

Track4 "Foot-Mounted IMU based Positioning (off-site)" special features

Organizational aspects:

Database/dataset download

- Participants can download the databases (logfiles) from this site:

<http://evaal.aaloo.org/images/2019/track4/>

Competitors can only use the data provided for the competition. They are not allowed to perform any additional on-site calibration.

Submission of the post-processed results

- After processing the evaluation logfiles, participants must submit the position estimates to the contact points of the corresponding track. Each submission must fulfill the format detailed in Section "Description of the Output File".
- A participant team can upload up to 3 different contributions, which will be evaluated by the competition organizers. Although the three alternatives will be evaluated on the final test set, only the best one will be considered for the contest.

Submission deadline of the post-processed indoor coordinates

- The deadline** for submitting the post-processed results is: **SEPTEMBER 14th 2019**

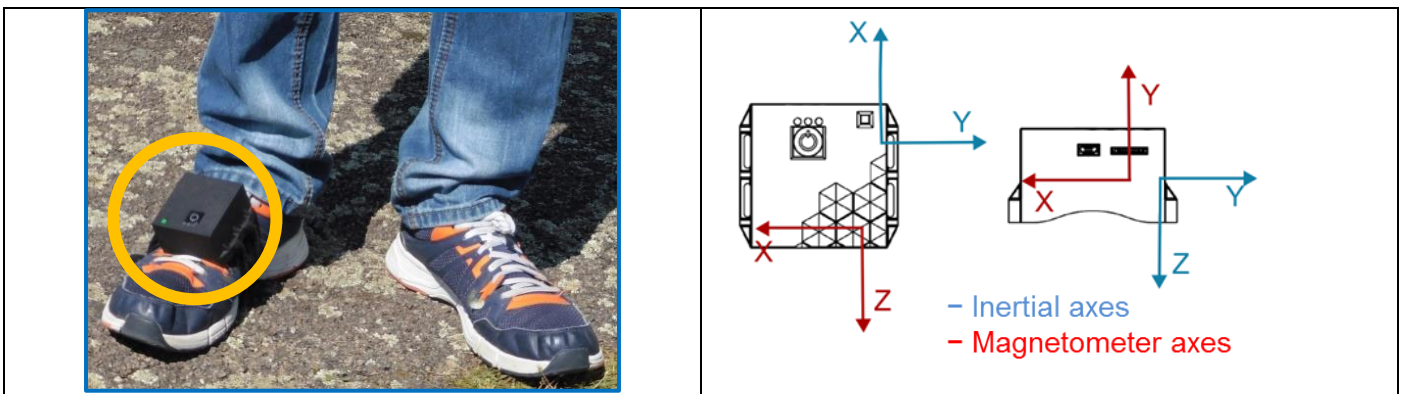
Scope

Many indoor navigation systems have been developed for pedestrians and assessing their performances is a real challenge. Benefiting from a reference solution that is accurate enough to evaluate other indoor navigation systems and assist novel research is of prime interest. According to ISO18305:2016 two different ways can be used for assessing indoor localization system: "Off-line surveyed test point" that is commonly used, or "reference system" with an accuracy at least one order of magnitude better the system you want to test. The scope of this track4 is clearly focused on the second way of assessing.

This track4 is based on the same material as the previous competition hold during IPIN2018.

Competition Goal

The goal of this competition is to evaluate how good up-to-date INS algorithm is. Each competitor will be given a dataset logged with PERSY (PEdestrian Reference SYstem).



Description of Datasets (Logfiles)

Each dataset is composed of the following files:

- HKBxx_mag.csv : magnetometer data from an Honeywell HMC5983 sensor
- HKBxx_sti.csv : accelerometer / gyrometer / inclinometer from a Sensoror STIM300 IMU
- HKBxx_ublox.ubx : GNSS rawdata and NMEA (GGA/ZDA) from a Ublox NEO-M8T receiver

Inputs given to competitors

The materials and methods provided by the competition organizers are:

