Fuel Cell Drone

Innovative Drone Design Combined with Fuel Cell Energy

HyDrone

UCI Samueli School of Engineering

Background

The demand for fossil fuel is increasing every year, while the rate of the fossil fuel production by nature is decreasing. As a result, fossil fuels will be depleted in the future if this continues. This will result in increase in price of fossil fuel products, such as gasoline, and will continue to harm the environment with pollution.

As a solution for the problem, hydrogen fuel cell has been developed, which produces pollution-free water. Also, since hydrogen is the most abundant element in the universe, it is inexhaustible unlike fossil fuels.

This is the first year that this project is being held, meaning that everything we do is brand new and our original work. Our team aims to understand fuel cell operations and apply our findings to the building of a fuel cell drone.

Goal

Design and build a hexacopter drone that is powered by fuel cell battery and able to carry 5 kg object.

Objectives

- Doing research on fuel cell operations
- Studying the structures of drone and construction material
- Design and build testing bed to test the required power supply
- Doing trade study for power supply (testing lithium battery & fuel cell battery)
- Design and build the drone
- Testing and optimizing the performance of the designed drone

Timeline

Fall 2018 — Starting Phase

- learn about drone structure by building up a reference drone
- design concepts and prototype of quadcopter drone
- GIF & UROP proposal for funding

Winter 2019 — Design Phase (week 1-5)

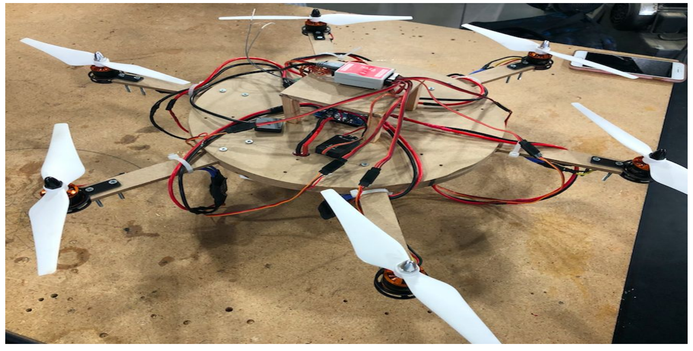
- Design a hexacopter testing drone and do simulation
- test of electrical connections
- trade studies for lithium battery choice for testing

Winter 2019 — Manufacturing Phase (week 6-10)

- manufacture the designed testing drone
- connect to the electrical parts
- testing and power calculation

Spring 2019 — Testing phase

- testing with lithium battery
- testing with fuel cell battery
- testing carrying an object

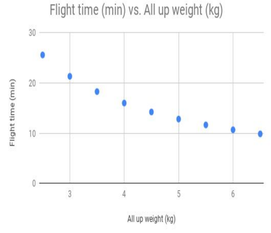


Requirements

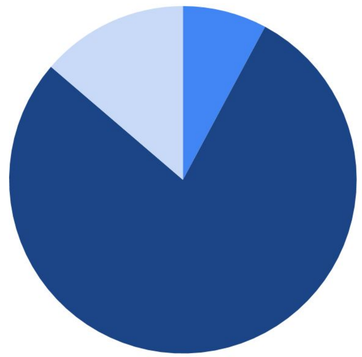
- Powered by fuel cell (able to carry the fuel cell battery and hydrogen tar
- Able to carry a 5kg object
  - Design Hexacopter (6 wings) drone carry more weight (6 motors)
- Fly at least for 10 minutes at an attitude of at least 2 meter
  - Enough power supply to support the flight time
- Low cost for building the drone frame

Current Status

- Designed the drone's electronic schematic for both testing bed and 24V drone system. Did the research and purchased the new series of electrical parts for the drone.
- Testing fly with lithium and gained battery performance.
- Testing fly with power source that can stimulate fuel cell.



Budget



- ●Reference Drone - $220
  - Includes the propellers and motors
- ●Fuel Cell Battery - $2000
  - Fuel Cell
  - Hydrogen Tank
  - Hydrogen Fuel
- ●Material Fee - $350
  - Electrical Part
  - 3D - Printing Fee
  - Additional Construction Materials

Next Step

The Fuel Cell Drone team has 3 objectives in mind for the upcoming academic year. In summary, we want to continue fuel cell research, find the most suitable fuel cell to use for the drone, and complete the design, building, and testing process of the drone.

Fuel cell research will aid us in our overall understanding of how the fuel cell works and how we can utilize its applications in accordance with our drone.

Finding the most suitable fuel cell type will allow for us to find the best balance of energy efficiency and battery life for the drone for maximum performance.

The testing process of the drone will be completed in accordance with our project. Once this objective is finished, our drone will finally be completed.

Faculty Advisor

- Professor Yun wang - yunw@uci.edu
- Professor Feng Liu - fliu@uci.edu

Team Members

Team Lead: **Yanfeng Hai**

Mechanical Team: Woongju Kim Hyunseoung Bang Amin Nadimzadeh

Electrial & Control Team: Xiangwang Hu Yangbo Zhou Songkun Li

Propulsion Team: Laiian Sou Chengyan Pan

Documentation: Peixin He Liming Zhao Clinton Kwong