報告題名：溫室自動化監控系統

Environmental Control System of Greenhouse

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開課系所：電子二合

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摘要:

目的:

溫室主要目的為隔離外界環境影響和提供適合生長的環境，以提高植栽生產品質。但市面上建置溫室系統需花費高昂成本並且控制介面不夠友善，故降低了一般百姓的使用意願。為了增加可用性及普遍性，本專題針對溫室設計開發一套方便操作的低成本溫室自動化監控系統。

原理:

我們使用 ESP8266WiFi 模板作為連接網路的工具，接上光感測器、溫濕度感測器與土壤濕度感測器，並且將資料上傳至 ThingSpeak，手機上下載 ThingView 程式，我們就可以從手機、平板等輕易的遠端監測環境數值。另外，再以繼電器加上水泵，配合土壤濕度感測器，當監測到數值低於一定值，則會啟動水泵，以作為澆水的工具。我們先準備一個小杯子，放入水泵，然後在接上水管並導向植物，就可以實現自動化的澆水。光照時長的部分，我們使用繼電器驅動馬達作為簡易遮罩，而自製遮罩與光感測器配合，使植物維持在一定的光照時間。以達到自動觀測及調整的目的。[1]

關鍵字：土壤溼度感測器、智能溫室、溫溼度感測器、光敏電阻

Abstract

purpose:

The main purpose of the greenhouse is to isolate the influence of the external environment and provide an environment suitable for growth in order to improve the quality of planting production. However, building a greenhouse system on the market requires high costs and the control interface is not friendly enough, which reduces the willingness of ordinary people to use it. In order to increase usability and universality, this topic designs and develops a convenient low-cost greenhouse automation monitoring system for greenhouses.

principle:

We use the breadboard to connect the ESP8266, and use the ESP8266 to receive the signals from the light sensor and the soil moisture sensor, so that we can get the light duration and soil moisture values from Thingspeak, and use a water pump as a watering tool , First prepare a small cup, put it in the water pump, and then connect the water pipe and guide the plants, cooperate with the soil moisture sensor, you can automatically water, and we use the shield to cooperate with the light sensor for the long light period. Keep plants in a certain light time.

Keyword: Light sensor, Temperature-Humidity sensor, ThingSpeak, Thingview, Greenhouse

目錄:

一、前言:

在植栽培養過程中，環境因子如濕度、溫度、日照強度、土壤水份等，對植物生長品質有決定性的影響。

本次研究主題是自動化養植植物。利用 ESP8266WiFi 模板、光敏感測器、濕度感測器、水泵與自製遮罩組實現自動化控制日照時長與自動澆水的功能。

在日新月異的科技發展中，任何新穎的想法都可能化為明日日常所使用的工具，有些甚至能帶給不一樣的產業革命性的改變，在這種環境下，我們該思考如何才能將我們所學到的知識，與不同的產業進行整合，使得不同產業達到智慧發展。

在最初步想法是由於現在年輕人生活繁忙，家裡植栽可能疏於照料，我們希望僅使用一低成本且簡易的溫室，即可提高植物的生長品質。

在未來，我們更希望以簡易溫室為基礎，做智慧化種植植物作為一個思維的開啟，進一步思考智慧化的農業能帶來怎麼樣的好處，舉凡減少氣候帶來的農損，緩解農村高齡化及從農人力短缺，提升水資源之有效利用、解決農業栽培及漁、畜飼養過程產生之廢棄物處理等問題，達成資源循環利用、環境友善及農業永續。[2]

Introduction

In the process of plant cultivation, environmental factors such as humidity, temperature, sunshine intensity, soil moisture, etc., have a decisive influence on the growth and quality of plants.

The subject of this research is automated cultivation of plants. Utilize ESP8266 WiFi template, light sensor, humidity sensor, water pump and self-made mask group to realize the function of automatic control of sunshine duration and automatic watering.

In the rapid development of science and technology, any novel ideas may be transformed into tools used in tomorrow's daily life, and some can even bring about revolutionary changes in different industries. In this environment, we should think about how we can transform what we have. The knowledge learned can be integrated with different industries to enable different industries to achieve smart development.

We hope to use intelligent planting as a starting point for thinking, and to further think about the benefits of intelligent agriculture, such as reducing agricultural losses caused by

climate, alleviating the aging of rural areas and the shortage of agricultural labor, and improving water resources. Effectively use and solve the problems of agricultural cultivation and waste disposal in the process of fishery and livestock breeding, and achieve resource recycling, environmental friendliness ,and agricultural sustainability.

