



POLITECNICO
MILANO 1863

DIPARTIMENTO DI ELETTRONICA
INFORMAZIONE E BIOINGEGNERIA



LOCALIZATION, NAVIGATION AND SMART MOBILITY

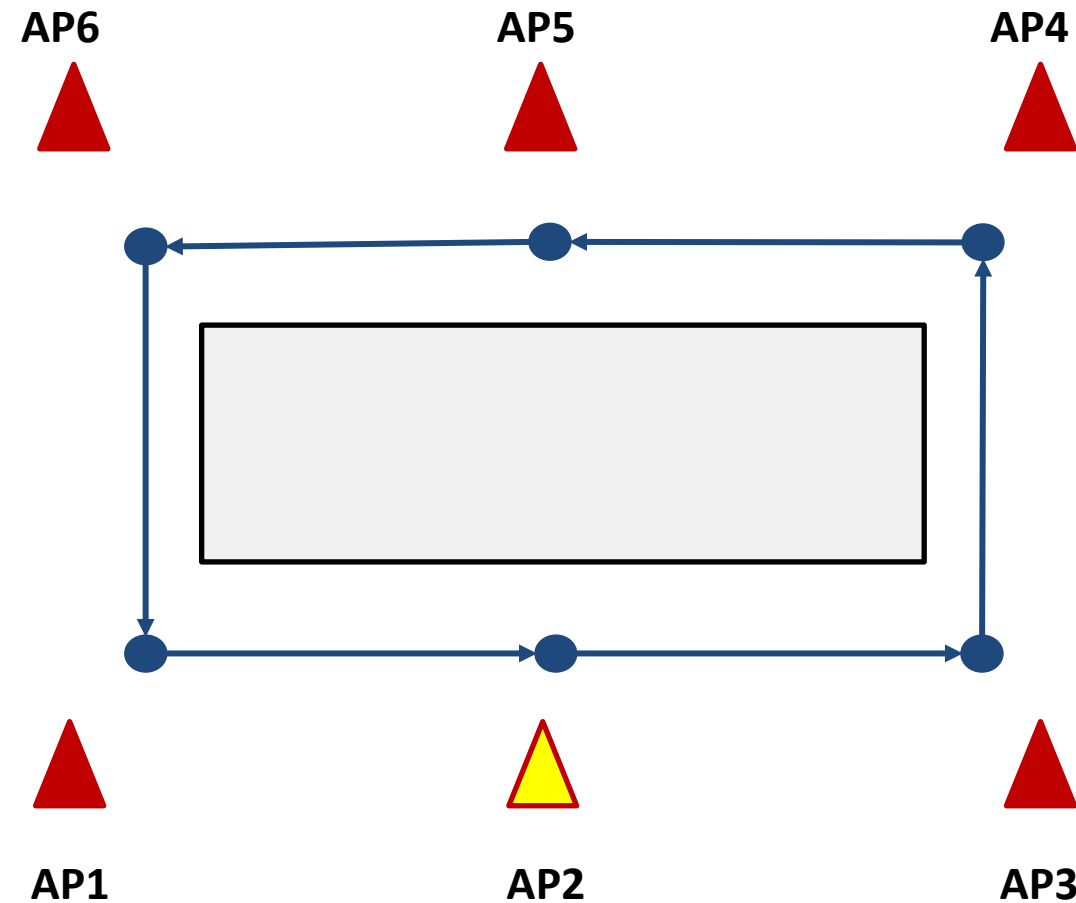
Project presentation A.Y. 2022/2023

- Project mark
 - July 2023 up to **4 points**
 - September 2023 up to **4 points**
 - January 2024 up to **3 points**
- The project can be done individually or in group (up to 4 members).
The project data are available in WeBeep
- Students can request assistance in case of issues or doubts while working on the project, we can schedule dedicated meeting either individually or by merging more than one group.
- Evaluation strategy: **presentation** of the results (please also deliver the matlab code and the slides/ppt), a report is optional.
- The exact day of presentation will be provided.

UWB localization area



Test area



4 UWB tags

6 APs

5 TDOA measurements, nominal sampling rate 10 Hz.

TDOA are computed w.r.t. master AP #2

TDOA is 3D!

AP positions

Master AP

AP			
6x3 double			
	1	2	3
1	0	0	1.8600
2	2.8800	0	1.8700
3	5.7600	0	1.8800
4	5.6900	3.3500	1.8500
5	2.8700	3.3500	1.8300
6	0	3.3500	1.8400
7			
	x	y	z

Data structure – TDOA measurement

Tag1
Tag2
Tag3
Tag4

rho

4x1 cell

1

1 5x269 doub...
2 5x665 doub...
3 5x666 doub...
4 5x665 doub...

