FLIGHT
The engineering behind the art

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FLIGHT is a complex, distributed system

- Mechanics (wings)
- Structural (safely attaching to building)
- Power distribution (each Fractal Flyer is 60W)
- Electronics (motor control, sensing)
- Firmware (processor on each FF)
- Software (system control GUI)
Fractal Flyer Top
Fractal Flyer Bottom
Fractal Flyer Internals
Dichroic
Electronics Architecture

- 49-to-1 USB hub
- 48V power supply
- USB GPIO
- LXStudio GUI
- /dev/ttyUSB0
- /dev/ttyUSB1
- /dev/ttyUSB2
- /dev/ttyUSB75
- /dev/gpio

76 Fractal Flyers

Cat5/7 Cable

PC

USB hub

USB hub

Headboard (7 flyers)

Data

Power

Reset

Tailboard
Electronics Architecture

- Centralized PC controls FLIGHT
- Each Fractal Flyer (FF) appears as 2 USB devices: a serial port and a storage device
  - Serial port: Python interpreter
  - Storage device: storing scripts/code
- Software on PC (LXStudio GUI) controls flyers by sending scripts
- A separate USB GPIO device allows PC to reset/reboot each flyer
Headboard is a custom PCB puts USB data, 48V power, and the reset line over a Cat 5/7 (Ethernet) cable.

PC has two 49 port USB hubs:
- Each headboard plugs into 7 ports at once.

4 Cat wire pairs:
- 1 is data
- 2 are power/ground pairs
- 1 is reset
Each Fractal Flyer has a tailboard, a custom PCB with an Ethernet jack (connected to headboard)
To Do Items

- Bring up and test headboard
To Do Items

- Bring up and test tailboard (more details coming up)
To Do Items

- Test, debug, and engineer data/power delivery over Cat cables
To Do Items

- End-to-end script generation and control
- Script looping
- Library of actions/animations

LXStudio GUI

/dev/ttyUSB0
/dev/ttyUSB1
/dev/ttyUSB2
/dev/ttyUSB75
/dev/gpio

76 Fractal Flyers
FLIGHT GUI

More patterns

Save/play loops
Tailboard PCB

- Motor controls
- Ethernet jack
- Body accelerometer
- Body LEDs
- Wing accelerometer
- Wing LEDs
- Wing accelerometer
- Wing LEDs
- Feather M4 compute board
Winter Goal

- Have 3 completed Fractal Flyers
- All 3 fliers connected with FLIGHT wiring/power
- Demonstrate end-to-end programming of 3 Flyers from a PC running the FLIGHT GUI
Projects for Winter

- Bring up tailboard (PCB)
- Bring up headboard (PCB)
- Get to bottom of signaling problems on Cat5/Cat7 (signals/EE)
- Full end-to-end script generation by GUI (hardware/software)
- Firmware for tailboard (software)
- Writing a library of animations/controls (Java/art)
- Composite looping in GUI (Java)
- Design/prototype fixtures for stairwell (mechanics)
- Graphics for FLIGHT simulator (OpenGL)