Through this experimental topic, I hope that everyone can pay attention to the future development of agriculture and promote the future to be more time-saving, labor-saving, more efficient, refined and resource utilization, and to establish a safe farming environment to make agriculture younger and have more ownership. High competitiveness.

二、研究步驟

我們使用 ESP8266WiFi 模板作為連接網路的工具，接上光感測器、溫濕度感測器與土壤濕度感測器，並且將資料上傳至 ThingSpeak，手機上下載 ThingView 程式，我們就可以從手機、平板等輕易的遠端監測環境數值。另外，再以繼電器加上水泵，配合土壤濕度感測器，當監測到數值低於一定值，則會啟動水泵，以作為澆水的工具。我們先準備一個小杯子，放入水泵，然後在接上水管並導向植物，就可以實現自動化的澆水。光照時長的部分，我們使用繼電器驅動馬達作為簡易遮罩，而自製遮罩與光感測器配合，使植物維持在一定的光照時間。[3]

Steps

We use the breadboard to connect the ESP8266, and use the ESP8266 to receive the signals from the light sensor and the soil moisture sensor, so that we can get the light duration and soil moisture values from Thingspeak, and use a water pump as a watering tool , First prepare a small cup, put it in the water pump, and then connect the water pipe and guide the plants, cooperate with the soil moisture sensor, you can automatically water, and we use the shield to cooperate with the light sensor for the long light period. Keep plants in a certain light time.

三、程式碼:

