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Smart Plant Pot

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Abstract-*Taking care of plants can be largely time consuming. Missing even a small scheduled task for the plant can result in the drying up of the plant and even its death. Another big problem is to put the plant pot at a place where it gets maximum sunlight. This is a big problem in houses(apartments) where the place with maximum sunlight shifts throughout the day and it's very tiring to shift the plant, time-to-time to those places. Watering the plant by checking the amount of moisture in the soil of the pot is another very important and time-consuming task. Automating all these processes or tasks can result in a huge work reduction and time saving for the owner and makes sure that the plant stays alive and healthy. This is the main goal of this project. The smart plant pot can do all the above tasks automatically, without needing any human intervention.*

Key Words: plant pots, IOT, Arduino, Automation, plant nourishment

1.INTRODUCTION

Taking care of plants can be largely time consuming. Missing even a small scheduled task for the plant can result in the drying up of the plant and even its death. Another big problem is to put the plant pot at a place where it gets maximum sunlight. This is a big problem in houses(apartments) where the place with maximum sunlight shifts throughout the day and it's very tiring to shift the plant, time-to-time to those places. Watering the plant by checking the amount of moisture in the soil of the pot is another very important and time-consuming task.

Automating all these processes or tasks can result in a huge work reduction and time saving for the owner and makes sure that the plant stays alive and healthy.
This is the main goal of this project. The smart plant pot can do all the above tasks automatically, without needing any human intervention.

Wheels are placed below the pot to transport the plant to places in the house where the sunlight is maximum. This is done using colored paths which the pot senses and moves along with it. The path is laid along the places where the sunlight falls the most, so that it directs the pot to these places. The plant can also displace itself to automatic tap systems, where it is watered by the tap which can sense the pot's presence and release the water accordingly. The taps are connected to tanks, which can send a message to the owner whenever they become empty.

The pot can sense the moisture level in the soil and displace itself to a tap whenever its moisture level is below a threshold, while also informing this to its owner.
This is all done automatically by the pot without needing any human intervention

2. HARDWARE SYSTEM

2.1 Arduino Nano:

This component is the brain of the whole project. This section consists of an Arduino

Fig-1: Arduino Nano

Nano chip with an ATmega328P microcontroller. This chip is the smallest of its kind and functions according to the program fed to it. The program fed to this chip instructs it about how to control the whole system according to the given input. It consists of a power cable to which the power is given and input and output pins to which the input and output components are connected

2.2 Node MCU

Node MCU is a micro-chip featured with wi-fi capability, analog pin, digital pins and serial communication protocols. It can be connected to the wi-fi and can communicate with other components through IFTTT server protocol. In this project it is used to send the owner updates about what the plant pot is doing at the moment and what is its status. It is equipped with a ESP8266 wifi chip and is an open source LUA based firmware. This development chip can be programmed using Arduino IDE.

Fig-2: Node MCU

2.3 Line Following Robot System

This is a system in which the robot follows a line, or a path laid on the floor. Usually, the line is the path in which the line follower robot goes, and it will be a black line on a white surface but the other way (white line on a black surface) is also possible. Invisible magnetic fields can also be used as paths and these are used in some high-level commercial robots. In this project the pot uses this line follower system to transport itself between stations and brightly lit areas.

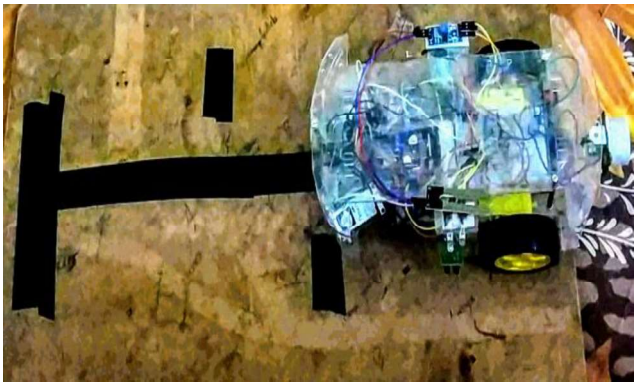

Fig-3: Line Following Robot

2.4 Stations

The stations are placed at different places throughout the home based on the position of the plant pot at different instances. The most common types of stations is a water station. This station consists of a water pump interfaced with an IR receiver. Whenever there is a signal received by the IR receiver the water pump is turned on and water is poured onto the plant pot which gave the signal through an IR transmitter, on its arrival.