- **Supplementary material:**
 - **Ublox file Parser**
 - u-center software: <https://www.u-blox.com/en/product/u-center-windows>
 - RTKLIB: https://github.com/tomoiitakasu/RTKLIB_bin
 - **Datasheet of each individual sensors can be downloaded here:**
 - Honeywell HMC5983:
http://evaal.aaloa.org/images/2019/track4/datasheet_hmc5983.pdf
 - Sensoror STIM300 IMU:
http://evaal.aaloa.org/images/2019/track4/datasheet_stim300.pdf
 - Ublox NEO-M8T GNSS Receiver:
http://evaal.aaloa.org/images/2019/track4/datasheet_neo-m8t.pdf
- **LogFiles:**
 - HKB08.zip : for sensors bias estimation:
<http://evaal.aaloa.org/images/2019/track4/HKB08.zip>
 - HKB08_mag.csv
 - HKB08_sti.csv
 - HKB08_ublox.ubx
 - HKB08_INFO.txt
 - HKB82.zip : for trajectory estimation:
<http://evaal.aaloa.org/images/2019/track4/HKB21.zip>
 - HKB21_mag.csv
 - HKB21_sti.csv
 - HKB21_ublox.ubx
 - HKB21_INFO.txt

- **Timing of expected Key Points:**

- 66 key points will be evaluated in Track4 (from 3 to 68 ; 1 & 2 are given)
- Key Points timestamps are expressed in GPS Time of Week in milliseconds (ms)

| Key Point | GPS Time of Week (ms) | Key Point | GPS Time of Week (ms) | Key Point | GPS Time of Week (ms) |
|-----------|-----------------------|-----------|-----------------------|-----------|-----------------------|
| 1 | 375822576 | 24 | 376160461 | 47 | 376572339 |
| 2 | 375873175 | 25 | 376170393 | 48 | 376584264 |
| 3 | 375892636 | 26 | 376198054 | 49 | 376603407 |
| 4 | 375901543 | 27 | 376214298 | 50 | 376613494 |
| 5 | 375906143 | 28 | 376227260 | 51 | 376620688 |
| 6 | 375910843 | 29 | 376243284 | 52 | 376625369 |
| 7 | 375922461 | 30 | 376248259 | 53 | 376632600 |
| 8 | 375930167 | 31 | 376260734 | 54 | 376656049 |
| 9 | 375935035 | 32 | 376273696 | 55 | 376659812 |
| 10 | 375942067 | 33 | 376281658 | 56 | 376665812 |
| 11 | 375949267 | 34 | 376296877 | 57 | 376671336 |
| 12 | 375954029 | 35 | 376303114 | 58 | 376680305 |
| 13 | 375958804 | 36 | 376327789 | 59 | 376697942 |
| 14 | 375967178 | 37 | 376342394 | 60 | 376701848 |
| 15 | 375973503 | 38 | 376378918 | 61 | 376708829 |
| 16 | 375980422 | 39 | 376410274 | 62 | 376725073 |
| 17 | 375988959 | 40 | 376488353 | 63 | 376731210 |
| 18 | 376000321 | 41 | 376499178 | 64 | 376742641 |
| 19 | 376051251 | 42 | 376524202 | 65 | 376770297 |
| 20 | 376098269 | 43 | 376528340 | 66 | 376775040 |
| 21 | 376131312 | 44 | 376544552 | 67 | 376792396 |
| 22 | 376139087 | 45 | 376555095 | 68 | 376824039 |
| 23 | 376154455 | 46 | 376560614 | | |

GPS time of week being the same as ones used in datasets, excepted those are in 's' instead of 'ms'.

