Civil Robotics - Brushfire Fighting Ground Vehicle

Project Description

Civil Robotics is a new company aimed at solving large scale problems normally faced by governments. Students involved with this project will have the opportunity to work with the mentor to pursue funding and commercial opportunities.

Statement of the Problem

When a forest fire starts, fire crews attempt to contain the fire by cutting a fire line ahead of the fire. By removing fuel from the path of the fire, some wildfires can be stopped. In some cases, firefighting aircraft dump water or fire retardant on or ahead of the advancing wildfire.

The current methods to fight wildfires have several drawbacks:

- It can take a long time to get a fire crew to the right location
- Fire crews can be in short supply during fire season
- Many firefighting aircraft can't operate at night
- Putting human firefighting crews near a fire is dangerous

Solution Concept

The team will develop a robot that can autonomously cut down brush and chapparal. One robot should be able to do the work of several members of a fire crew. A swarm of these robots should be able to work tirelessly to cut large fire lines, day and night, containing large wildfires.

An ultimate version of this product would be able to:

- Be air-dropped into a brushfire area
- Rapidly cut down brush and chaparral
- Scrape the ground, exposing mineral soil
- Autonomously cut firelines along a pre-specified path
- Handle a very wide range of exceptions, from navigating around boulders to avoiding cliffs.

By the end of this project, the device should be able to:

- Travel in preprogrammed lines on complicated terrain while encountering resistance from brush
- Team will research current cutting methods and implement them safely
- Detect and navigate around obstacles
- Reliably cut down tall brush and chaparral
- Get un-stuck during common failure modes
- Perform an emergency shutdown

Motors used for the prototype should be in the 800-watt to 5-kw range. Students will be able to select all aspects of the system design, from locomotion to sensing and cutting.

Reading Material:

Wildland Fire: Fireline Construction
https://www.nps.gov/articles/wildland-fire-fireline-construction.htm

Fireline Production Rates
https://www.fs.fed.us/eng/pubs/pdf/11511805.pdf

USDA SBIR Topic 6
Developing Technology that Facilitates the Management of Wildfires on Forest Lands
https://nifa.usda.gov/sites/default/files/rfa/FY2020-2021-SBIR-Phase-I-2nd-solicitation-508_1.pdf

Ideal Student Qualifications

- Strong hands-on prototyping skills
- Past experience with autonomous vehicles or electric vehicles
- Interest in forming a startup company

Student Requirements
Team participants must sign a nondisclosure agreement and an invention assignment agreement.

Assets Provided By the Company
The company will purchase up to $2000 of parts on an as-needed basis.

Contact
Aaron Rowe, PhD
818-207-6875
AaronRowe@gmail.com