A light station can also be placed at various places which shines light onto the plant. The pot platform brings the plant to this station whenever there is a scarcity in sunlight, like when the sky in cloudy.

Fig-4: Station

3. SYSTEM ARCHITECTURE AND MODULE INTERFACE

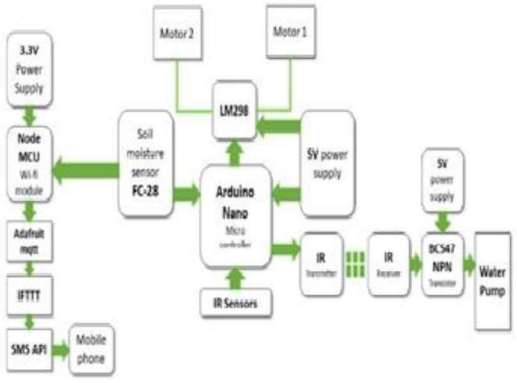

Fig-5: SYSTEM ARCHITECTURE

Automating all the processes or tasks of plant nourishment can result in a huge work reduction and time saving for the owner and makes sure that the plant stays alive and healthy. This is the main goal of this project. The smart plant pot can do all the above tasks automatically, without needing any human intervention

As shown in the figure, 9v power supply, Soil moisture sensor, IR sensors (for path sensing) are connected as the input to the Arduino MC. These give signals to the Arduino chip about the various values corresponding to the plant. LM298 motor driver, IR transmitter, Node MCU are connected to the output of the Arduino MC. These control the actions of the plant pot according to the input given. Arduino gives out the output signals to these components based on

the program written. The unit with the IR receiver and water pump is the self-watering station.

Wheels are placed below the pot to transport the plant to places in the house where the sunlight is maximum. This is done using colored paths which the pot senses and moves along with it. The path is laid along the places where the sunlight falls the most, so that it directs the pot to these places. The plant can also displace itself to automatic tap systems, where it is watered by the tap which can sense the pot's presence and release the water accordingly. The taps are connected to tanks, which can send a message to the owner whenever they become empty.

Node MCU is used to send SMS information to the owner about the various actions taken by the plant pot, updating him/her about it' s status and its actions. The part of the block diagram with IR receiver, NPN transistor and a water pump is an example of a water station. We can make many versions of these stations to attend to various needs of the plant. The part with Node MCU is the part responsible for sending SMS to the owner at various points of time. It uses online services like Adafruit IO and IFTTT connected the Node MCU with the help of a SMS API.

4.BOARD HARDWARE RESOURCES FEATURES

4.1 IR Sensor

This module is used for the line following aspect of the project. Two of these modules are placed below the robot platform on either side. These both IR sensor modules will sense the presence of a black line in between them. They do this by transmitting and receiving the reflected IR rays from the ground. Whenever there is a black line there will be no reflection. This information is sent to the Arduino which will steer the robot in order to avoid it to go across the black line. This is done using the program fed to the Arduino

Fig-6: IR Sensor

4.2 IR Transmitter and Receiver

These sensors transmit and receive IR rays respectively. As shown in the block diagram, a transmitter is connected to the robot platform and a receiver is connected to a station. Whenever the robot reaches a station it transmits IR rays and on receiving them, the IR receiver signals the water pump and turns it on according to the program fed to it.

4.3 Soil Moisture Sensor

This sensor senses the amount of moisture in the soil of the plant and signals Arduino the moisture levels at various points. The Arduino observes these moisture levels and it responds whenever the moisture levels are below a certain a threshold value. This threshold is hardcoded into the program fed to the Arduino. Whenever the moisture levels reach below the threshold, Arduino turns the motors on and takes the plant pot to the nearest water station.

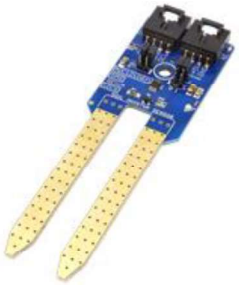

Fig-7: Soil Moisture Sensor

4.3 LDR Sensor

We use this sensor to sense the sunlight around the plant pot and the plant wherever the sunlight is maximum. This sensor returns a value of the intensity of light around it to the Arduino. Based on this value the Arduino makes the decision of whether to move the plant or stay there. This decision is made based on whether the light intensity value is below a threshold or not. This threshold is hardcoded into the program.

