Nakuja Project

Avionics

Week 3 Progress Report

Tasks completed this week

- [#30] Research on camera

  ESP32 CAM test

  FPV Camera test
- [#1] ESP Wi-Fi data transmission test
- [#2] Research on ground station

Research on camera

- We found an ESP32 CAM module that communicates over WIFI Ip address
- ESP32 cam uses OV2640 camera module-JPEG compressed image

ESP32 CAM Specifications

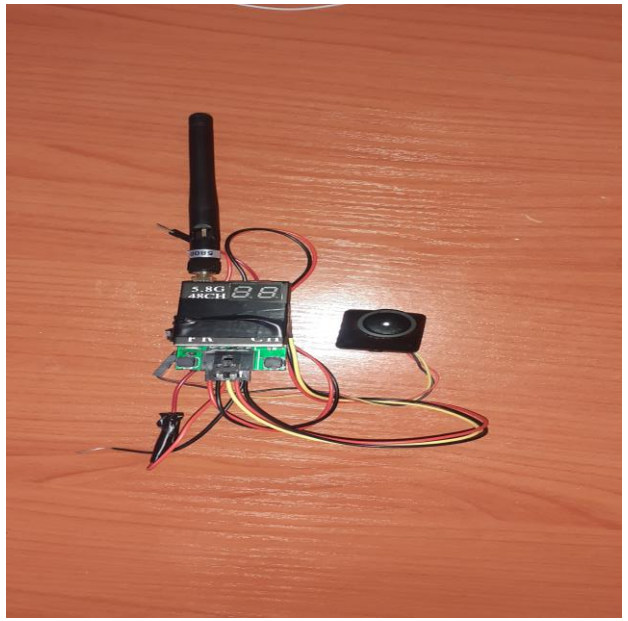
- The smallest 802.11b/g/n Wi-Fi BT SoC module
- Low power 32-bit CPU, can also serve the application processor
- Up to 160MHz clock speed, summary computing power up to 600 DMIPS
- Built-in 520 KB SRAM, external 4MPSRAM
- Supports UART/SPI/I2C/PWM/ADC/DAC
- Support OV2640 and OV7670 cameras, built-in flash lamp
- Support image Wi-Fi upload

Test results

- We conducted tests on video transmission over a range of 15m
- Video results were received over IP address
- Constrained by Wi-Fi Strength considering its operating over Wi-Fi
- Good resolution up to distances of 5m. Beyond 15m, the camera lost its clarity

