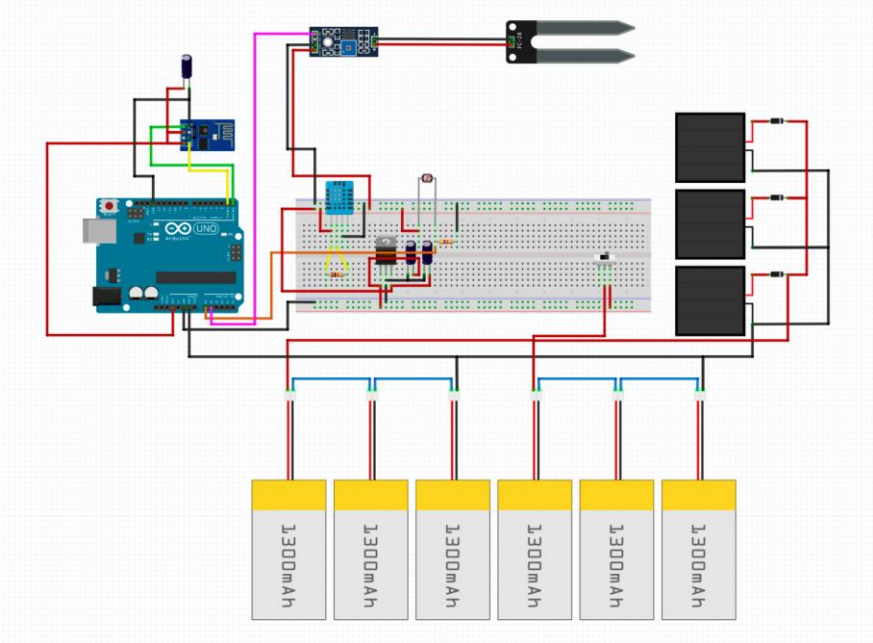


Figure 1 Circuit Scheme

Our Thingspeak and Twitter account screenshots are respectively, shown below:

Smart Agriculture with IoT

Channel ID: 622685
Author: emirbyildiz
Access: Public

This project aims to track the conditions of a plant and lets user to know them.

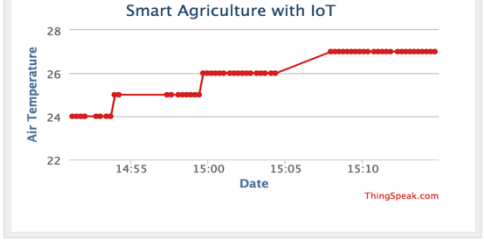
Private View | Public View | Channel Settings | Sharing | API Keys | Data Import / Export

Add Visualizations | Add Widgets | Export recent data | MATLAB Analysis | MATLAB Visualization

