UAV Assisted Energy Delivery

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Summary

Problem Statement

Devices are being added that need power; however, there are few energy connections available to power these devices. We need to develop a flexible way to power these devices.

Solution

– Use a drone to reach these isolated devices
– The drone will fly autonomously to destination
– Detection of device by QR code and color recognition
– Transfer energy from drone to isolated device

Standards

– 1028-2008 Software Audits
– 1625-2008 Multicell Batteries
– 16085-2006 Risk Management
– 14764-2004 Software Lifecycle Processes and Maintenance

Drone

Design Requirements

Functional

– Take off, fly to / from a specified location autonomously
– Dock with docking node for power transfer autonomously
– Deliver power to / from payload battery to docking node

Non-Functional

– Scalability (up to miles)
– Security
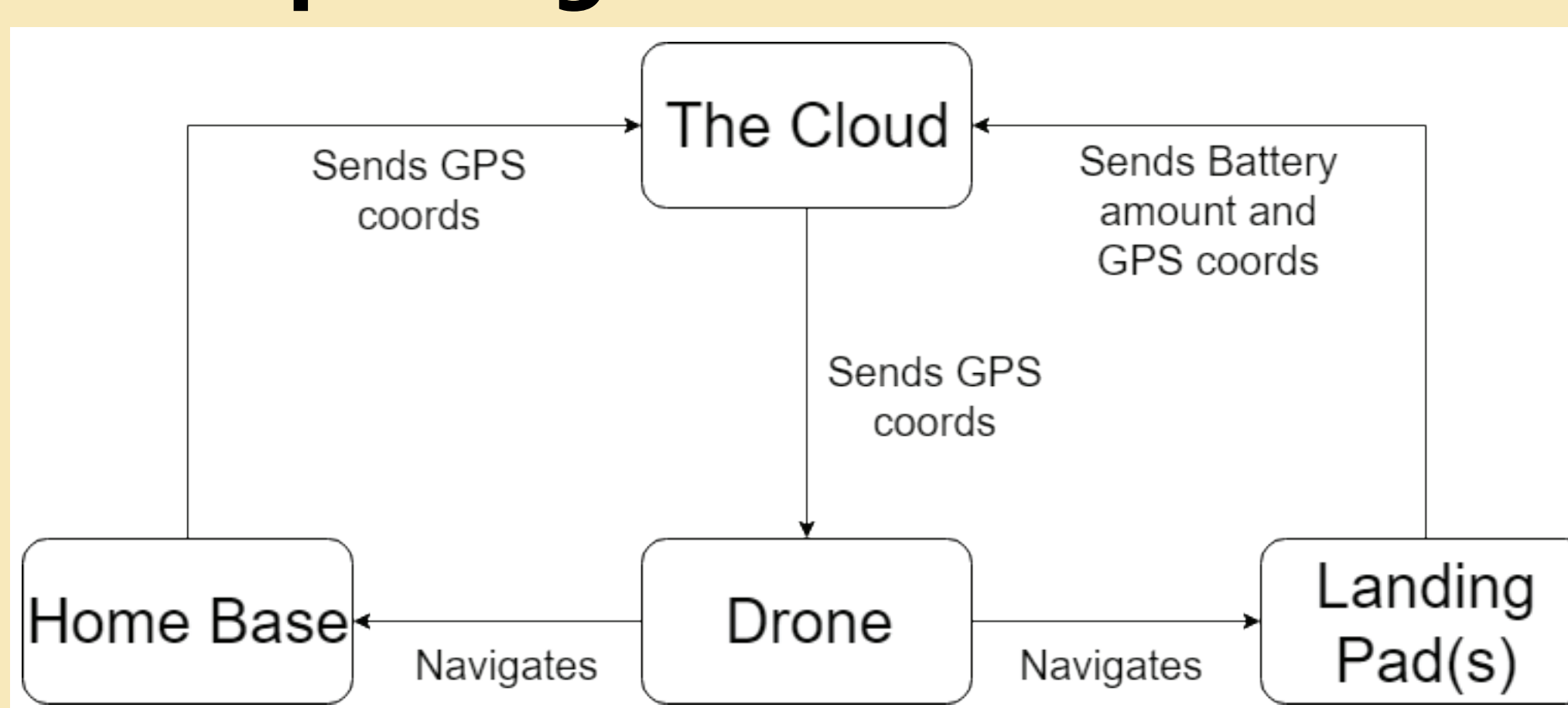– Performance (wind resistance, flight efficiency)

