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Creating Artificial Environment for Indoor Farming Using Iot

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ABSTRACT:
Theaimofmodernagricultureistoenhancethegrowtho fplantsforamaximumyield.Asthereis increase in population growth we are in desperate need for increase in productivity to suffice ourpopulation.Inthisproject weareimplementingtwosensorstheyare DHT11 which isused tomonitor the temperature and humidity parameters and MQ135 which is an air quality sensor formonitoringtheenvironmentoftheparticularregion. Ifanyoftheseparameterisinabnormalcondition then exhaustfan getturnedon,sothatwe canreduce thehumidity. Byusingtheseparametersthe rate of plantgrowthis doubled. Results shown that when allthe factors of plantgrowth are stabilized, then it is possible to grow a plant in 50 days which normally takes 80 days forits growth.
Themaincomponentsincludedinthiscultivationofpla ntsunderartificialenvironmental parameters are
1. Lights(RGB)
2. Sensors(DHT11,MQ135)
Microcontroller.

KEYWORDS: Photosynthesis,LED'S,Artificial farming.

I.INTRODUCTION

The world is increasingly faced with global problems including unusual weather, environmentalpollution, and shortages of water, fossil fuel and plant biomass. Accordingly, the stable and safesupply of plant-derived food andother products will be endangered. When leaf vegetables are grownin the open field, their quality and productivity tend to vary with the local climate, weather conditionsand soil fertility. On the other hand, when plants are grown in this artificial environment, their qualityand productivityaregenerallyimproved.
The artificial environment is an approach to grow crops in a controlled indoor environment. As theenvironment is indoor it will not have any insects, and pests affecting the crops, hence no insecticidesandpesticideswillberequired.Theindoore nvironmentwillneitherevaporatewaternorwillpercol ate it in to the earth hence water requirements be very small. The indoor environment isequippedwithartificiallightening,socropscanbegro wnindependentofseason.

HOWPLANTSGROW

1. **Light**: Alllivingthings,exceptfora few groupsofbacteria,dependonphotosynthesisforth eirexistence. Photosynthesis is the process by which green plants make their own food. In thepresence of light energy, plants manufacture food (mainlysugars), bycombining carbondioxideandwater inthepresenceofchlorophylltorelease oxygenandwater.
2. **Proper-temperature:**Temperature is the most important environmental factor affecting plantgrowth.Plantsvaryintheir temperatureneeds.The abilityofa planttowithstand coldtemperatures is known as hardiness. Plants that cannot tolerate cold weather are known astenderplants.
3. **Water**:Wateris essentialforlife. Itisoneofthemostimportant requirementsforplant growth.
4. **Air:** The manufacture of carbohydrates and proteins which a plant needs to live and growrequiresrawmaterials.
5. **Nutrients:** Although plants are able to use a few nutrients from the air, most of the nutrientsthat a plant needs must be present in the growing medium (soil). Minerals such as nitrogen,potassium,phosphorous,calcium,and magnesiumaretakenupthroughtheplant'sroots.

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LIGHTSYSTEM

Plants absorb the light spectrum in an almost similar range as the humaneye, but unlikehumans,they absorb best red and blue light. Red and blue light are the essential light that have higher relativequantum efficiency of photosynthesis, and they can fulfill normal growth and development of plants.

Blue-Blue light is perceived by the blue light photoreceptors,phototropinsand cryptochromes. Phototropins mediate stomatal regulation and plant movement towards light. Cryptochromes regulate many photomorphological responses, such as inhibition of stem elongation

Green- Green light is atleast partially perceived by phototropins and cryptochromes (bluelightreceptors).Mostgreenlightisreflectedorpenetratedthroughthecanopy.However,greenlight contains valuable information about theplant'ssurroundings,guiding thegrowthaccordingly.

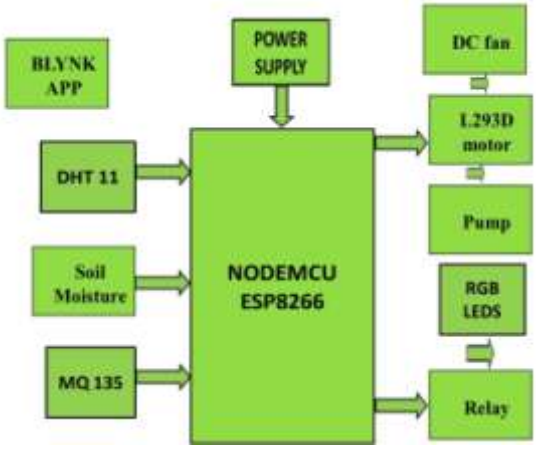
Red- red lightis perceived by phyotochromes. Phytochromes absorbs both redand far-redlight and arethemainregulatorsof theshadeavoidancesyndrome.Red lightconvertsphytochromesto theirinactivestate, Pr, which has an absorption peak at 660 nm.