Fig-8: LDR Sensor

4.4 IFTTT

If This Then That (IFTTT) is an online service which creates statements, called applets. Whenever changes that occur within an app such as Gmail, Facebook, Telegram, Instagram, or Pinterest, an applet is triggered. For example, an applet may send an e-mail message if the user tweets using a hashtag or copy a photo on Facebook to a user's archive if someone tags a user in a photo. It also runs on Android and IOS. IFTTT changed its name to IF, and launched a new set called Do, using which users can create shortcut applications and actions. All the functionalities of the Do suite of apps have since been integrated into a redesigned

IFTTT app. We use this service to make our Node MCU chip to send an SMS about the status of the plant pot at various points of time.

Fig-9: IFTTT

4.5 Adafruit IO MQTT Server

Adafruit IO is an online service which helps our project talk to the internet. This is an MQTT server connected to the Node MCU. Using Adafruit IO Node MCU connects to the IFTTT service which is then connected to an SMS API which sends the SMS to the owner.

Fig-10: Adafruit Server

4.6 Bluetooth Module and Android Application

We can also connect a Bluetooth module to the Arduino and control the robot using manual controls whenever needed. This controls works using and android application which controls the robot using Bluetooth connection based on the input of its user. The android application is created using MIT app inventor which is an online service used to create android apps easily without any professional's help. The android app is equipped with on-screen touch controls, like front, back, left and right, which can be used by the user to control the robot manually.

This feature is especially useful in situation where the owner wants to bring the plant pot to a certain place manually by himself. This manual control works just like controlling a remote-controlled car.

Fig-12: Bluetooth Module

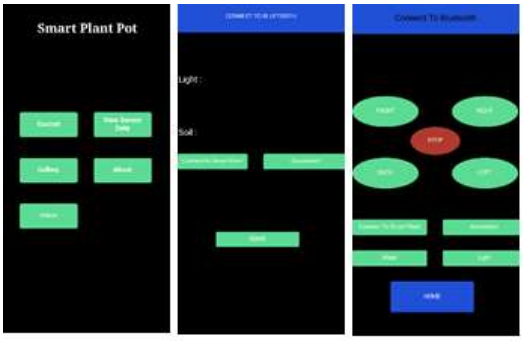

Fig-13: Android Application

5.RESULT

Whenever the power is turned on, the plant pot follows the line to reach the place with maximum sunlight and settle there. Whenever the sunlight change is sense by the LDR sensor, the plant pot moves to the place where sunlight is more. When there is no sunlight the pot moves to a light station where artificial light is turned once it reaches the station.

Whenever the soil moisture sensor senses that there is less moisture in the soil, the pot moves to a water station. The water pump in the station is turned on once the plant pot reaches it and water is poured into the pot. After it gets its required amount of water it moves back to the place with the maximum light This setup can also be controlled manually using an android application through Bluetooth. The user can use the on-screen controls inside the app to move the plant pot in his desired direction.

Fig-14: Watering the Plant

Fig-15: Providing Light to the Plant

Fig-16: Smart Plant Pot

6.CONCLUSION

This system can even be extended to pet nourishment. This can be done by adding stations for feeding pets. These stations will ring a bell and provide food for the pet at regular times without needing the owner's intervention. The stations can also be in such a way that they bring the food to the pet. Even fish tanks can be equipped with these stations to provide food to the fish at regular times or whenever needed.

Automating all the plant nourishment tasks can result in huge work and plant mortality reduction. This can help the owner in huge ways and protect the plant by attending to all its needs.

7.REFERENCES

[1] This Cyborg Plant Moves Toward Light on Its Own https://www.seeker.com/tech/this-cyborg-plant-moves-toward-light-on-its-own
[2] How To Make Arduino Line Follower Robot https://www.electronicshub.org/arduino-line-follower- robot/
[3] A world that works for you (IFTTT) https://ifttt.com
[4] A world that works for you(IFTTT) https://ifttt.com
[5] Adafruit IO MQTT server https://learn.adafruit.com
[6] MIT app inventor 2https://appinventor.mit.edu/explore/ai2/tutorials.html

BIOGRAPHIES

Bandari Theja working as an assistant professor of St.Martins Engineering college, dhullapaly,secunderabad. she has teached core subjects and published papers in so many journals and guided projects in R and D of ECE Department. Her areas of interest include Embedded Systems.

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