

# AAE2004 Introduction to Aviation Systems

## AAE

### Design of Path Planning Algorithm for Aircraft Operation

#### Week 12 (Conclusion of the project)

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Assisted by

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Mr Hoi Fung NG (Ivan) and Mr Feng HUANG (Darren)

# Why coding/programming 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

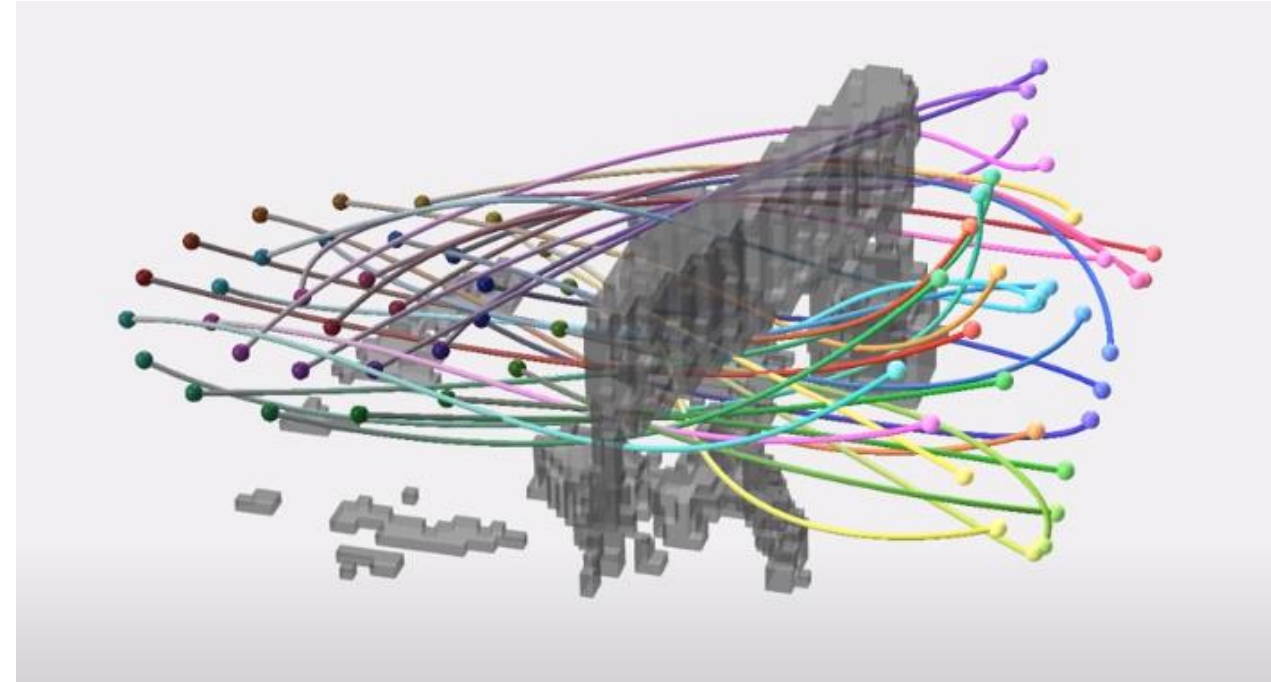
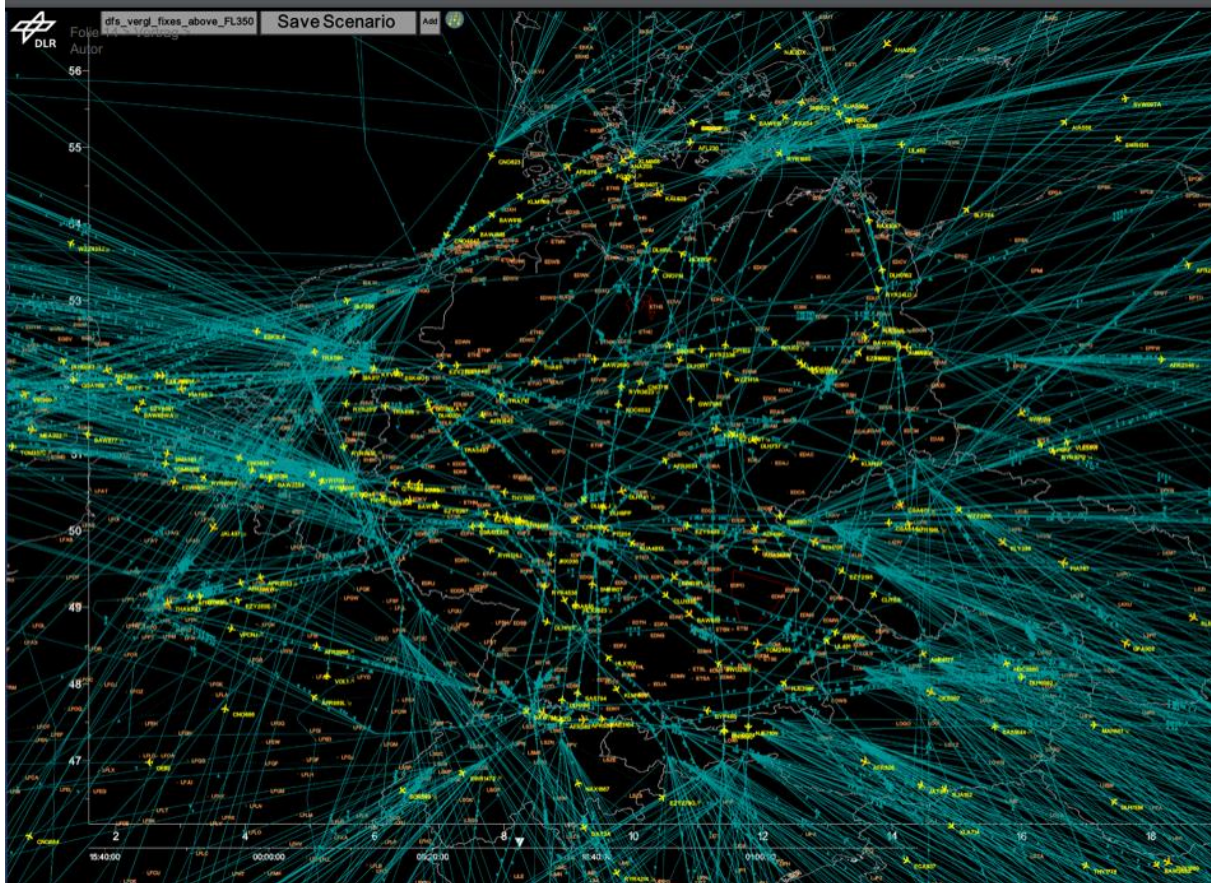


