AAE2004 Introduction to Aviation Systems
AAE
Design of Path Planning Algorithm for Aircraft Operation

Discussion and Outlook

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Why coding/programing is important for Aviation Engineering (specially after COVID-19)?

What are challenges to make this happen?

Infrastructure inspection
- Parcel Delivery

Infrastructure inspection
- building and bridge defects, etc.

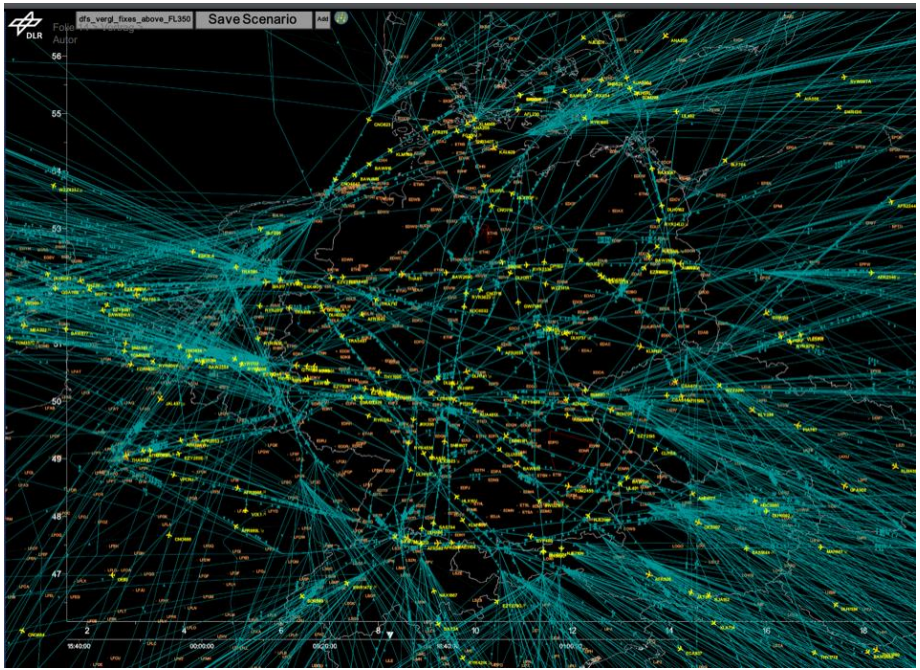
Search and Rescue (SAR)
- disaster prevention and rescue,

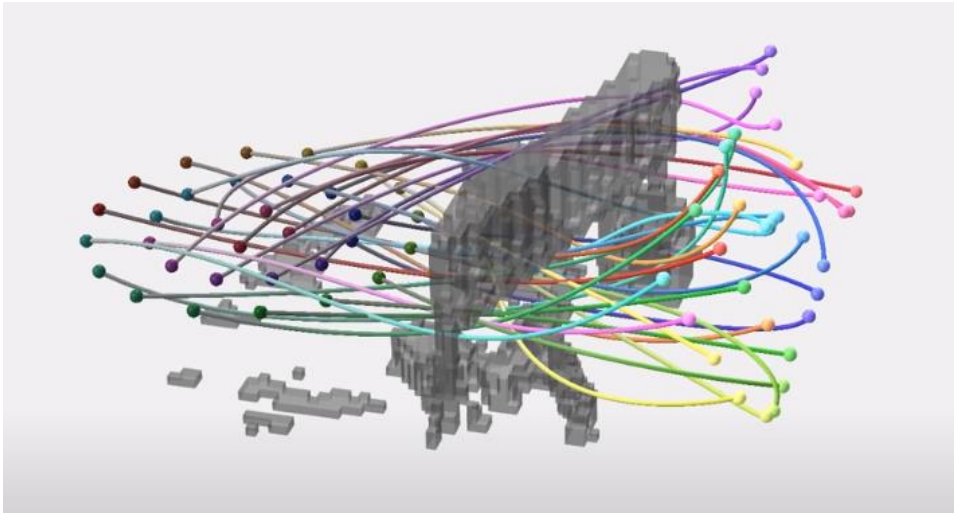
Smart transportation
- traffic monitoring management
- air quality monitoring