II.WORKINGPRINCIPLE

Theideaofapplyingcultivationofplantsunderartificialenvironmentalparameterstoincrease productivity is very new. As we know the climatic conditions may prevent the grow ofcertain plants in certain areas. The key aim of modern agriculture is to enhance the growth of plantsfor a maximum yield. It maintains the microclimaticparameters in a correct ratio as per therequirement of the plants. It has also reduced the labor for the maintenancethus making the systemuseful for the smallscale agriculturists. This paper proposes the adoption and control of soilmoisture, temperature, humidity, air quality, light intensity using sensors. The main purpose of thisproject is to grow crops anywhere, however the climatic parameters be. This proposed system isused for a single plant cultivation and can be developed for mass production. Our proposed systemiseconomical,portableandhaslowmaintenancewhichcanbeincorporatedinruralarea.

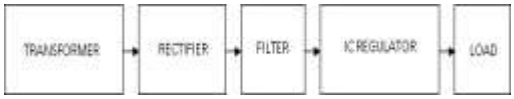
III.HARDWARE DETAILS

Block Diagram



POWERSUPPLY

The Power supplies are designed to convert high voltage AC mains electricity to a sustainable lowvoltage supply for electronic circuits and other devices. A power supply can be broken down into aseries of blocks, each of which performs a particular function.



MICROCONTROLLERDESCRIPTION

NODEMCU ESP8266

The Node MCU is an open-source firmware and development kit that helps you to Prototype yourIOT productwithin a few Lua script lines. This module comes with a built in USB connector and a rich assortment of pin-outs. With a microUSB cable, youcan connect Node MCU device to your laptop and flash it without any trouble, justlikeArduino.

TheESP8266isalowcostMCUwithbuiltinWi-Fi.Itcanbepairedwithanotherhostmicrocontroller,likeanArduino,toprovideWi-FinetworkingcapabilityforabasicIoTdevelopmentplatform. Additionally, the ESP8266 can be used as a stand-alone MCU, as it includes a 32-bit 80MHz processor, 16 GPIO pins (4 PWM enabled) and a built in Analog-to-Digital converter, SPI andI2C interfaces and more.

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DHT11

This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with thetemperatureandhumiditysensorcapability.Itisintegratedwithahigh-performance8-bitmicrocontroller. Its technology ensures the high reliability and excellent long-term stability. Thissensor includes a resistive element and a sensor for wet NTC temperature measuring devices. It hasexcellentquality, fastresponse,anti-interference abilityandhighperformance.

MQ135

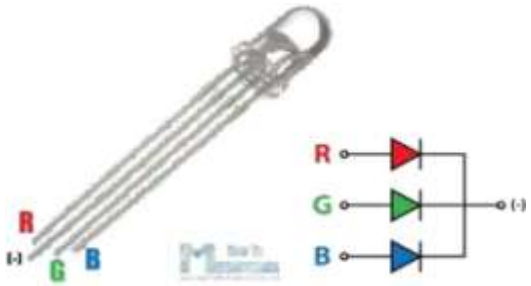
TheMQ-135gassensorsensesthe gaseslikeammonianitrogen,oxygen,alcohols,aromaticcompounds, sulfide and smoke. The boost converter of the chip MQ-3 gas sensor is PT1301. Theoperatingvoltageof thisgassensorisfrom2.5Vto5.0V.TheMQ-3gas sensor hasa lowerconductivity to clean the air as a gas sensing material. MQ-135GasSensorSensitivematerialofMQ135gassensor isSnO2,whichwithlowerconductivity in clean air. When the target combustible gas exist.

RELAY

A relay is an electromechanical switch, which perform ON and OFF operations without any humaninteraction.Generalrepresentationofdoublecontactrelayisshowninfig.Relaysareusedwhereitis necessary to control a circuit by a lowpower.

RGBLEDs

RGB LEDs have three internal LEDs (Red, Green, and Blue) that can be combined to produce almost any color output. In order to produce different kinds of colors, we need to set the intensity of each internal LED and combine the three color outputs. In this tutorial, we are going to use PWM to adjust the intensity of the red, green, and blue LEDs individually and the trick here is that our eyes will see the combination of the colors, instead of the individual colors because the LEDs are very close to each other inside.