Arduino 控制感測器

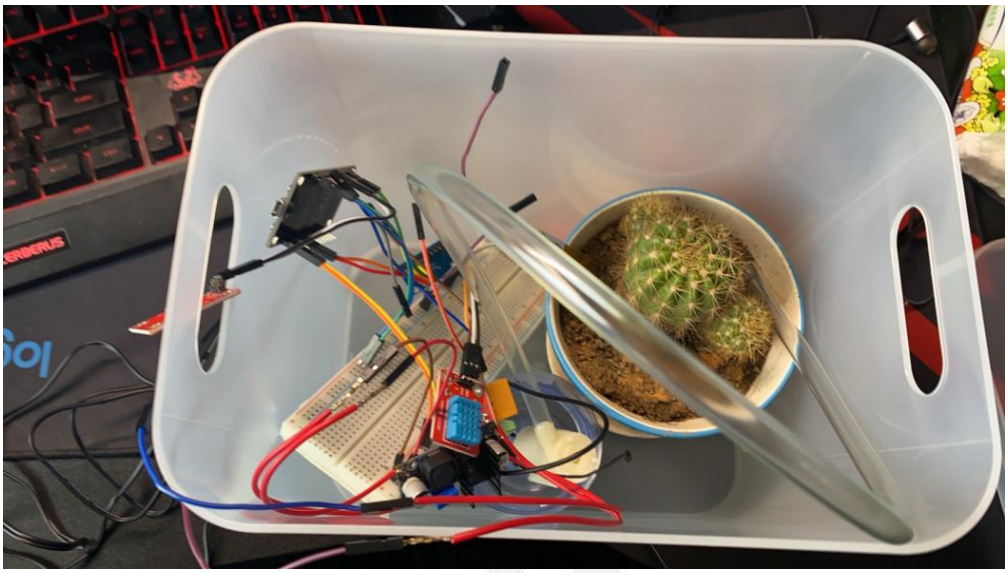
Greenhouse §

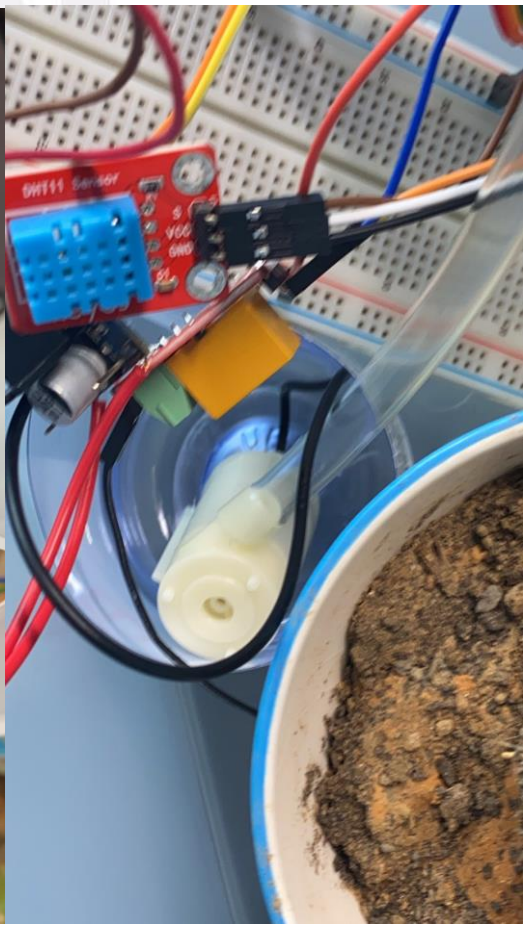
```
#include<ESP8266WiFi.h>
#include"DHT.h"
#include <Wire.h>
#include <Adafruit_ADS1015.h>
#define DHTPIN 2
const char* ssid =  "Ying Chen";      // Enter your WiFi Network's SSID
const char* pass =  "Chencandy1212"; // Enter your WiFi Network's Password
unsigned long myChannelNumber = 1616564;
unsigned long myTalkBackID =  44831;
const char * myTalkBackKey = "ZVVQ7LHSO45Q98ZT";
const char * myWriteAPIKey = "A5X3KZZXG5ZIIHAE";
float humi;
float temp;
DHT dht(DHTPIN, DHT11);
Adafruit_ADS1115 ads(0x48);
WiFiClient  client;
void setup() {
  pinMode(A0,INPUT);//moist
  pinMode(12,OUTPUT);//waterD6relay
  pinMode(14,OUTPUT);//lightD7relay
  digitalWrite(12,HIGH);
  digitalWrite(14,HIGH);
  ads.begin();
  dht.begin();
  Serial.begin(115200);
}
```

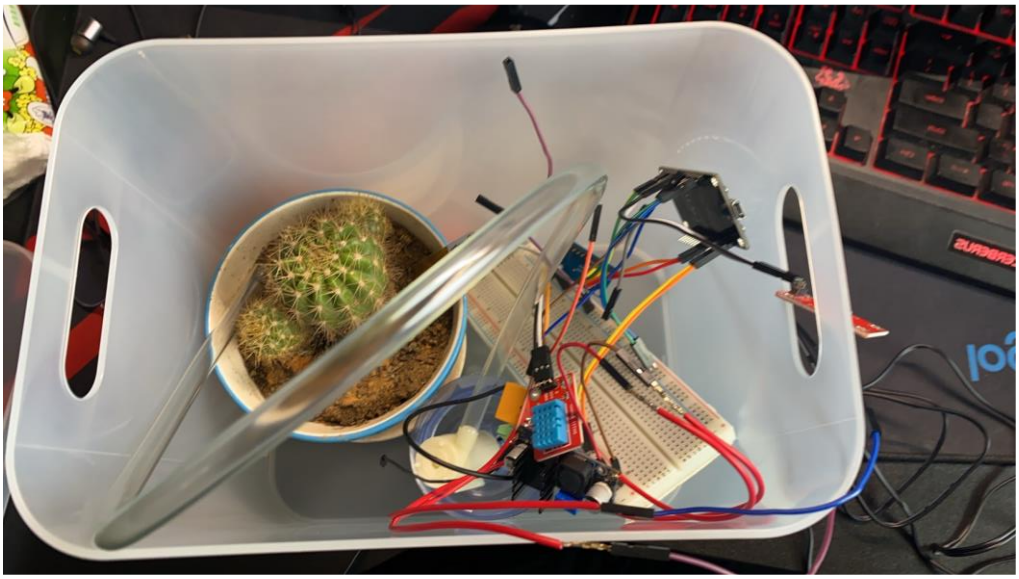
```
void loop() {
   if(WiFi.status() != WL_CONNECTED){
    // Connect or reconnect to Wi-Fi
    Serial.print("Attempting to connect to SSID: ");
    Serial.println(String(ssid));
    while(WiFi.status() != WL_CONNECTED){
      WiFi.begin(ssid, pass);
      Serial.print(".");
      delay(5000);
    }
    Serial.println("\nConnected.");
  }
  int moist;
  int16_t light ;
  float h = dht.readHumidity();
  float t = dht.readTemperature();
  light=ads.readADC_SingleEnded(0)/16;//adsA0
  moist=analogRead(A0);
  String postMessage =  String("field1=") + String(t) +  String("&field2=") + String(h) +
    String("&field3=") + String(moist) + String("&field4=") + String(light) +
