Plant growth support system

Domain: Agriculture

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Team
Control_alt_elite

Overview

Most important phase of a crop or tree is when it is still a sapling/plant, so creating a system that can automate the caretaking of this fragile stage is the need of the hour.

Maybe agriculture is the only field that still uses 19th century practices even in these modern times, which greatly increases manual labour and also decreases productivity.

In these times of IOT when everything is controllable by your mobile phone, an automatic farming model, controlled by your mobile is not impossible, and yet is not available in the market.

Goals

1. To create an automatic farming system which can perform various tasks automatically to nurture the plant.

2. Linking the system to a website from which a user can easily view the status of the plant and can also manually control various functions of the plant nurturing system.

Conditions to maintain

1. In moderately coarse soil, plants grow well at 50-75% soil moisture range and in medium soil will grow at 25-50% soil moisture range.
2. Ideally, plants need 6-8 hours of sunlight a day, with an ideal temperature of 32 degrees to 35 degrees Celsius, for unaffected growth. Plant will obviously have to be kept outdoors.
3. For healthy growth, pH of soil should be neutral i.e. 7 at all times.

Mechanism implementation ideas:

- We build a mechanism to close a lid (semi-reflective sheet) in case of strong sunlight (high temperatures) to protect the plant from being damaged.
- Lid opens in case of high soil moisture and humidity to allow passage of extra sunlight to evaporate the excess moisture in soil.
- We also have a mechanism to add water to the soil in case of low moisture as well as to add mild organic acid or base appropriately, in case the pH of the soil is not neutral.

- Water pipe and acid/base pipe meet at a junction and further are distributed into multiple pipes on reaching soil to ensure that no part of the soil is left unirrigated or not neutralised.

Website implementation ideas:

- Front page of the site contains an introduction to the project, our objectives, and the methodology we have pursued.
- "Track plant" tab contains tabulated data displaying the current soil temperatures, soil moisture levels and soil pH of our plant.
- Ideal growth conditions are also mentioned along the above-mentioned data parameters next to the current value, for comparison as well as verification of proper working of the system.
- If ideal conditions previously defined are not met or the data values deviate from the provided range, the system automatically takes care by compensating for the deviated condition by method as mentioned in "Mechanism Implementation Ideas".
- If the system fails due to any malfunction or runs out of water/acid/base in its tanks, pop-up notification informs the user about the situation.
- Functionality to either reset the hardware in case of malfunction is also available on the website.
- As we are using Li-Po batteries in the prototype phase, low battery notification is also available on the website.
- If time permits, through the backend, functionality to allow changing the environmental conditions (increasing or decreasing) the temperature, moisture, or pH through the site will also be added.

Components Used

I.   Motor driver L293D

II. DC motors

III. Servo motors

IV. Li-Po battery (11.1V, using voltage division)

V. Arduino Mega

VI. DHT11 temperature and humidity sensor (0 C – 50 C)

VII. pH meter

VIII. Wi-Fi module

IX. Relay module

X. Translucent, semi-reflective sheet

XI. Metal frame

XII. Mild organic acid and base

XIII. Potted plant and water

XIV. storage units for water, acid, base.

Future Scope of the project:

Once the initial phase of the project is successful, we plan on testing our project in the real farming fields with and going BIG! Bigger models, bigger areas, bigger motors, and bigger impact!

We also plan on installing music boxes in the fields to play soft music and secretly produce frequency to keep off birds and insects.