# Crowded Airspace in Cities





# Challenges - Collaborative Path Planning

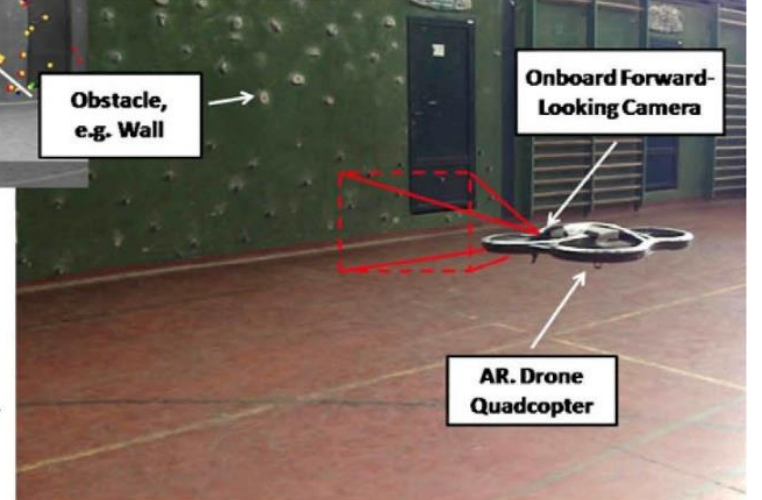
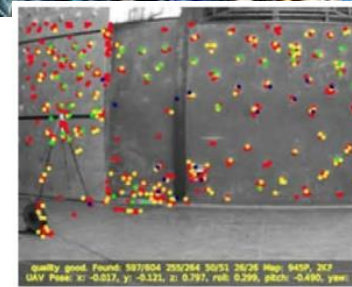


