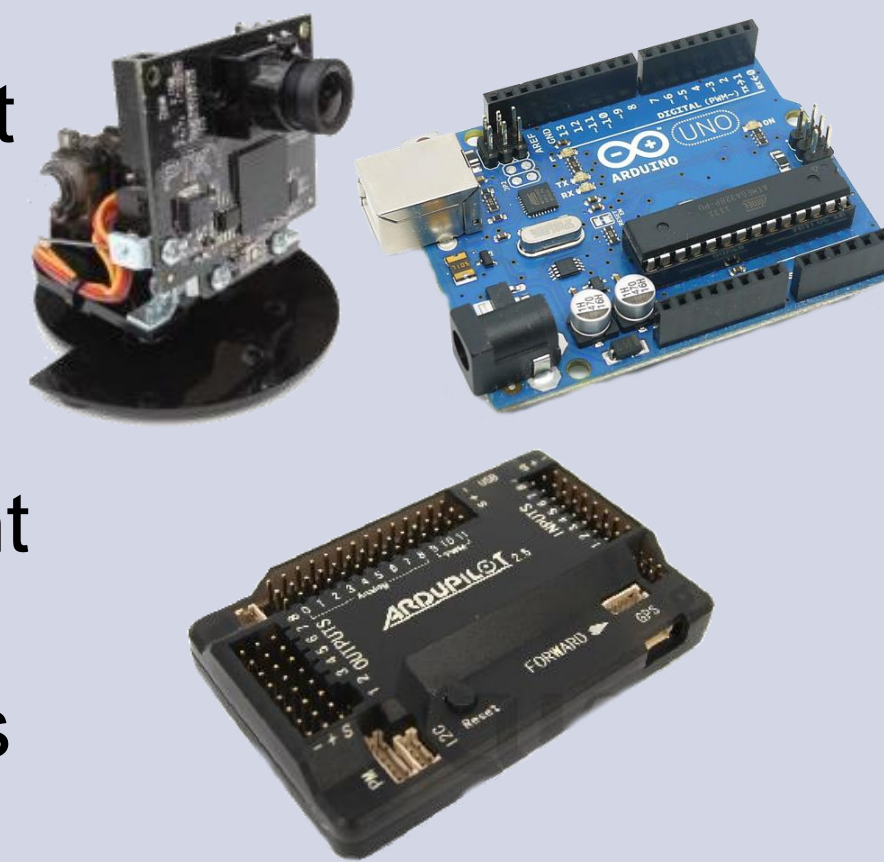


Autonomous Hovercraft – Rescue Robotics

Background

Local high schools decided to host competitions in robotics as part of a state-wide program. The program has as a goal to increase technical proficiency of high school students. The purpose of this project is to develop guidelines and methodologies for controlling a quadcopter autonomously with the use of a microcontroller.

Another goal is to recommend hardware that is friendly for making the quadcopter autonomous. These will be used, in the future, as the starting point for local high students to work on their own projects for the competition.



Objectives

- Build a prototype that executes the basic functions necessary for the requirements
- Identify hardware that is easy to assemble for high school students
- Identify software tools and algorithms for victim detection and movement control
- Provide documentation and workshops to high school teachers responsible for the competition

Requirements

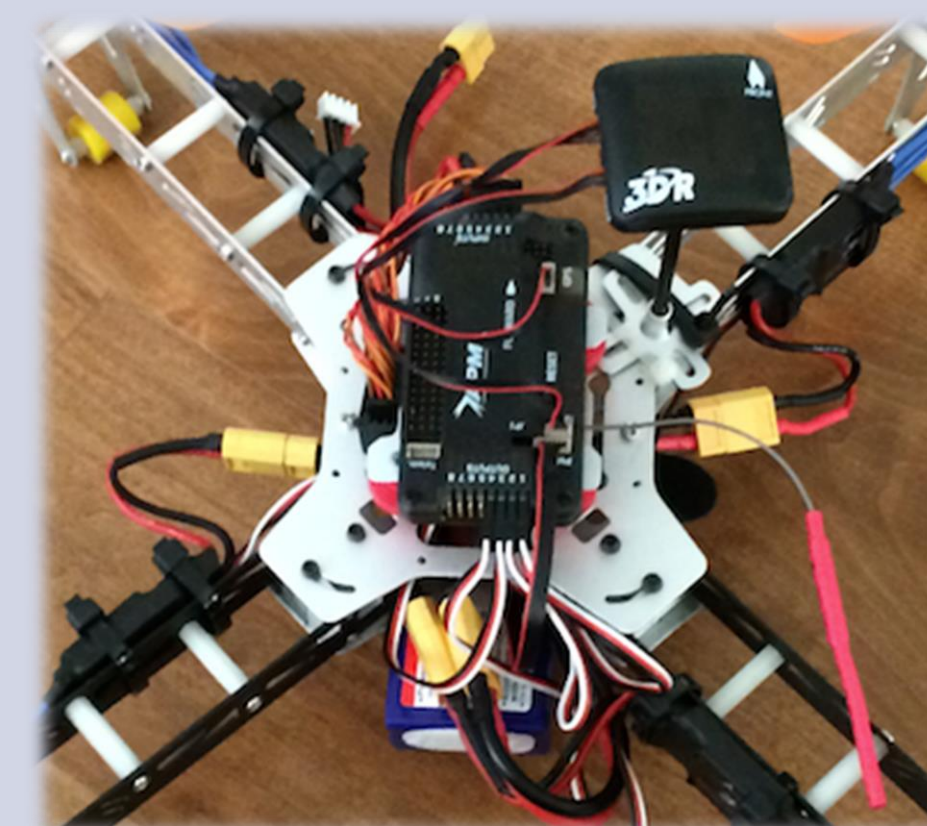
- Navigate autonomously and scout for victims of natural disasters
- Take a picture of the victim and log its global position
- Move to victims and log their coordinates
- Report the detected victims wirelessly
- Stable flight in outdoor conditions

Current Status

The current prototype is capable of semi-autonomous flight. It requires the use of an RC Controller for take off. The scouting and victim detection mode can be triggered from the RC controller. Once the detection mode is triggered, it will fly within a preset radius of where it took off from. The hovercraft will stop itself on top of victims, take a picture and log the latitude and longitude of where the victim was found.

Main Components:

- APM Flight-controller 2.6 (Controls rotors and stabilizes flight).
- PiXy camera with embedded color-based object detection GPS for navigation control and logging position.
- SD Card for storing pictures and text file with recorded positions
- Two Arduino Uno micro-controllers for programming the artificial intelligence (Interfaces with flight controller, cameras and GPS)



Innovation

The main innovative aspect of this project is the framework it provides for the creation of autonomous quadcopters with unique features. Autonomous aircrafts in the market come in a black-box design that does not allow the user to extend its functionalities. With the use of an Arduino for controlling flight, the possibility of features that can be added to the aircraft are virtually endless. Non-experts can use the base provided and learning materials to design their own unique aircraft.

• Next Steps

- Create an application programming interface (API) to facilitate programming the artificial intelligence of the hovercraft.
- Develop application that can receive the data sent wirelessly from the quadcopter to track current status of flight.
- Figure out a networking solution to allow multiple Quadcopters to coordinate as a swarm

