SEMI-AUTONOMOUS AGRICULTURAL ROBOT TEAM 14

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INTRODUCTION

Small-scale farmers and researchers struggle with monitoring crops and managing resources. SO FOR them, whoi need an affordable and portable solution, the Autonomous Agricultural Monitoring Robot IS A farming tech product THAT simplifies crop care. UNLIKE manual monitoring, our robot integrates advanced sensors for accurate results with long battery life

CONSTRAINTS

- Compliance with governmental standards and regulations
- No need for specialized trails fixed on ground
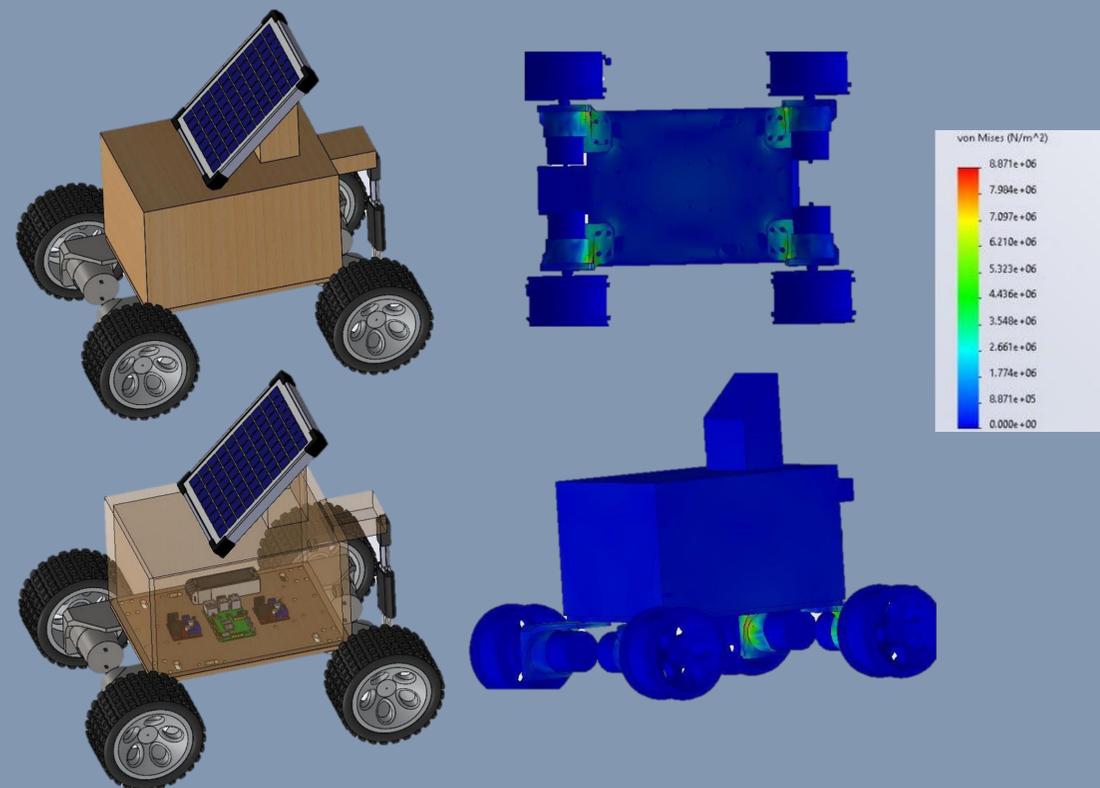- High temperature tolerance (In summer 50C)

SPECIFICATIONS

- Battery Life: Target: To work for 8-12 hours Each day
- High Torque: Target: To have safety factor of 1.5-3.Torque > 2.2 Nm/wheel
- High Speed: Target: speed > 1 m/s
- Injection Force: Target: Force > 50 N

Validations:
- The robot battery life can operate for more than 9 Hours
- Injection has a force higher than 70N
- Torque of each motor more than 3.5 N.m
- Speed of the robot is could reach 1.92 m/s same as 6.9 km/h

ELECTRICAL PROSPECTIVE BLOCK DIAGRAM

PROTOTYPE

REPRESENTATION OF APPLICATION UI

Greenhouse Visualization

Data for P6:
pH: 7
Humidity: 50%
Temperature: 23.5°C
Conductivity: 350 µS/cm
Nitrogen: 15 mg/kg
Phosphorus: 10 mg/kg
Potassium: 15 mg/kg

PATH MODEL

Parameters
- W: Width of the area (meter)
- L: Length of the area (meter)
- V: Velocity of the robot (meter/hour)
- S: Time to take one sample (hour)
- R: Total rotation time (hours)