Webcam

Acknowledgements

– Dr. Geiger
– Dr. Chen
– Dr. Zambreno
– Jeffrey Richardson
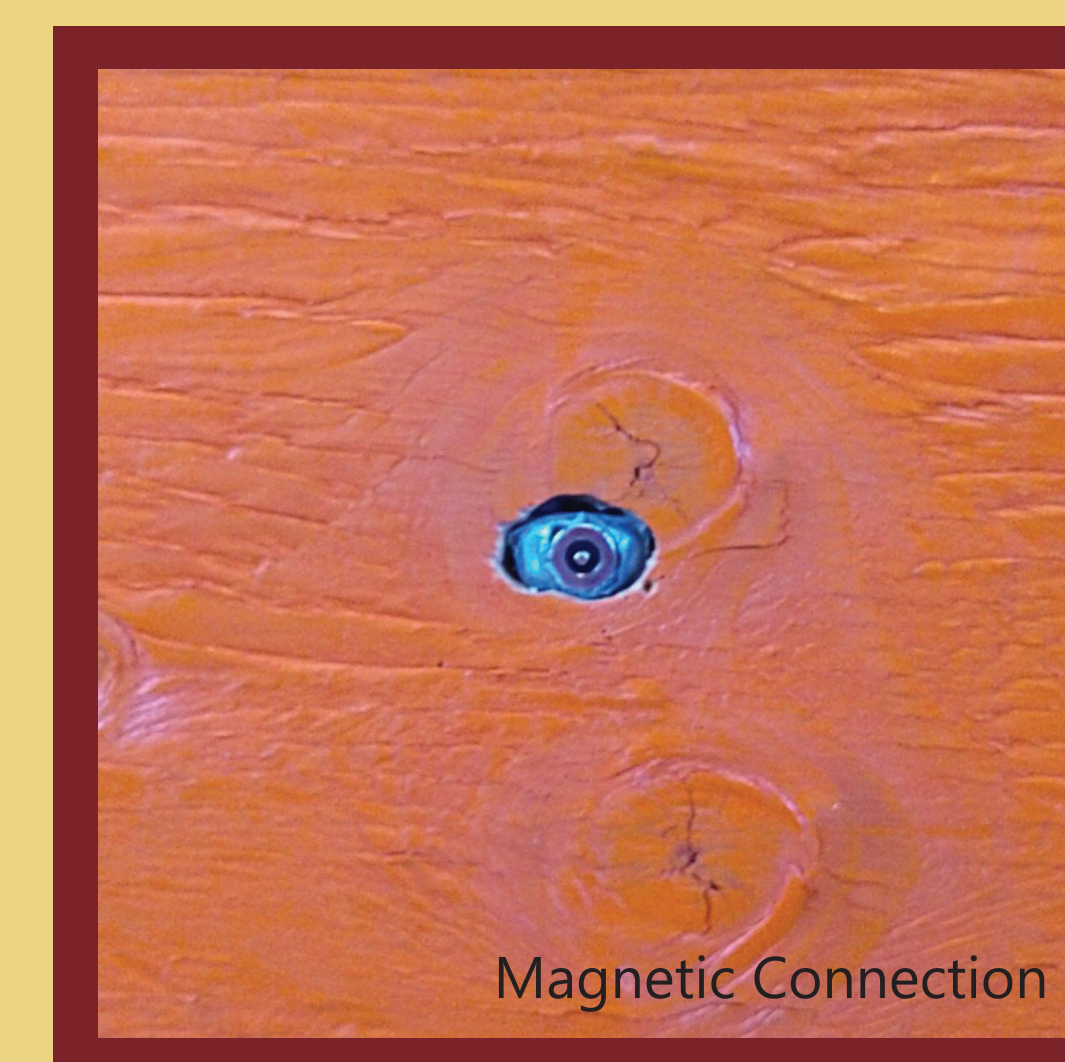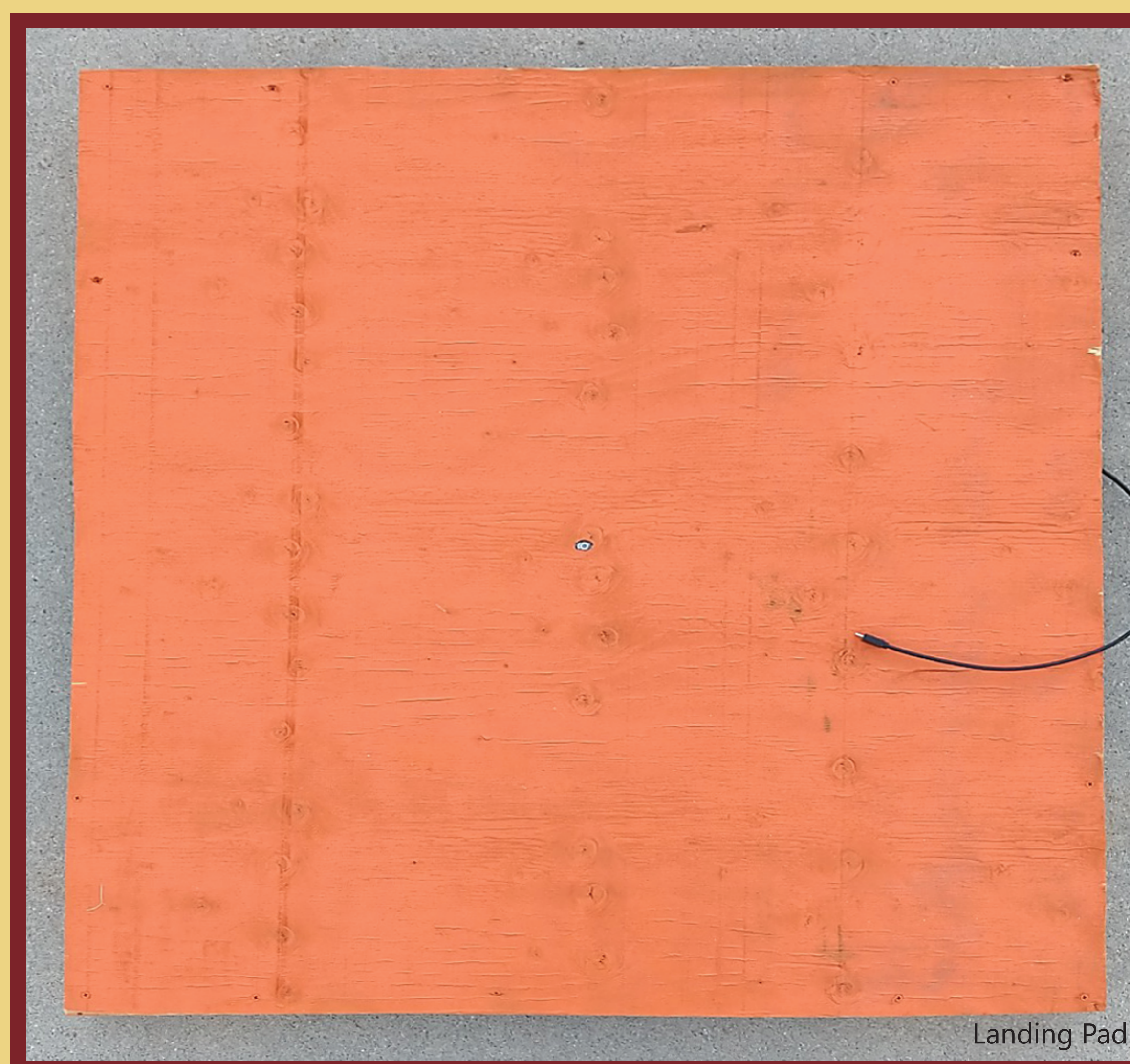– Jacques Arnoult
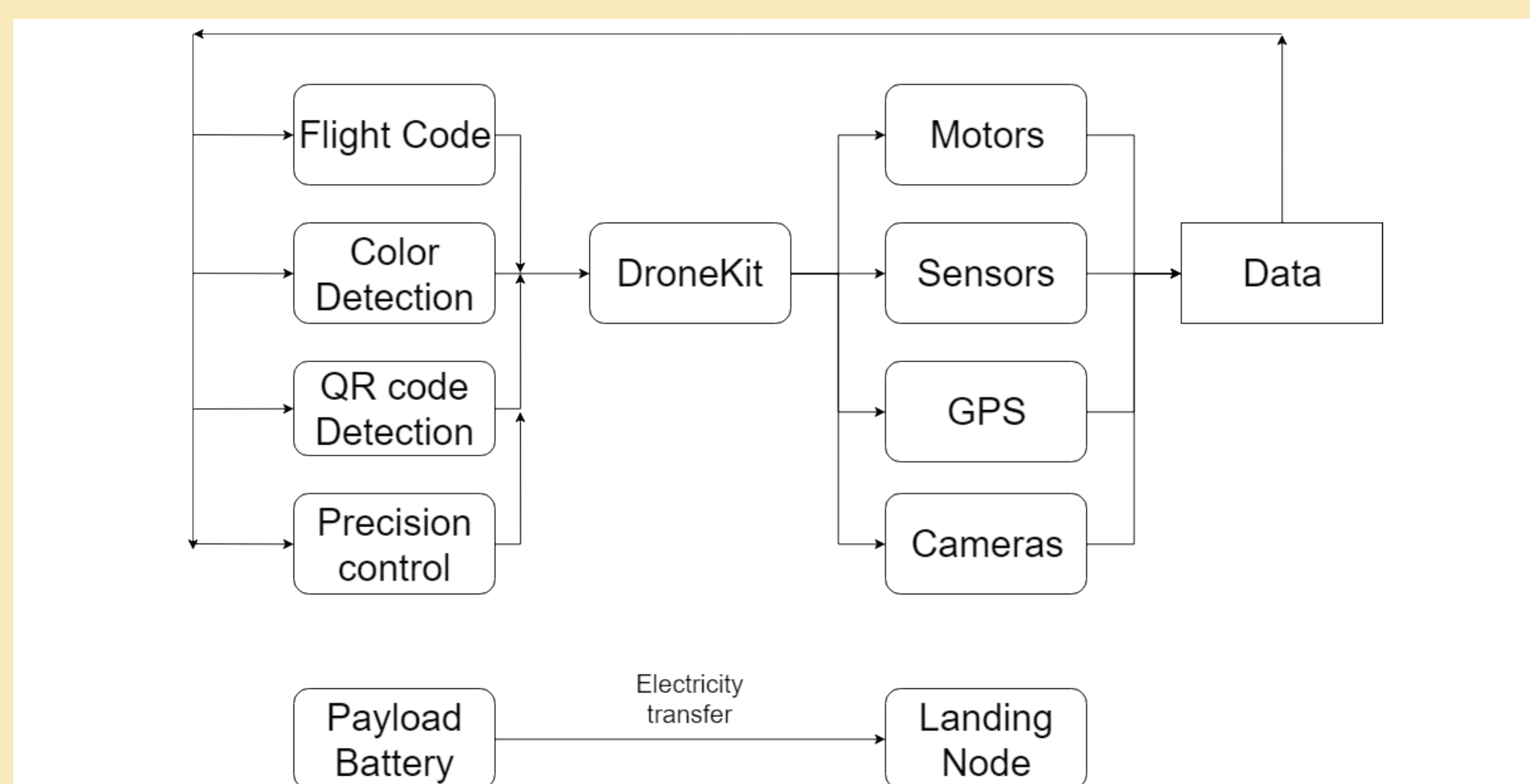– Alec Ehlke

Design Approach

Concept Diagram

System Implementation

– DroneKit
– Python
– Pyboof (QR)
– OpenCV2
– Lithium-ion battery
– Intel Ready-To-Fly drone
– Magnetic connection

Landing Pad

Magnetic Connection

QR Code for Landing Detection

System Functions

System Architecture

– Magnetic connection used for power transfer
– Software systems process data to give directives to DroneKit
– DroneKit interacts with the hardware; for example, commands propellers
– Sensors feed data back into software to complete the process

Testing

Unit Testing

– Fly to location
– Precision movement/landing
– QR/color detection
– Power transfer

System Testing

– GPS coordinate testing
– Fly to location with 1 meter accuracy
– Switch flying modes
– Integration

Conclusions

Accomplishments

– Getting the drone to fly to location
– Reliable power transfer
– Precision movement
– Image detection/color detection/QR
– Wireless communication

Future Extensions

– Multiple drones/devices
– Charge detection
– Server communication