<https://www.youtube.com/watch?v=7Kla9FlmbRc>

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



# Challenges – Collision Avoidance



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

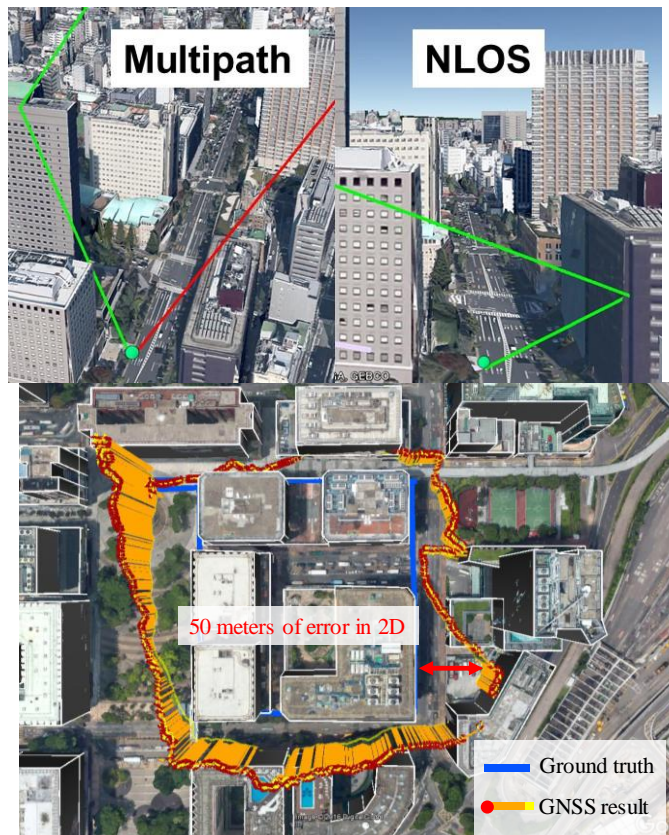
Onboard Image

External Image →



# Challenges – Navigation in Challenged Environments

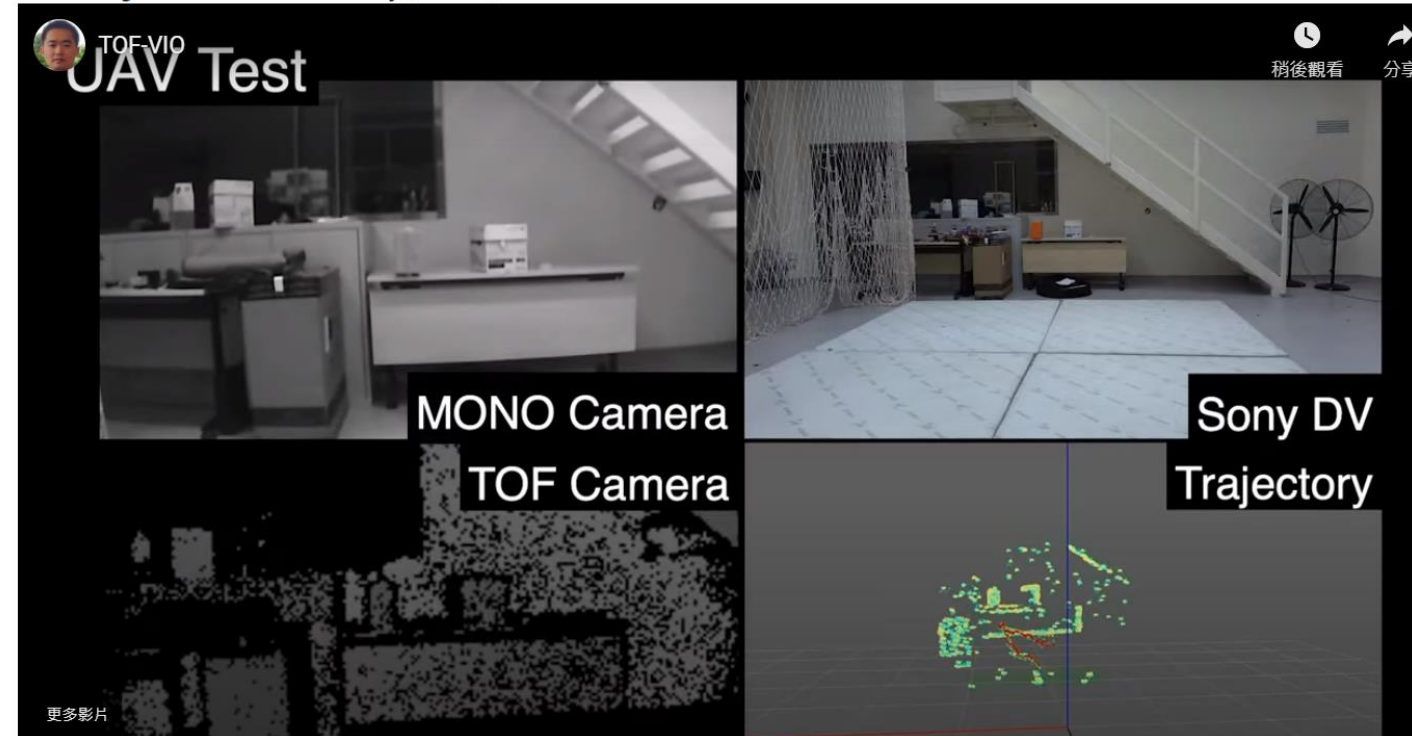
## Challenge in GNSS Positioning



## 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

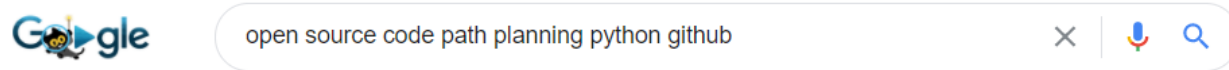


Keywords:

Airworthiness, Reliability, Compliance (regulation-wise)

Statistics and modelling (mathematics-wise)

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



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github.com › AtsushiSakai › PythonRobotics ▾

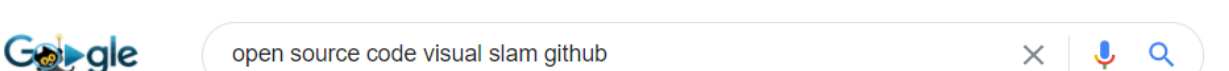
[AtsushiSakai/PythonRobotics: Python sample codes ... - GitHub](#)

This is a **Python code** collection of robotics algorithms, especially for autonomous navigation.

Features: Easy to read for understanding each **algorithm's** basic idea.

[README.md](#) | [Issues 4](#) | [AtsushiSakai/PythonRobotics](#) | [Pull requests](#)

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github.com › xdspacelab › openvslam ▾

[OpenVSLAM: A Versatile Visual SLAM Framework - GitHub](#)

OpenVSLAM is a monocular, stereo, and RGBD **visual SLAM** system. ... Citation. OpenVSLAM won first place at ACM Multimedia 2019 **Open Source Software** ...

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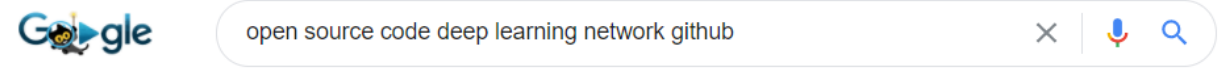
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[mnielsen/neural-networks-and-deep-learning: Code ... - GitHub](#)

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# 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.

# Undergraduate Research and

## Exclusive Privileges



Scholarship up to HK\$10,000



Project grant



Hall residence



Activities, trainings & workshops

### Application Eligibility

- Full-time undergraduate students
- Completed at least two semesters of studies in PolyU
- Excellent academic performance

### Application Cycle

- Call for application: around March
- Application period: March - April
- Result announcement: early June

<https://www.polyu.edu.hk/en/gs/ug-research/uris/about-uris/>

<https://www.polyu.edu.hk/en/gs/ug-research/uris/application-for-uris/>



# What URIS Students say?



**TAI Cheuk Yiu** (Year 3)  
School of Optometry

*Through research studies, hypothetical ideas might come to life. By participating in URIS, we aspire to identify underlying mechanisms of common visual problems.*

*It boosts my morale to conduct research work that benefits mankind. I gained valuable experience through URIS to learn and create knowledge.*



**SU Meiling** (Year 3)  
Department of Aeronautical  
and Aviation Engineering



**Scan to learn more!**

# (Video) AI and Data Science in Aviation

- <https://www.youtube.com/watch?v=D8NIYPtPgWA>
- [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

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

# Final 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