Laboratory Tutorial: GPS NLOS Signal Identification Using Machine Learning

AAE4011 – Artificial Intelligence for Unmanned Autonomous Systems (UAS)

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Week 7, S2, 2024/2025

Our Teaching Assistants


Zhang Ziqi


Yang Qian


Wang Xin


Qiu Shaoting


Hu Runzhi


Ma Pei

- Role/features of TAs in this course
  - Helper in lab session
  - Expert in AI and coding with Python
  - Experts in UAS, such as drones

- Let's get to know with each other
  - Short introduction about yourself (if we have enough time)? ☺
  - Who is your Final Year Project supervisor and what is your topic? ☺
  - Why you select this course? ☺

GNSS*: Global Navigation Satellite Systems
NLOS*: Non-line-of-sight

GNSS in urban canyons

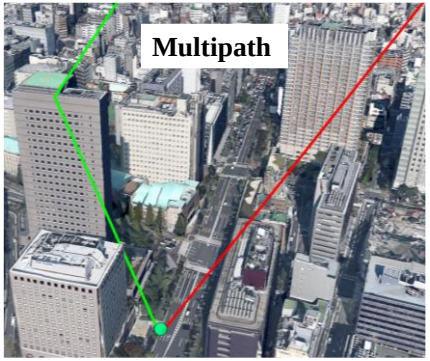
GNSS applications:

- Autonomous driving
- Unmanned aerial vehicle
- …

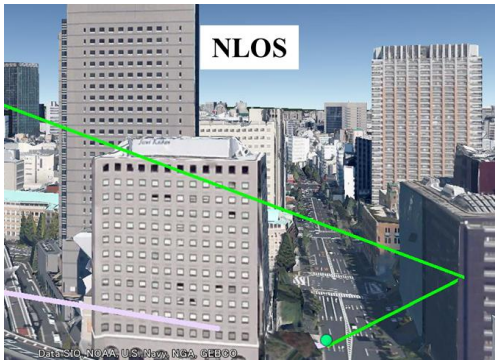
Courtesy: Google

Problem of GNSS solution in urban canyon:

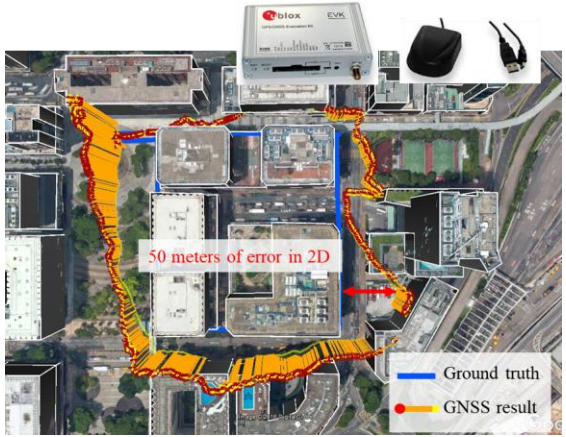
- Low availability (limited satellite numbers)
- Low accuracy (due to multipath and NLOS)



Hsu, 2016



Hsu, 2016

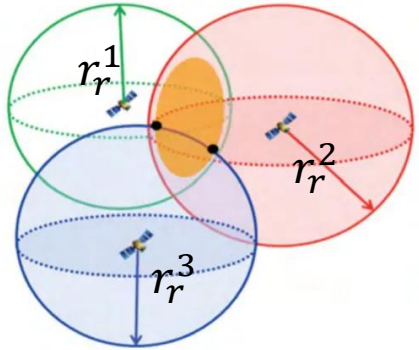


GNSS solution in Urban using u-blox M8T GNSS Receiver

[1] Hsu Li-Ta et al. "3D building model-based pedestrian positioning method using GPS/GLONASS/QZSS and its reliability calculation." *GPS solutions*, 2016

Background

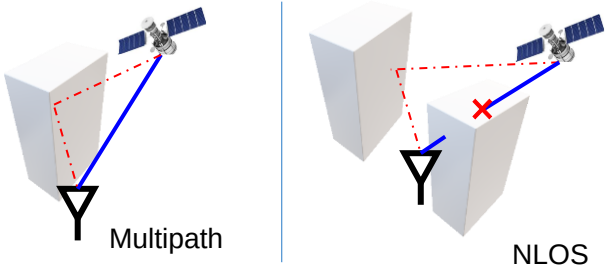
Open area



RTK Mean Error:
0.11m

Urban area

NLOS*: non-line-of-sight



RTK Mean Error:
10m

Noisy and biased GNSS measurements

Grafarend, Erik W., and Jeffrey Shan. "GPS solutions: closed forms, critical and special configurations of P4P." *GPS solutions* 5 (2002): 29-41.

Outline for today's lab

- Introduction and Background
- Generation of the GPS feature related dataset
- Classification using the different machine learning technique
- Results and analysis
- Discussion

Q&A

Thank you for your attention

Q&A

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If you have any questions or inquiries, please feel free to contact me.
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