https://dronelife.com/

Crowded Airspace in Cities

Challenges - Collaborative Path Planning

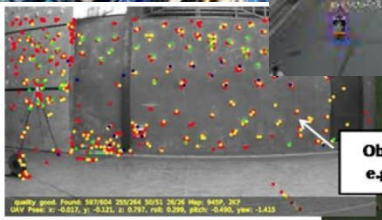


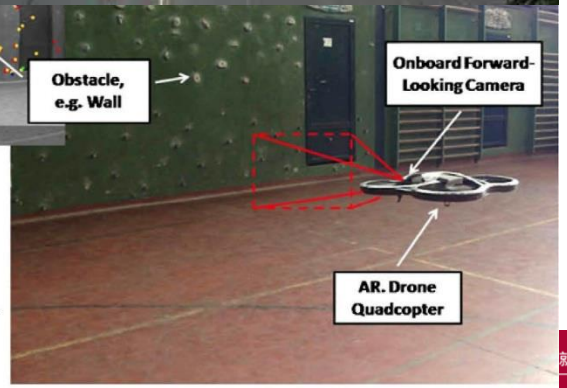


https://www.youtube.com/watch?v=7KIa9FlmbRc

Keywords: Path planning, traffic control, SWARM collabation, IoT, Connect vehicles, and Smart Cities

Challenges – Collision Avoidance





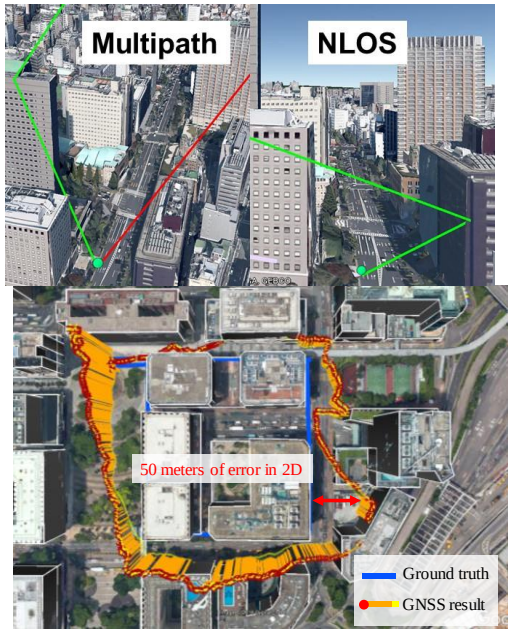
Onboard Image

External Image

Keywords: Perception by AI (deep learning), image processing, estimation and optimization

Challenges – Navigation in Challenged Environments

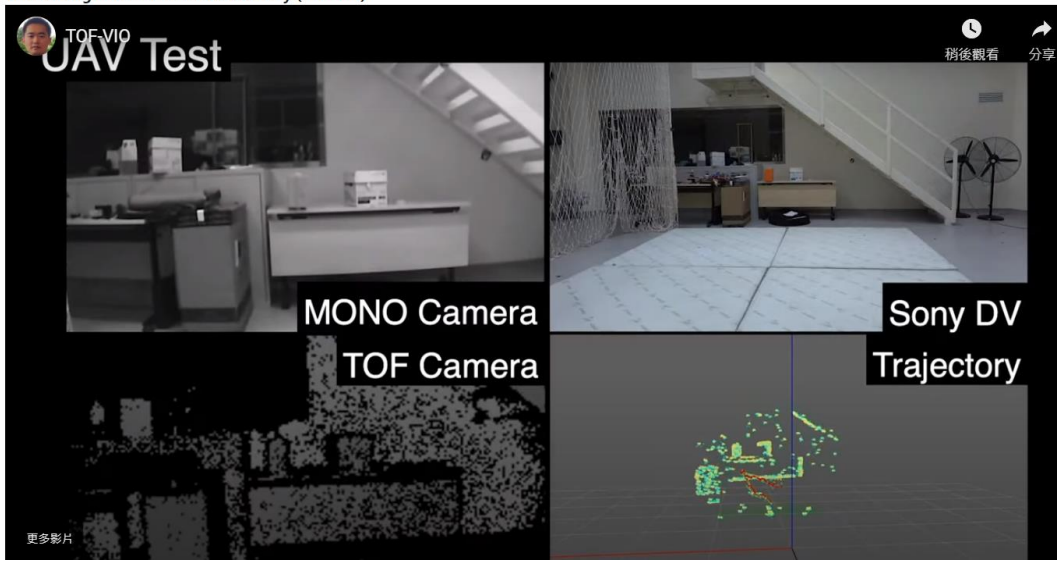
Challenge in GNSS Positioning



Visual Navigation

https://www.polyu.edu.hk/researchgrp/cywen/index.php/en/mav-uav/perception-slam.html

Time of Flight Visual Inertial Odometry (ToF-VIO)

