

Background

Plant Research (NZ) Limited are plant breeders based in Templeton, Christchurch, specializing in peas, oats, wheat and triticale. Currently they employ seasonal workers to hoe the weeds between crop rows, at a large cost to the company. An engineering solution was desired to reduce this dependence.

Weed Detection

- Simple and effective colour detection algorithm using Open CV functions in Python.
- Features variable size spraying, cluster detection and a linear tracking algorithm.
- 70% detection accuracy during testing.



Raw 480p Image

Colour Segmentation

Tracking

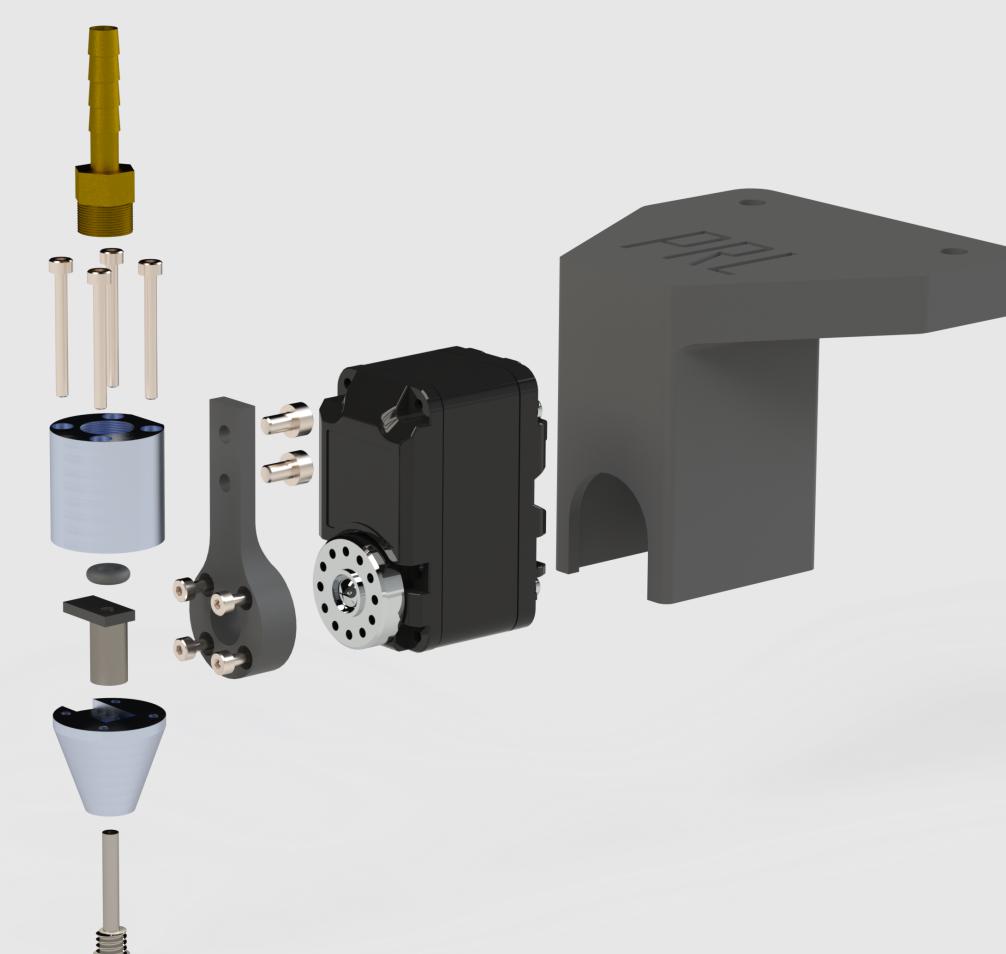
Obstacle Avoidance

- Detects obstacles using a single front facing Intel D435 stereo camera.
- Dynamically re-adjust paths to avoid obstacles in the row.
- Store obstacle image and location for the user to review.



Spraying

- Single degree of freedom servo operated positioning system.
- Micro dose solenoid actuated nozzle.
- Dynamically controllable dosage volume.
- Closed loop pump control regulates system pressure for greater accuracy.