Decision Variables
- pi: Number of samples to be taken where i = 1, 2, ..., k
- Xi: Longitude for each i, where i = 1, 2, ..., n
- Yj: Latitude for each j, where j = 1, 2, ..., m
- C: Actual path coverage
- n: Number of longitudes (along the width)
- m: Number of latitudes (along the length), where m = n − 2
- k: Number of samples were taken

$$Maximize \ i = 0\sum k \ p \ i$$

$$X \ i = W \quad \forall i = 1,2,...,n$$

$$Y \ j = \frac{2L}{m+1} \quad \forall j = 1,2,...,m$$
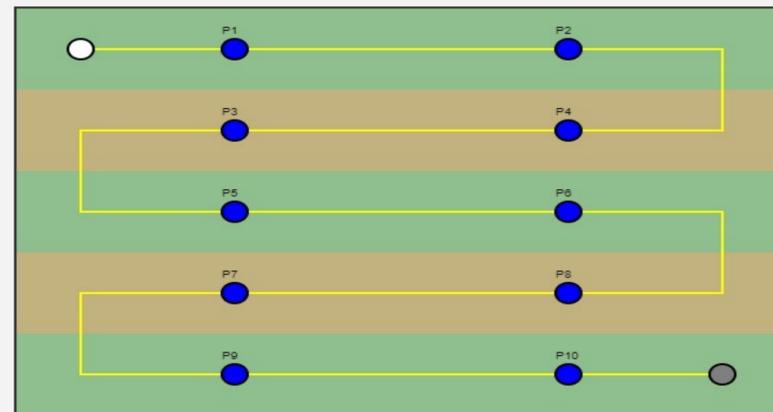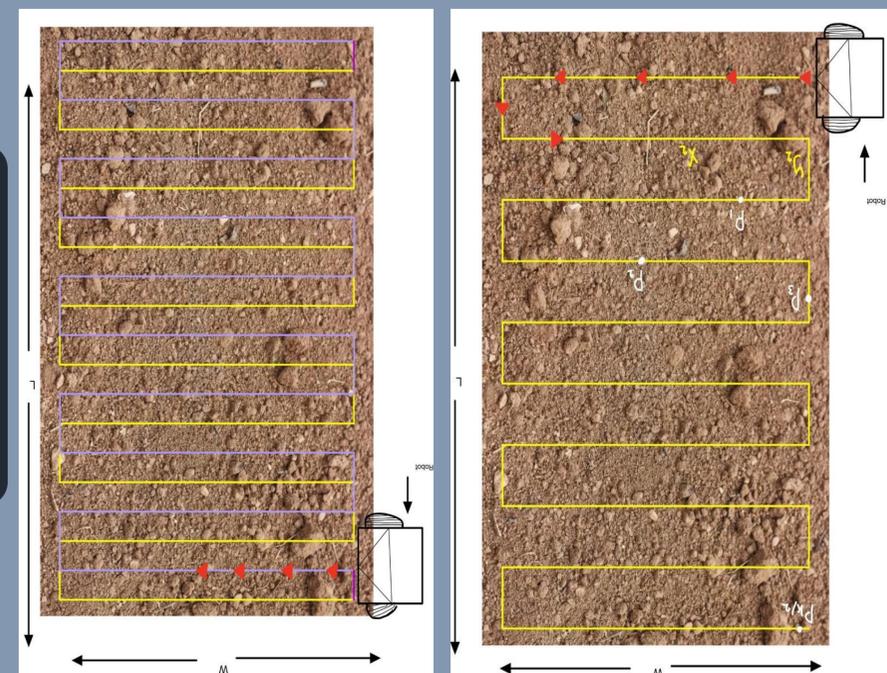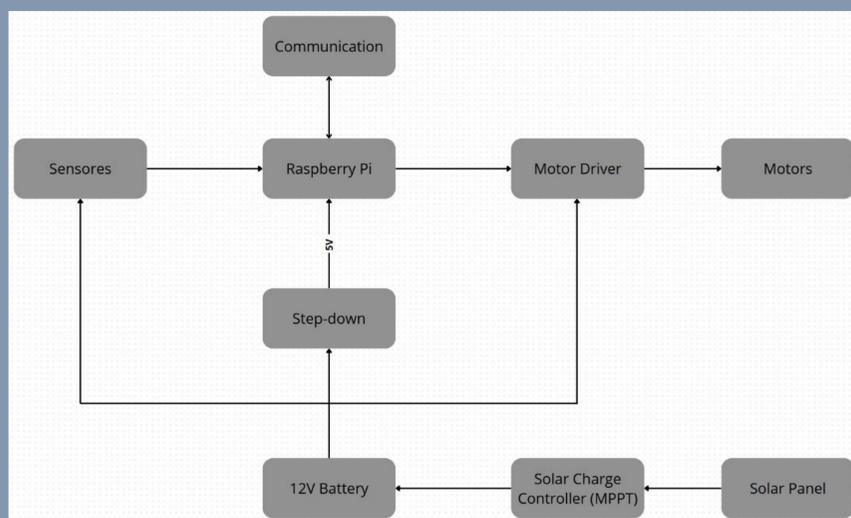
$$C = \ i = 1\sum n \ X \ i + 2L \quad \forall i$$

$$R \geq \frac{1}{V} \ (i = 0 \sum n \ X \ i + 2L) + S \times p$$

$$X \ i \geq 0, Y \ j \geq 0, p \ i \geq 0 \quad \forall i$$

PATH SIMULATION

CONCLUSION

Our robot serves as an efficient and reliable solution for automated sample collection, designed to operate seamlessly within diverse environments. Equipped with advanced sensors and intelligent navigation, it ensures accuracy and adaptability to meet user-defined requirements. This project showcases the potential of robotics in simplifying complex tasks, reducing human effort, and enhancing productivity across multiple industries.