UC San Diego
JACOBS SCHOOL OF ENGINEERING
Electrical and Computer Engineering

Drone Integration for RF Scanner Payload

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HOVERPORT

UCSD

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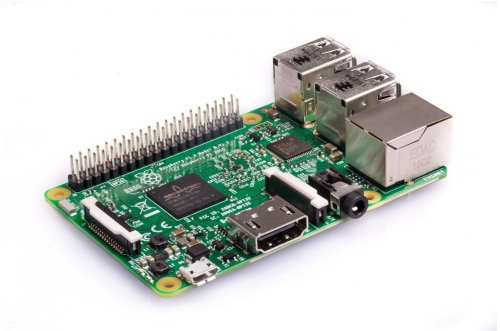
Technologies Used: Hardware

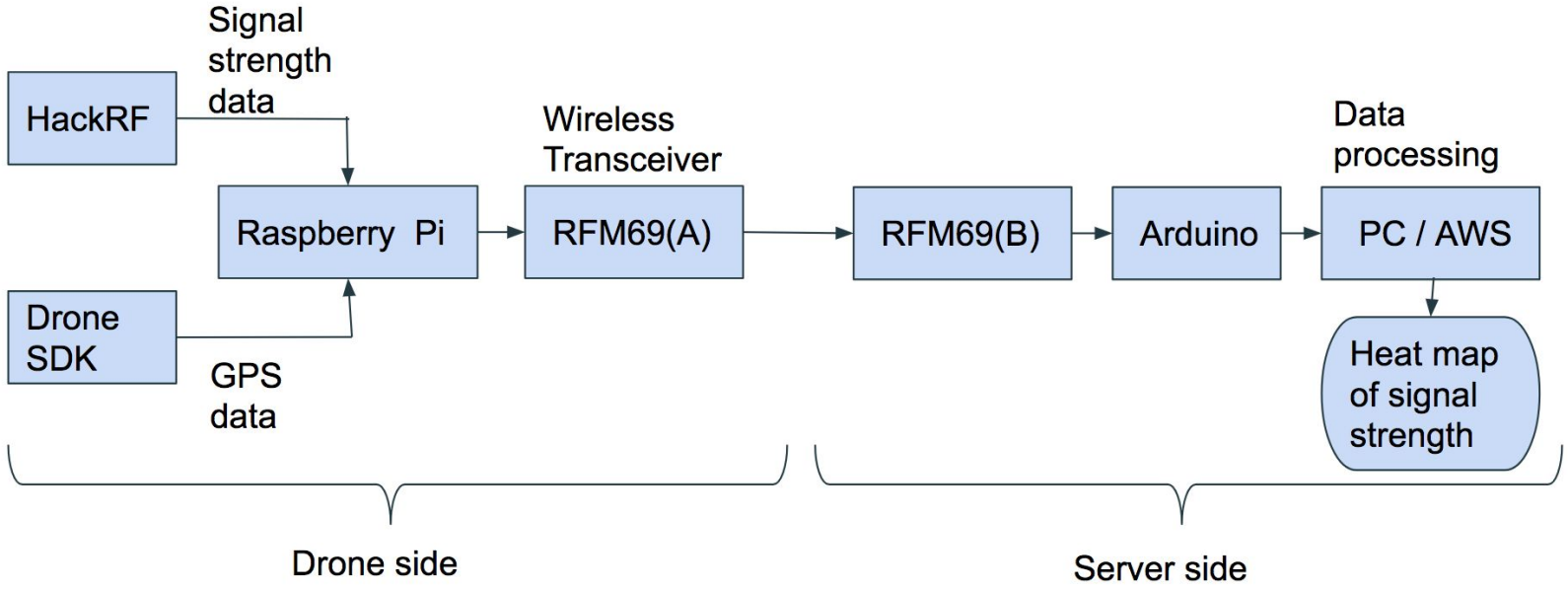
- Microcontroller
  - Raspberry Pi
    - Develop logic onboard drone
- Frequency Scanner
  - HackRF
  - Mobile Phone
- Drone
  - DJI Matrice 100
    - SDK for application development