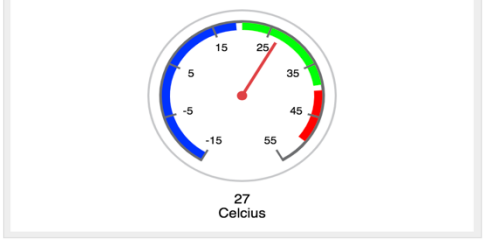
Channel Stats

Created: 28 days ago
Updated: 9 days ago
Last entry: 3 minutes ago
Entries: 103

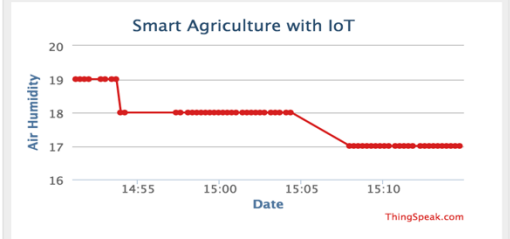
Field 1 Chart



Temperature

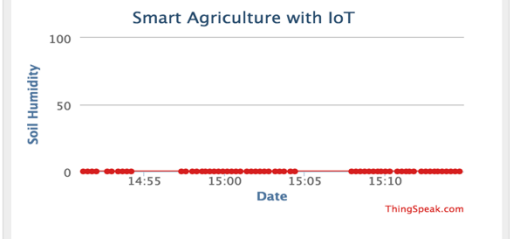


Field 2 Chart

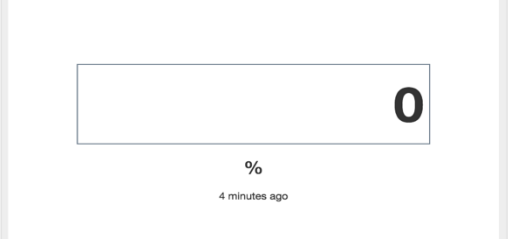


Humidity

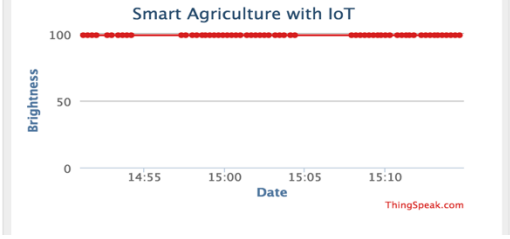
Field 3 Chart



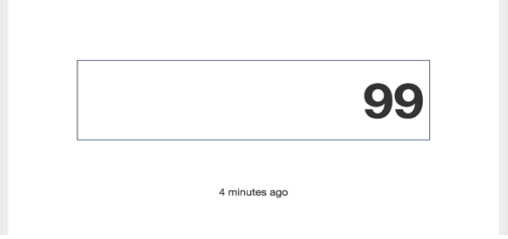
Soil Humidity

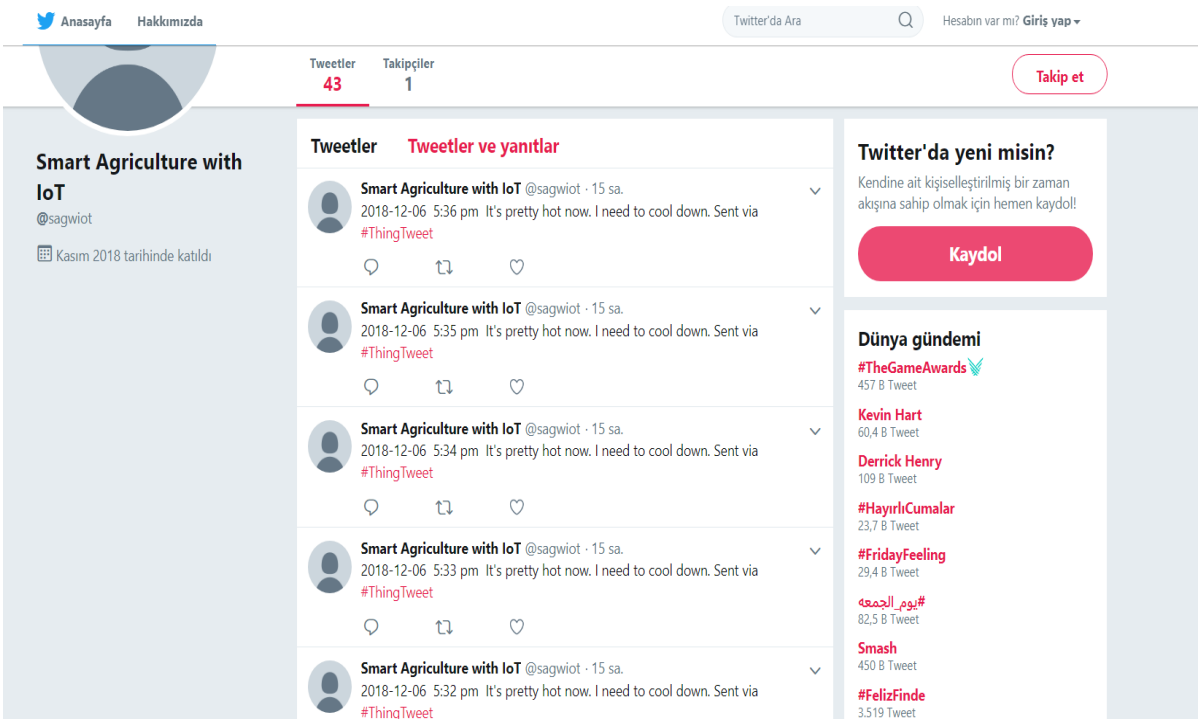


Field 4 Chart



Brightness





References:

https://www.sunrom.com/get/443700 (LDR data sheet)

https://www.mouser.com/ds/2/758/DHT11-Technical-Data-Sheet-Translated-Version-1143054.pdf (DHT11 data sheet)

http://www.mouser.com/ds/2/744/Seeed_101020008-838655.pdf
(Soil Humidity sensor data sheet)

https://maker.robotistan.com/esp8266-dersleri-2-thingspeake-sicaklik-yollama/

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