    String("&api_key=") + String(myWriteAPIKey) + String("&talkback_key=") + String(myTalkBackKey);
  String newCommand = String();
  int x = httpPOST(postMessage, newCommand);

  client.stop();

  if(moist<100)digitalWrite(12,HIGH);//D6
  else digitalWrite(12,LOW);

  if(light<100)digitalWrite(14,HIGH);//D7
    else digitalWrite(14,LOW);
```

```
int httpPOST(String postMessage, String &response){   //上傳
  bool connectSuccess = false;
  connectSuccess = client.connect("api.thingspeak.com",80);
  if(!connectSuccess){
      return -301;
  }
  postMessage += "&headers=false";
  String Headers =  String("POST /update HTTP/1.1\r\n") +
                    String("Host: api.thingspeak.com\r\n") +
                    String("Content-Type: application/x-www-form-urlencoded\r\n") +
                    String("Connection: close\r\n") +
                    String("Content-Length: ") + String(postMessage.length()) +
                    String("\r\n\r\n");
  client.print(Headers);
  client.print(postMessage);
  long startWaitForResponseAt = millis();
  while(client.available() == 0 && millis() - startWaitForResponseAt < 5000){
      delay(100);
  }
  if(client.available() == 0){
    return -304; // Didn't get server response in time
  }
  if(!client.find(const_cast<char *>("HTTP/1.1"))){
      return -303; // Couldn't parse response (didn't find HTTP/1.1)
  }
  int status = client.parseInt();
  if(status != 200){
    return status;
  }
  if(!client.find(const_cast<char *>("\n\r\n"))){
    return -303;
  }
  String tempString = String(client.readString());
  response = tempString;
  return status;
}
```