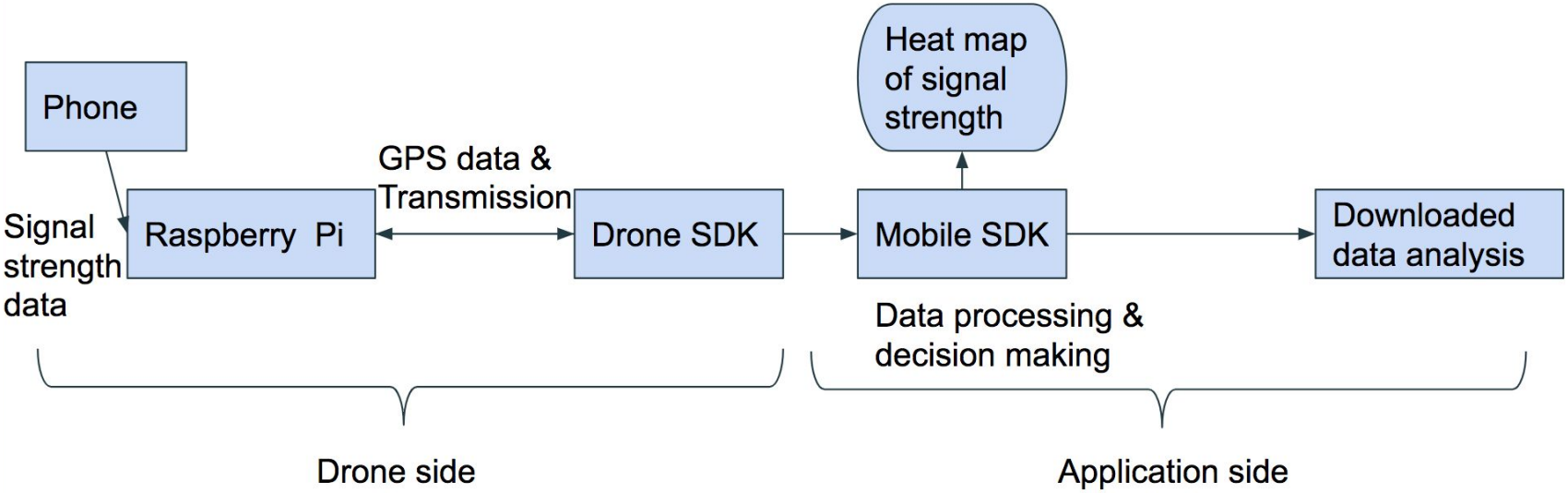
Source: https://www.raspberrypi.org/products/raspberry-pi-3-model-b/

Source: https://www.dji.com/matrice100

Initial Approach



Our Approach



- Replace HackRF with mobile phone
- Use drone to transmit data
- Heat map in mobile application
- Integrate data analysis and drone control

Steps

- Phase 1: Research components
- Phase 2: Develop onboard application to receive GPS data from drone, and transmit it through the drone
- Phase 3: Develop mobile application to process strength data for visualization

Source: https://developer.dji.com/

Source: https://developer.dji.com/

Onboard Computer Integration

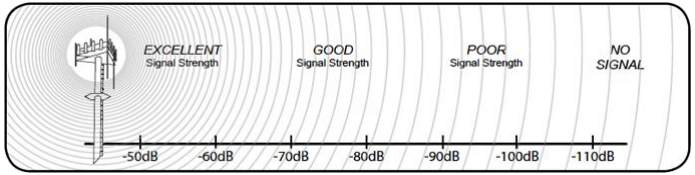
- DJI's Onboard SDK
- Integration with Raspberry Pi
  - Provide GPS Data
  - Transmit data to Raspberry Pi
- Script for receiving signal strength data

Source: http://linuxgizmos.com/new-dji-drone-computer-runs-ubuntu-on-tegra-has-open-sdk/

Source: https://developer.dji.com/onboard-sdk/

HackRF Replacement

- Replace HackRF with a phone application
  - More relevant data
- Record information on
  - Dropped calls
  - Cellular frequencies such as 3G and 4G LTE
  - Different WiFi Networks
- Phone application pushes data to Raspberry Pi
  - Con: must be mounted on drone