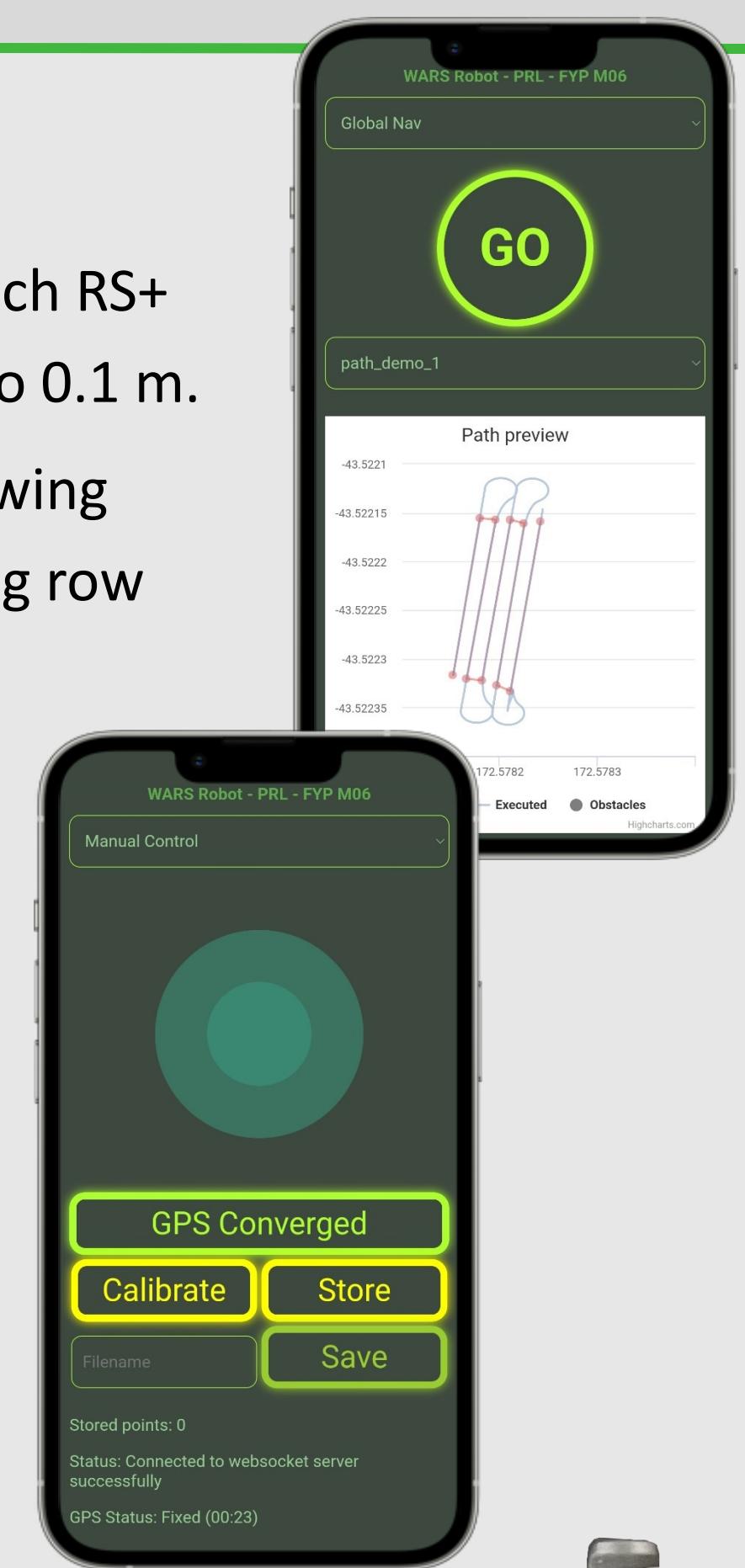


Project Brief

Design and implement a robotic solution capable of autonomously navigating through crop fields, identifying weeds and spraying them with a herbicide. Previous teams have already completed the chassis, drivetrain and power componentry.

Navigation

- GNSS positioning using an Emlid Reach RS+ provides a global position accurate to 0.1 m.
- Implements a generalized path following algorithm, with a focus on minimizing row deviation.
- Capable of following a path with a deviation of less than 0.1 m.



User Interface

- Manually control the robot using a joystick on a local webpage.
- Create, store and execute new paths to follow.
- Receive operating information on robot position, path completion and GNSS position.



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