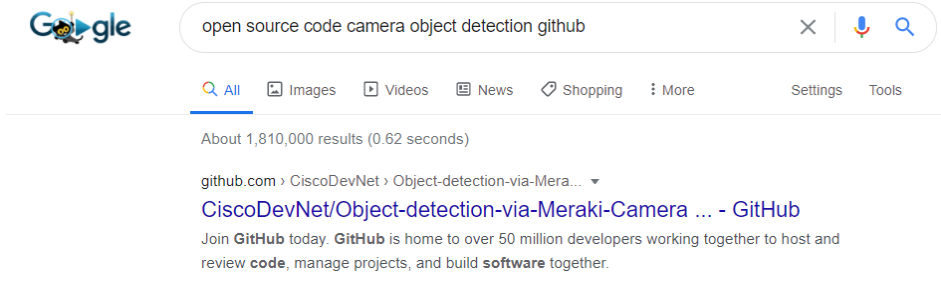


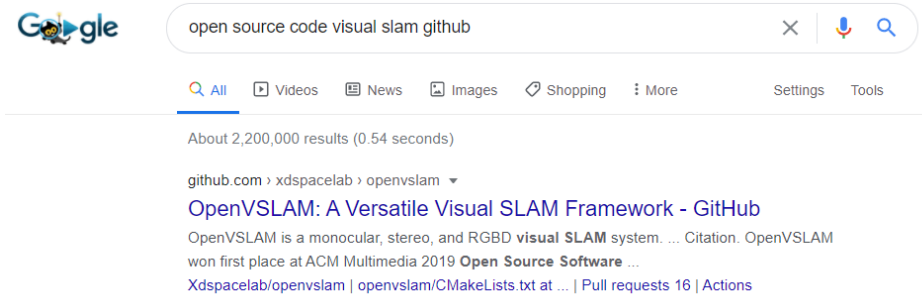
Keywords: GNSS, inertial navigation system, visual positioning, simultaneous localization and mapping (SLAM), sensor fusion, filtering.

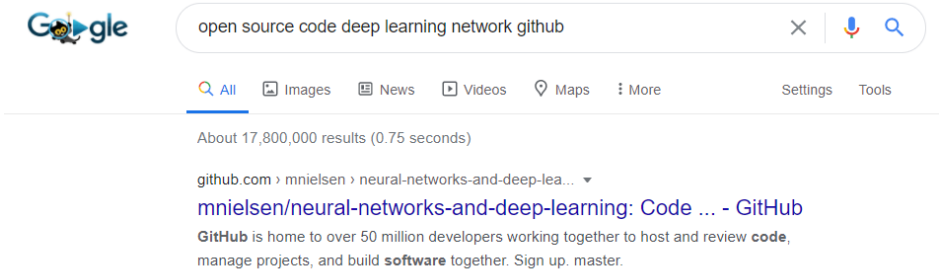
Integrity and Safety

Keywords:
Airworthiness, Reliability, Compliance (regulation-wise)
Statistics and modelling (mathematics-wise)

Most of the sample open-source codes can be found in GitHub







To do list in your 4 years…

1. To initiate one hand-on project (by coding or manufacturing) related to your passion.
   - Manufacturing an UAV, Enabling autonomous function of an UAV, etc
2. To find news and articles (by hashtag or club in social networks) that related to your interests.
   - Accumulating your domain knowledge and expand your network with someone who have similar passion to you.
3. To find the issues/problems (in your network, village, city, nation, area and the world) you cared and try to find solutions to these challenges.

(Video) AI and Data Science in Aviation

- https://www.youtube.com/watch?v=D8NlYPtPgwA
- 1:18 - Revenue Management
- 3:36 - In-flight sales and food supply
- 5:03 - Fuel consumption optimization
- 6:36 - Boarding and checking bags with facial recognition
- 8:33 - Preparing a plane for the next flight

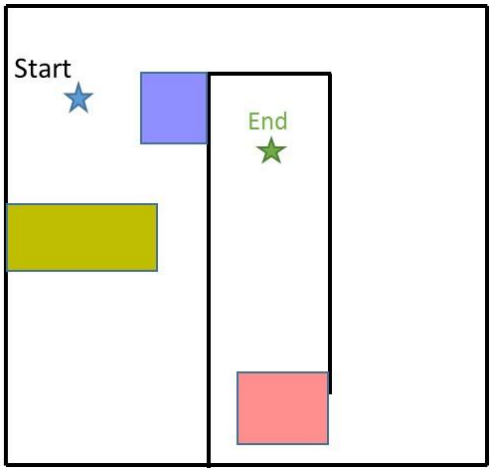
Dialogues and Discussions

Dare to ask and communication is the first step of your success

In this project, we do…

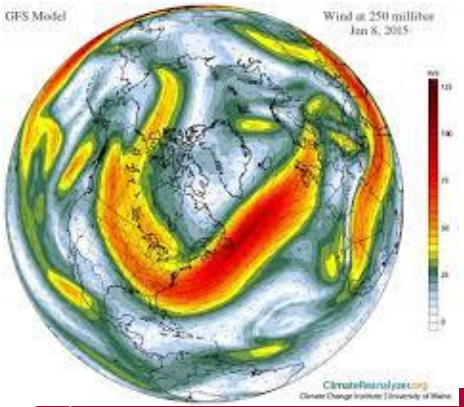
Aircraft Model	C_F	ΔF	C_T	ΔT	C_c	ΔF_a	ΔT_a	C_P	ΔP
PolyU-A380	1	1	2	5	10	0.2	0.2	-2	2