Source: http://www.procel.com/signal_amplification.html

Source: https://hackerwarehouse.com/product/hackrf-one-kit/

Mobile Application

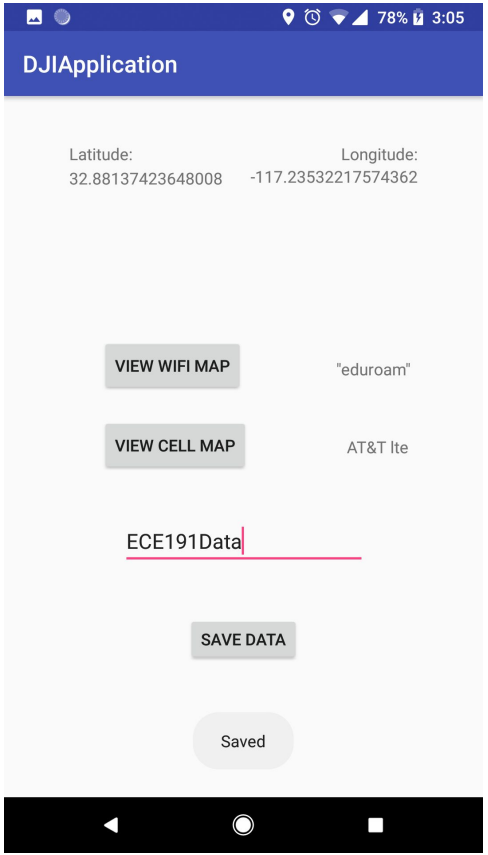
Drone side

- Mobile phone scans signal strength and sends to Raspberry Pi

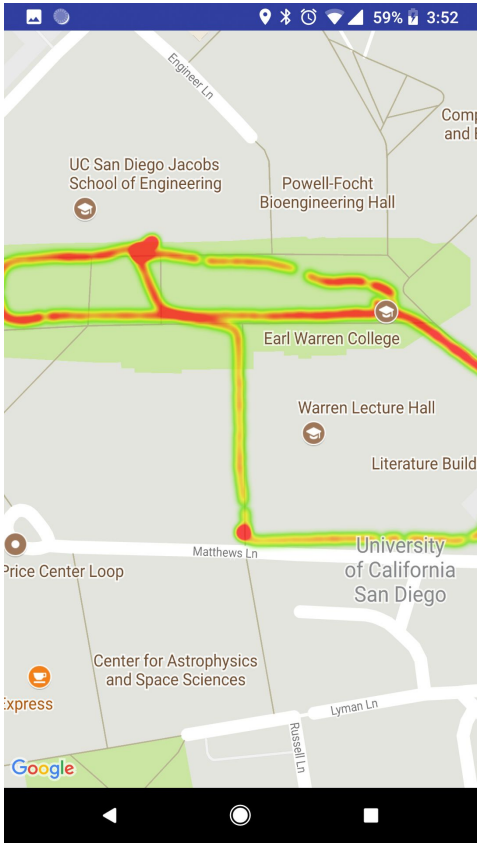
User side

- Receiving data from transparent transmission data
- Mobile SDK provides endpoint for displaying drone coordinates
- Google Maps API for generating heatmap based on data
- Writing data to file

Success!



AT&T LTE



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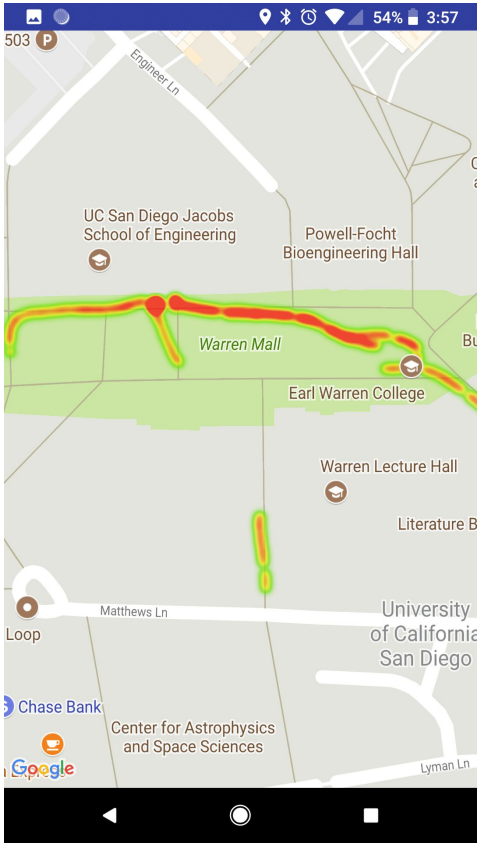

Future

- Incorporate more types of data that Hoverport can use
- Data driven flight decisions of drone
- Upload heatmap data online for more advanced analytics
- Overall performance upgrades!

Source: https://www.myboothang.com/dji-matrice-100-quadcopter-drone/