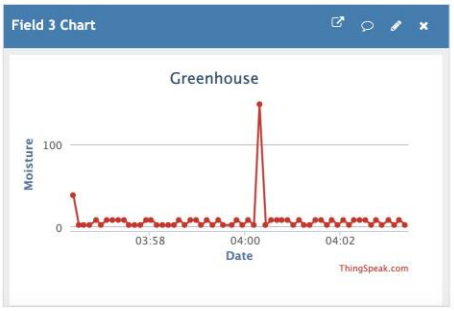
四、成品:



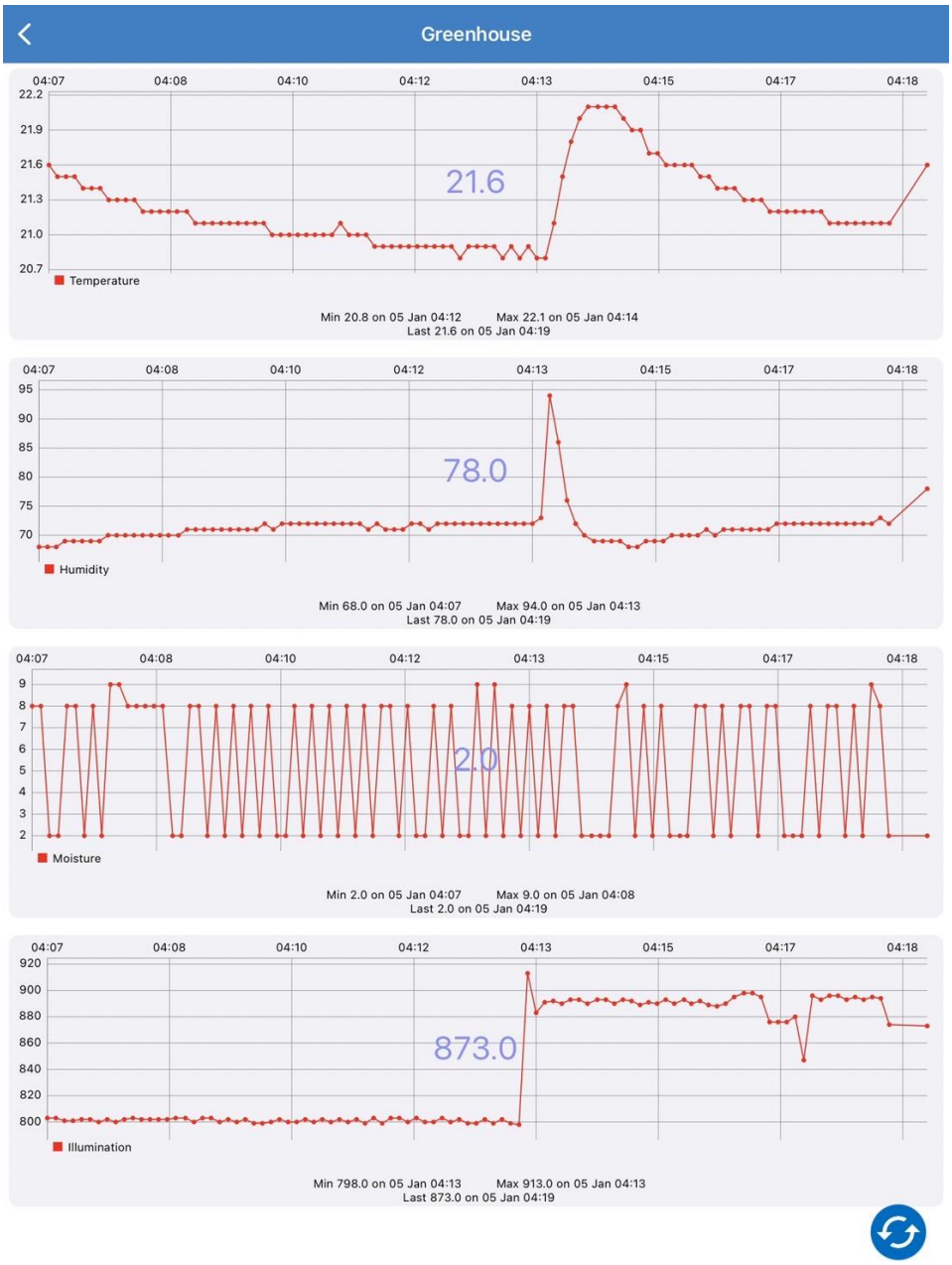




ThingSpeak 監測



ThingView 監測


Greenhouse
04:07 04:08 04:10 04:12 04:13 04:15 04:17 04:18
22.2 21.9 21.6 21.3 21.0 20.7
21.6
Temperature
Min 20.8 on 05 Jan 04:12 Max 22.1 on 05 Jan 04:14
Last 21.6 on 05 Jan 04:19
04:07 04:08 04:10 04:12 04:13 04:15 04:17 04:18
95 90 85 80 75 70
78.0
Humidity
Min 68.0 on 05 Jan 04:07 Max 94.0 on 05 Jan 04:13
Last 78.0 on 05 Jan 04:19
04:07 04:08 04:10 04:12 04:13 04:15 04:17 04:18
9 8 7 6 5 4 3 2
2.0
Moisture
Min 2.0 on 05 Jan 04:07 Max 9.0 on 05 Jan 04:08
Last 2.0 on 05 Jan 04:19
04:07 04:08 04:10 04:12 04:13 04:15 04:17 04:18
920 900 880 860 840 820 800
873.0
Illumination
Min 798.0 on 05 Jan 04:13 Max 913.0 on 05 Jan 04:13
Last 873.0 on 05 Jan 04:19

五、結論:

藉由這一次的 IOT 實驗，我們學到了如何使用感測器來觀測植物生長過程中的數值，包括感測光照的光敏感測器、感測土壤濕度的土壤濕度感測器，進而使用相應的器材如水泵與遮罩，來達成我們想要控制的溼度與光照時長，用程式自動化偵測並調整植栽生長環境，以節省更多時間與人力資源。

雖然初衷只是為了造福一般忙碌的人們，但是如果能擴大在農業養植方面上實現，對於花農果農來說，可以帶來非常大的幫助，不僅讓產量提升，品質穩定，並減少大量人力成本與時間。

Conclusion

Through this IOT experiment, we learned how to use sensors to observe the values during plant growth, including light sensors that sense light, and soil moisture sensors that sense soil moisture; and then use the corresponding Equipment such as water pumps and masks can achieve the humidity and light duration we want, so that we can save time and human resources, and allow the program to automate the management of plants.

Although this is just a small experiment for us, if it can be realized in practice, it can bring great help to flower farmers and fruit farmers, increase production, stable quality, and reduce a lot of labor costs and time.

六、參考資料:

[1]張琮凱 林維庭 廖怡欽, “溫室自動化監控系統,” 南華大學資訊工程學系

[2] I Know Water Tech. Ltd,Co. 溫室農業自動化系統 [Online].

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[3] 行政院農業委員會,溫室遠距無線傳輸監控系統簡介, [Online].

Available:https://www.coa.gov.tw/ws.php?id=19486