FPV Camera test

Transmitter



Receiver

Specs

- Transmitter

Channels - 8

Frequency band - 2.4 – 6.8GHz

- Receiver

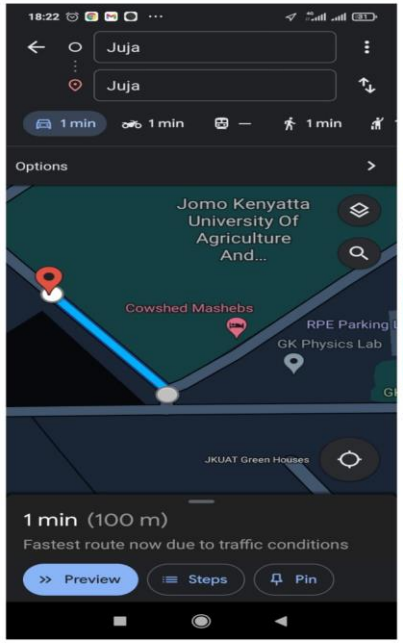
Channels - 8

Frequency band - 2.4 – 6.8GHz

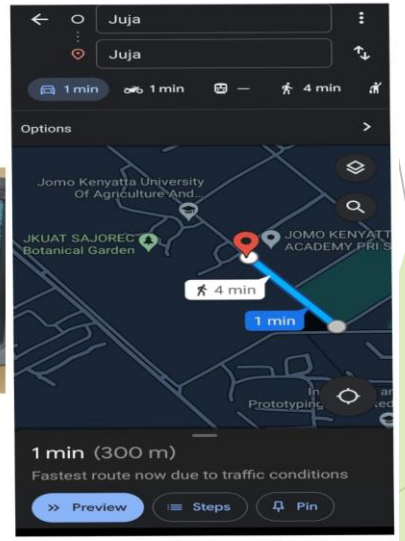
Test results

Test site: Sajorec, Distance ~1.1km

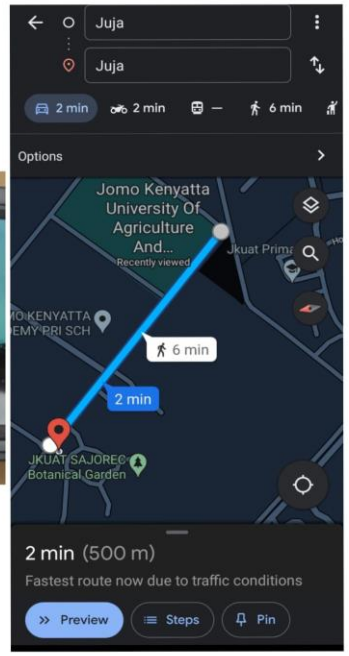
100m



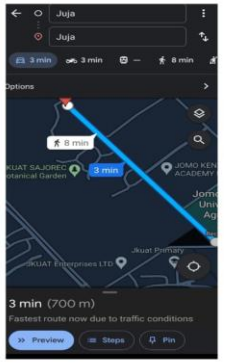
300m



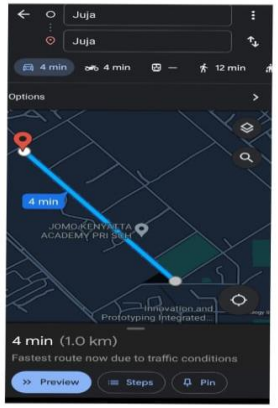
500m


Juja
Juja
2 min
2 min
6 min
Options
Jomo Kenyatta University Of Agriculture And...
Recently viewed
6 min
2 min
JKUAT SAJOREC Botanical Garden
2 min (500 m)
Fastest route now due to traffic conditions
Preview
Steps
Pin

700m


Juja
Juja
Options
8 min
3 min
3 min (700 m)
Fastest route now due to traffic conditions
Preview
Steps
Pin

1km



- Image started becoming grainy and pixelated at 1km

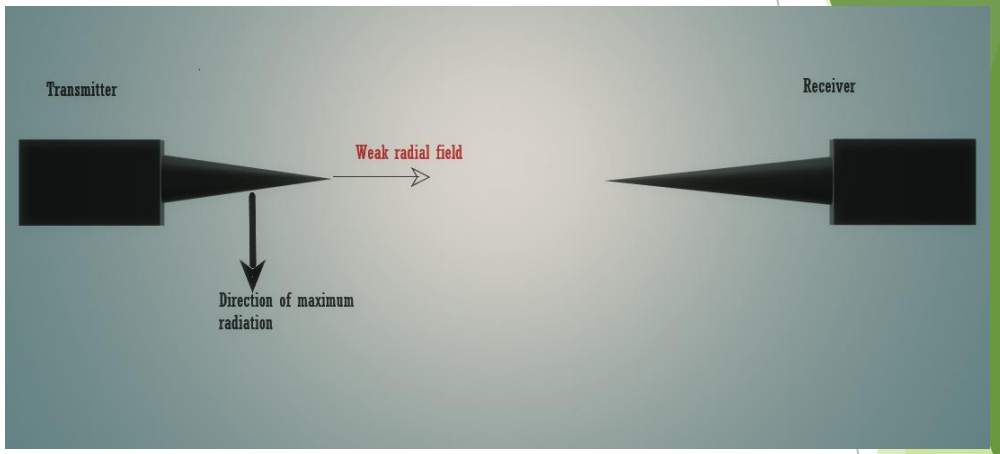
Concerns

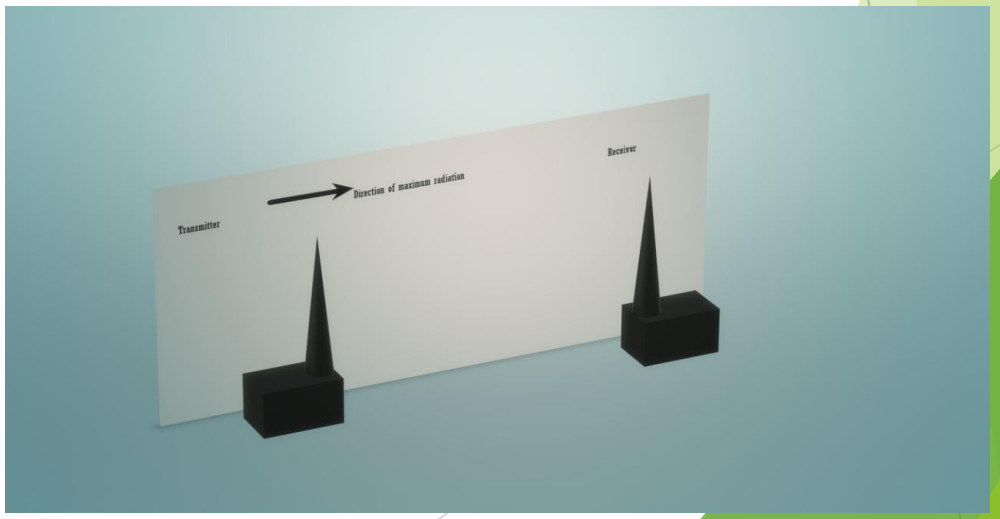
- Interference with other Wi-Fi frequencies especially ESP32 Wi-Fi

  Solution: Operate FPV on a different frequency

- Directivity

  At 300m we noticed that when the antennas are pointed towards each other the video signal is degraded compared to when they are held upright





Concerns

- Power usage

  FPV transmitter uses 9-12 Volts. We intend to add a more powerful battery
- Storage – Tweak the LCD-TFT receiver to include flight video storage

[#2] Research on ground station
1. Flight Data Recorder

- Aim: Receive data from esp32 to Raspberry Pi Serial monitor
- We were able to fetch data received from ESP32 to Raspberry pi via the serial monitor and store in a csv file with python
- Advantage: Graphing, Storage and analysis for future optimization

Task this week

- [#23] Avionics bay design
- [#1] Wi-Fi Antenna design for range extension
- [#2] Dashboard design
- [#31] Apogee detection
- [#26] Improve Kalman filter performance