# Solar Hydroponics Monitoring Vehicles SAC Undergraduate Research Project

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ALAMO COLLEGES

SAN ANTONIO COLLEGE

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### **Team Members**

Tepher Ward - Team Lead; Mechanical Design
 Michelle Mata - V1 Arduino Programmer
 Juli Williams - V2 Raspberry Pi Programmer



### Introduction to Hydroponics

- Soilless farming
- Shipping container is 320 sq. ft.
- Controlled environment
- ReEnergize initiatives







### Requirements

Solar Hydroponics Team
 Remote control
 Data tracking via WiFi

### Environmental

✓ Temperature ranges from 70° - 90° F

✓ Humidity ranges from 60% - 80%

ReEnergize Program

✓ Cost-efficient

✓ Adaptable for future enhancements

# Project Goal

The Hydroponics Monitoring Vehicles team set out to construct and compare two vehicles to determine which would be better suited to meet all needs, including end-user, environmental, and program requirements.

# Design for V1

#### Construction

- ✓ Tetrix parts
- ✓ Tetrix motors
- Electronics
  - ✓ Arduino UNO
  - ✓ WiFi Shield 101
  - ✓ Motor driver

### Programming

- ✓ Windows
- ✓ Arduino IDE
- ✓ Arduino libraries



# Design for V2

#### Construction

- ✓ Hardware store parts
- ✓ Tetrix motors
- Electronics
  - ✓ Raspberry Pi (RPi)
  - ✓ Motor driver

### Programming

- ✓ Linux
- ✓ Minibian
- ✓ Apache





### **Results for V1**

### Construction

- $\checkmark$  Constraints of components
- $\checkmark$  Durability of parts
- Electronics
  - ✓ Sufficient drivers
- Programming
  ✓ Arduino pin overrides
  ✓ Shield limitations



### Results for V2

Construction

Adaptability of componentsDurability of parts

✓ Balance and weight distribution

Electronics

✓ Sufficient drivers

Programming
 Web-accessible controls
 Controlled stops



### **Conclusions and Findings**

End-user Requirements Met

✓ Both V1 and V2

Program Requirements Met

- ✓ Arduino and Raspberry Pi
- ✓ V2 More Structurally Adaptable and Flexible

✓ V2 More Cost-efficient (\$170 vs \$420 for materials)

### The Future of SAC's RC-HMVs

✓ Line sensors

✓ Swivel-mounted front camera

 $\checkmark$  Better traction and weight distribution

✓ Data tracking via WiFi

✓ Camera hoisting mechanism

✓ Moisture-proof

✓ A cool name and logo!





### Acknowledgements

#### Team Advisors and Supports

**Mr. Steven Lewis** - Director of Eco Centro, Project Advisor

**Mr. Klaus Bartels** - Adjunct Faculty, Physics, Engineering, and Architecture Department, Project Advisor

**Mr. Ben Uresti** - Academic Lab Technician for the MESA Center, Technical Advisor

**Ms. Bly Korseau** - Engineering Administrative Assistant

**Ms. Barbara Knotts** - Adelante Tejas Project Grant Director

Ms. Patty Medina - Exitos Grant Director

Ms. Dee Dixon - MESA Center Coordinator

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Ms. Susan Paddock - LSAMP/CIMA Grant Co-PI

**Ms. Susan Espinoza** - Director of College Grants and Development

Dr. Robert Vela - SAC President



# **Questions?**