RGB LEDs have three LEDs inside them and usually, these three internal LEDs share either a common anode or a common cathode especially in a through-hole package. So basically, we can categorize RGB LEDs as either common anode or common cathode type just like in seven segment displays.

Soil Moisture sensor

This Moisture Sensor can be used to detect the moisture of soil or judge if there is water around the sensor, let the plants in your garden reach out for human help. They can be very easy to use, just insert it into the soil and then read it. When the soil moisture deficits, the sensor output value will decrease. You can know whether a Plant needs water or not by observing the results that the sensor outputs.

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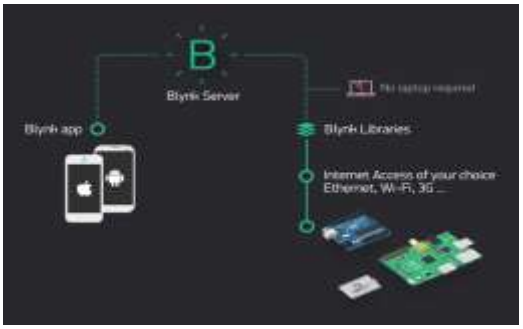
L293D Motor

L293D Motor Driver Module L293D is a basic motor driver integrated chip (IC) that enables us to drive a DC motor in either direction and also control the speed of the motor. The L293D is a 16 pin IC, with 8 pins on each side, allowing us to control the motor. It means that we can use a single L293D to run up to two DC motors.

IV.SOFTWARE DETAILS

BLYNK APP

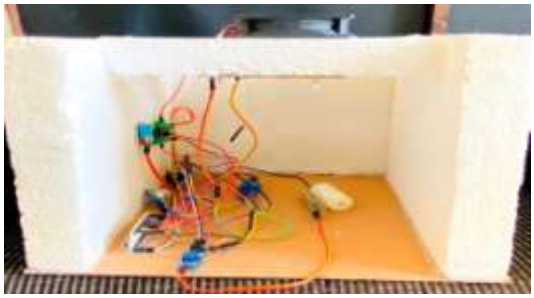
Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen.monitor and control the hardware components by using this app.



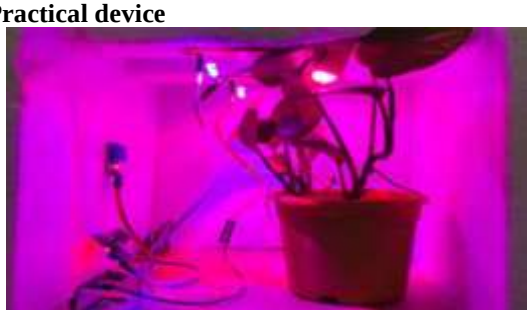
V.RESULT

This project is well prepared and acting accordingly (including all the hardware and software) aspertheinitialspecificationsandrequirementsofourproject.Becauseofthecreativenatureanddesigntheideaofapplyingthisprojectisverynew,theoppurtunitiesforthisprojectareimmense.Cultivation of plants under artificial environmental parameters allow all without any harmful sideeffectsonenvironmentandincreases thegrowthofplant andrateofproductivity.

The practical representation of an experimental board is shown below



Practical device



Artificial environment created successfully

Monitoring and controlling the Weather parameters by using the Blynk app

VI.CONCLUSION

This paper mainly reviewed the research and development work for a system to cultivate crops.Thissystemmadeautomatictoprovideconstantclimaticparameters.Thisconstantsupplyofparameterstoprovideplantsnecessarynutrientsandprotectscropsfrompests.Inthisprojectwehavemadearackstructuresothatwecantakethemorecropproductionbymakingracksononeaboveina small area. In this artificial environment we are using sensors to monitor the condition of soil, air,temperature. According to collected data by the sensors, this data is provided to aurdino for thecontrolling the water supply, lights, fans. The Leds are used to provide the special light wavelength.By using that wavelengths the plants are going to carry out the photosynthesis process. In this processthe food making process of plants is done. As the environment is indoor it will not have any insects,and pests affecting the crops.The indoorenvironmentwillneitherevaporatewaternorwillpercolateitintotheearthhencewaterrequirementsbe very small..By using the artficial farming methodwe canreduce the greenhouse gases,the overall quality of the food is increased due to the organic fertilizers being used to grow the plantand also the pesticides and the chemical fertilizers are not used in this type of farming.

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