$$C = C_F \cdot \Delta F + C_T \cdot \Delta T + C_c + C_P \cdot \Delta P$$

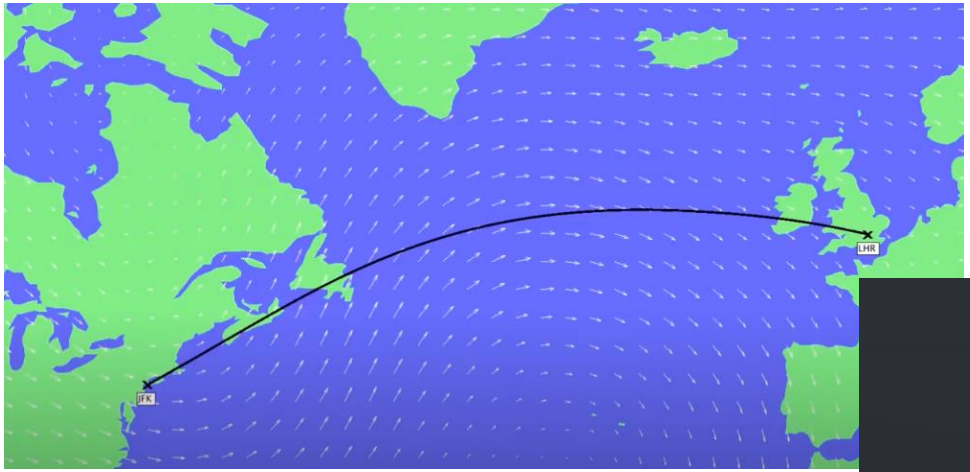


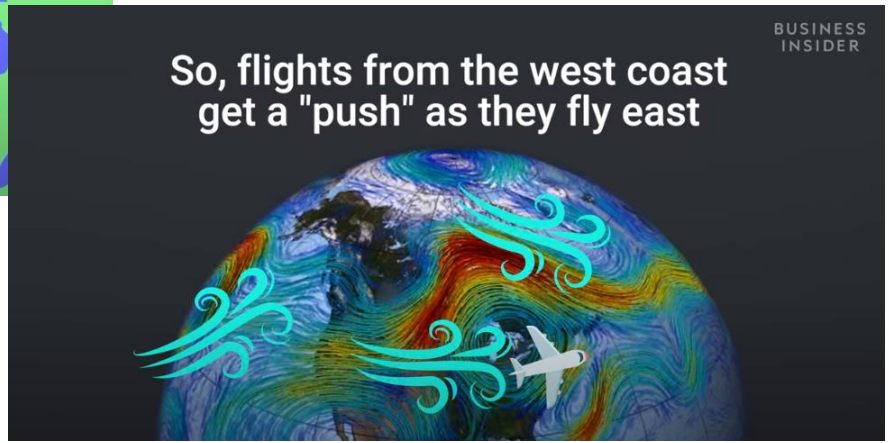
But in the real life,

Aircraft Model	C_F	ΔF	C_T	ΔT	C_c	ΔF_a	ΔT_a	C_P	ΔP	…
Your designed aircraft	?	?	?	?	?	?	?	?	?	?



What does C_P mean? Jet Stream Winds





https://www.youtube.com/watch?v=tMN1f4dvpHI

To do list in this project…

1. Finish as much tasks (using Python) as you can
2. Write a report to introduce your project and reflect what you have learned
3. Make a video presentation to share and communication your ideas and projects
4. Submit the peer evaluation form individually

GitHub Tasks

	Group Repository	Members have Github account	Branch of Each Members	Upload Self Photo	Collaborate and Merge in Master
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓

Path Planning Tasks

✓: done some result (not sure if it is optimal)

	Task1	Task 2.1	Task 2.2	Task 3	Your own innovation
1	✓	✓	✓	✓	
2	✓	✓	✓	✓	
3	✓	✓	✓	✓	
4	✓	✓			
5	✓	✓			
6	✓	✓		✓	
7	✓	✓	✓		
8	✓	✓	✓		
9	✓	✓	✓		
10	✓	✓	✓	✓	