Introduction

“Hydroponics is a subset of hydro culture and is a method of growing plants using mineral nutrient solutions, in water, without soil.” Under this basis, the idea of SproutBot was born. However, for this project, soil is utilized to promote speedy growth of the test subject plants. Although soil is used, conservation of water is key to the effectiveness of SproutBot. As an assistive technology device, SproutBot was created to help users with mobility issues to maintain a full yard of plants.

Mission Statement

To produce a user-friendly, sensor maintained garden, that will conserve water and create an ideal solar environment capable of producing and maintaining edible plants.

Project Description

• Autonomous sensor-controlled garden that is programmable using open source, modified code
• Easily to configure, physically and by code
• Compact and modular for transportation
• Easily replaceable components

Test Subjects

Plant 1 – Collard Greens  Plant 2 – Kale

Initial v. Final Design

Isometric View: Fully Closed Trays

Trimetric View: Fully Opened Trays

Close-Up Aerial View of Components

Applications

• SproutBot can be used by a wide range of users including, but not limited to:
  • Elderly
  • Tenants with limited land/space for a garden, like condominiums, apartments, and convalescent homes
  • Children with the aid of an adult for agricultural education
  • Users with mobility disabilities that prevent them from maintaining large space gardens

Benefits

• Conservation of water, soil and land - minimizing these crucial resources keeps costs and maintenance low and helps the environment
• Mobility - by making the height adjustable and adding wheels, the garden can be adjusted to allow for changeable sunlight exposure for various plants
• Sensor Program - allows user to raise a garden with little hassle

Challenges

• Modification of code to interpret purchased components
  • We found that certain parts were creating errors in the lines of code preventing us from executing future steps
• Availability of brick and mortar parts in a short amount of time
  • Some necessary parts were unavailable for faster shipping options or were entirely unavailable for purchase.
• Time Restraints
  • Due to conflicting schedules and the start of a new project, our team faced issues with available time for meetings

Outcome

• Upon completion of the semester, the following has been achieved:
  ✓ Fabrication of final design
  ✓ Coding Sensors and troubleshooting overall program
  ✓ Initial Tests on plant Subjects
• Tasks that were not completed:
  ✓ Adjustable legs
  ✓ Motors to lift and lower inside trays

Major Component Analysis

• Linkage System - Difficulty was found when deciding the linkage system to raise the inner plant beds above the main tray, the simplest linkage, was a four bar linkage system modeled after a make up box similar to a Caboodle.

Parallellogram linkage

\[ s + l = p + q \]

(continuous motion)

Sensor System – example schematic

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