TDOA

rho

rho(2, 1)

rho(2, 1)

	1	2	3	4	5	6	7	8	9	10	11
1	NaN	2.1768	2.1040	2.1343	NaN	1.8773	1.9977	1.8048	1.8353	1.6394	1.5065
2	-2.6611	-2.1570	-2.4021	-2.2936	NaN	-2.6196	-2.3016	-2.1996	-2.2733	-2.2980	-2.4804
3	-3.8727	-3.8395	-3.8793	-2.8102	NaN	-4.1379	-2.7816	-2.8966	-2.8278	-3.0102	-3.1251
4	-1.2427	-1.3719	-0.4090	-0.4779	NaN	-0.6274	-0.6108	-0.7311	-0.5993	-0.7847	-0.9268
5	0.3882	0.4370	0.3867	0.2402	NaN	0.1201	0.1501	-0.0585	-0.0633	-0.2561	-0.3847

TOA_MasterAP - TOA1
TOA_MasterAP - TOA3
TOA_MasterAP - TOA4
TOA_MasterAP - TOA5
TOA_MasterAP - TOA6

6 APs -> 5 TDOA meas., each column is a timestep

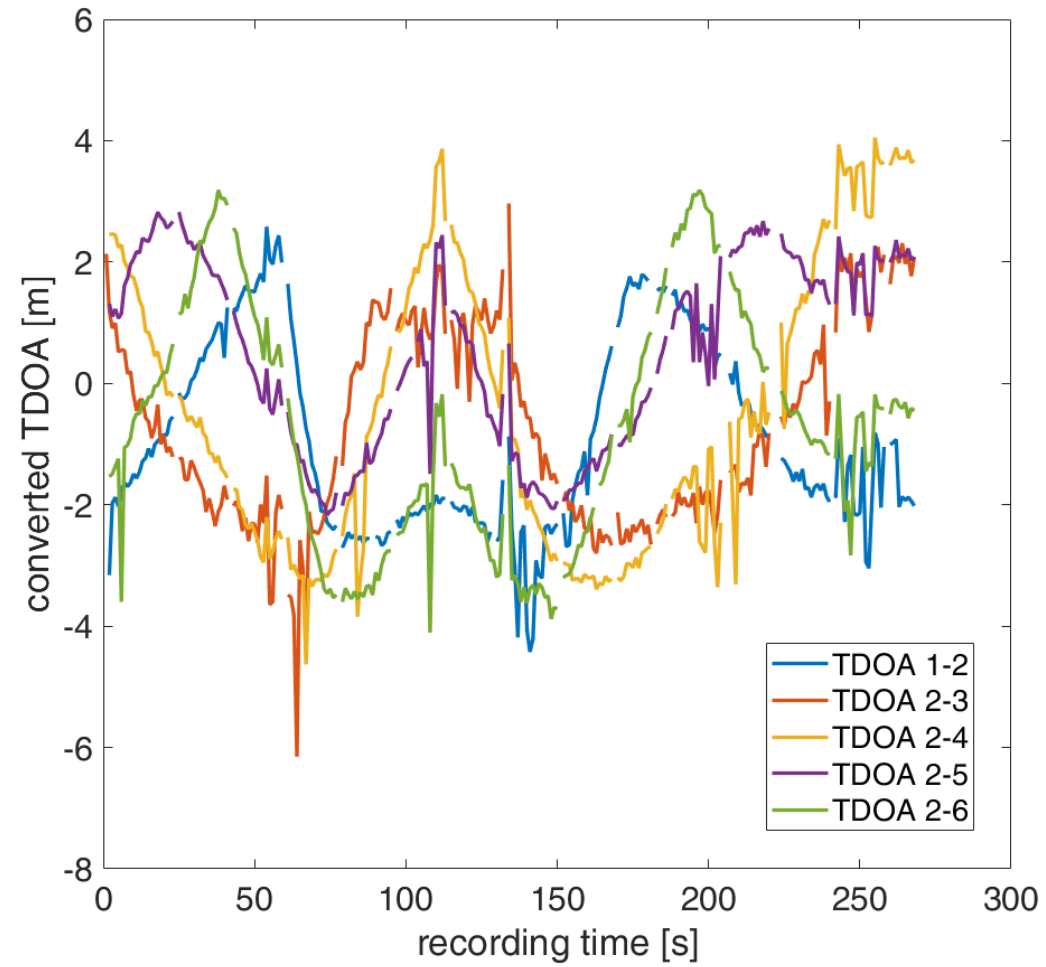
Each TDOA meas. is computed as $\rho = \text{TOA_MasterAP} - \text{TOA_AP}$

The master AP is AP2

The TDOA is already converted into meters

Pay attention to NaN and outliers (it's a real system...)

