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Faculty Advisor(s): Dr. Bruce Maxim - CIS
Sponsor: Dr. Zheng Song - CIS

Sky Socket

Senior Design I

Project Needs:

Unmanned aerial vehicles (UAVs) provide bird's-eye video stream, which can significantly extend the vision systems of ground vehicles. However, processing the video on the drone itself may drain the drone's battery rapidly, while sending the video to the ground vehicle for analysis may cause car response times to suffer from higher delay.

Objectives:

- ***Model*** how the division between computing tasks locally and transmitting video to the car impacts the power consumption of the drone and the information delay on the car.
- ***Develop*** object segmentation algorithm for bird's-eye view video streams and a decision-making algorithm.
- ***Build*** a testbed to evaluate our system's performance.
- ***Optimize*** drone-car workload: *maximize* drone battery life, *minimize* car response delay.

Testing:

- Simultaneously run the car and drone with an object in the car's path.
- Run a bandwidth analysis program.
- Log bandwidth, battery life, and car response delay.
- Run the experiment programs until the battery of the drone is drained to mark the end of the test run.
- Analyze log data from each test run and modify our system.

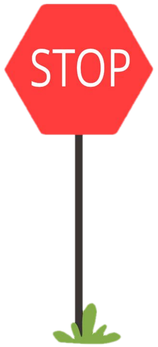
Requirements, Constraints, & Design Tradeoffs

- The battery capacity cannot be expanded efficiently since higher capacity comes with increased weight.
- Transmitting the video to the ground vehicle for analysis will cause higher delay; analysis on the drone drains more battery.
- The system needs to achieve the right balance between energy consumption and latency (car response delay to traffic incidents).

Key Areas of Interest and Motivation

- With the emergence of the **5G** network infrastructure, the realization of **Edge Computing** (data processing closer to the source of data generation) and **Vehicle to Vehicle Networks** has emerged.
- We aim to take advantage of and advance these emerging technologies to improve driving safety and driver experience by enhancing **ADAS (**Advanced Driver-Assistance Systems).
- Our work will also advance the future of **Autonomous Vehicles**.

OpenCV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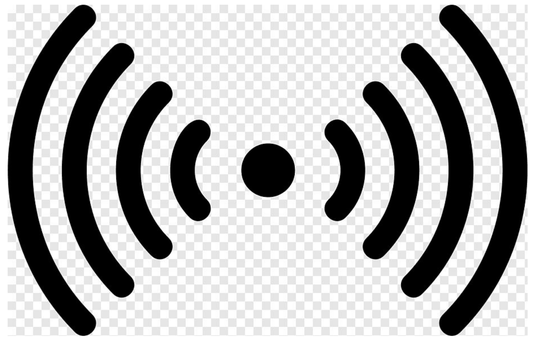
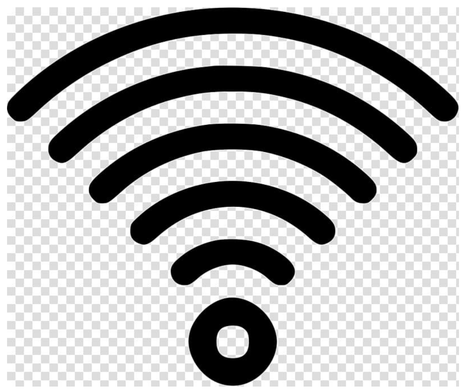
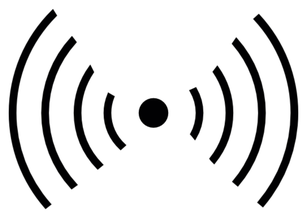
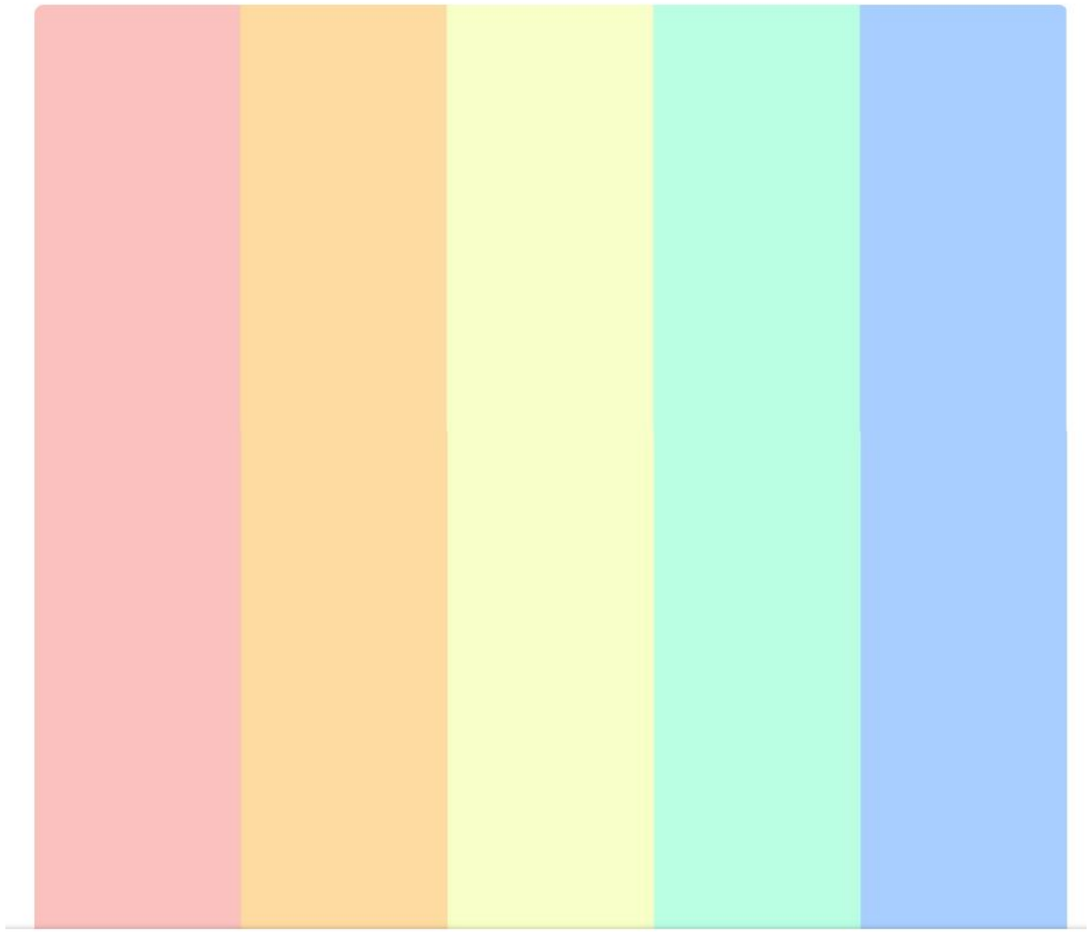






COLORS THAT ZHENG SONG NEEDS!

NEED!



More feedback from Dr. Song on the poster

1. add more photos
2. drone flying

stuff we can use some time