TDOA measurements



1. Load and analyze data

E.g., statistics, coherence, availability, outliers, missing, etc.

If you find something that seems not to be ok, detail how you address the specific issue.

2. Localization algorithms implementation

Implement one localization algorithm and one tracking filter that use TDOA measurements to estimate the UE position. Compare and visualize the results.

3. Tune the tracking filter

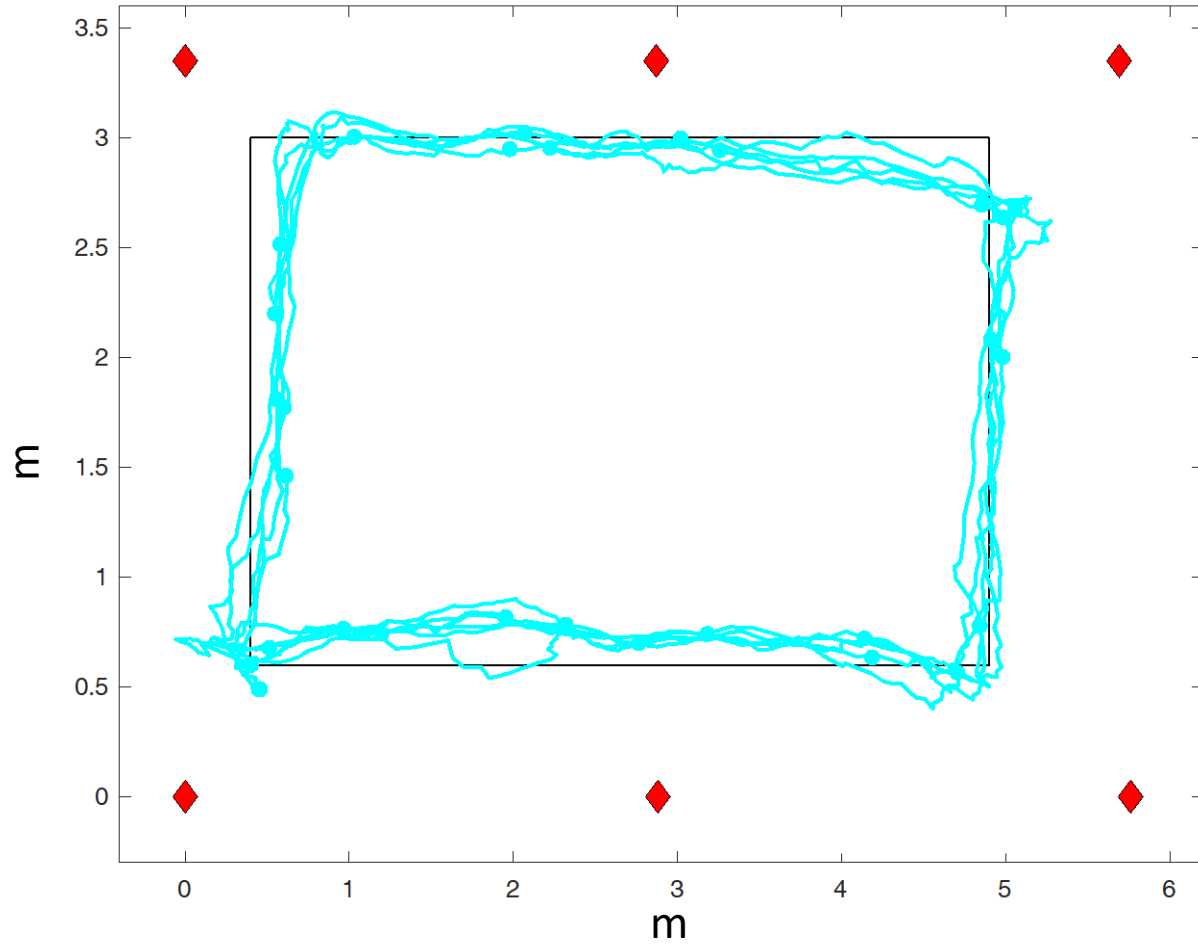
Compare the performance of the developed tracking filter by varying filter parameters trying to obtain the best estimated trajectory.

Compare and visualize the results.

NOTE: CAREFULLY SELECT THE WAY TO PRESENT THE RESULTS

Example of estimated trajectories

Configuration A



Configuration B