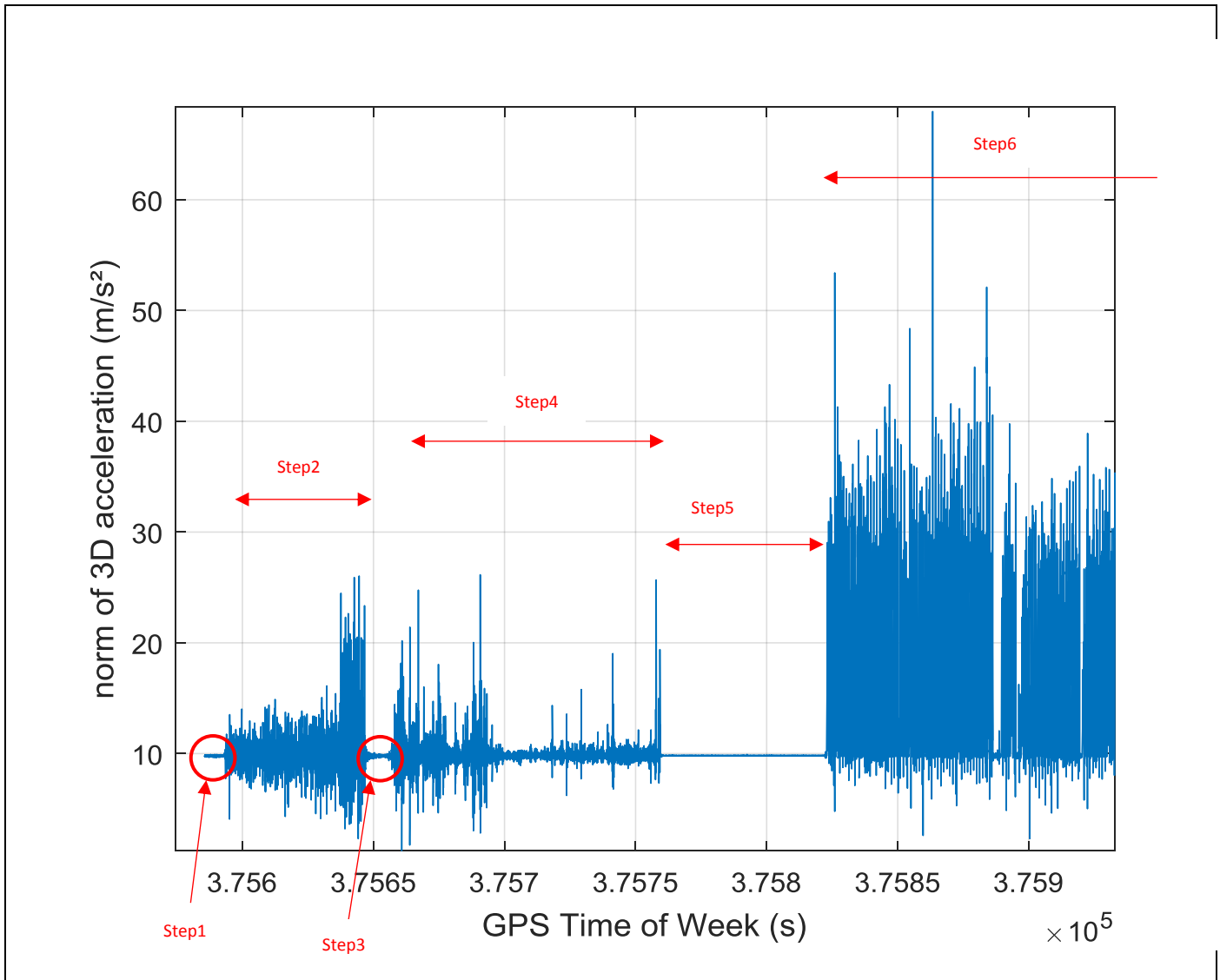
The output format as described in the chapter "Description of the Output File" here after shall be used. The table above shall be used for columns 1 & 5 of output location file, as illustrated here after:

```
375822576,141.346893310,43.070755004,-1,1
375873175,141.346908569,43.070758815,1,2
375892636,141.347000152,43.070770262,2,3
...
376824039,141.347020152,44.070770262,2,68
```

- **Description of different phases of evaluated trajectory:**

- Step1: 10s hand held static phase
- Step2: 60s magnetometer calibration.
- Step3: 10s hand held static phase

- Step4: PERSY setup on the foot
- Step5: 60s static phase with PERSY on the foot
- Step6: evaluation track including Key Points from 1 to 68.



- **Coordinates of Key Point n°1 corresponding to static phase at Step5 :**
 - WGS84 longitude in decimal degrees: 10.422833333 (East)
 - WGS84 latitude in decimal degrees: 43.718888889 (North)
 - Floor Number in integer: 0 (Outdoor environment)
- **Coordinates of Key Point n°2:**
 - WGS84 longitude in decimal degrees: 10.4222949817 (East)

- WGS84 latitude in decimal degrees: 43.7184717927 (North)
- Floor Number in integer: 0 (Outdoor environment)

- **Note about Maps use**

- Even if maps is allowed in others tracks, for this one, **it is NOT**.
- Algorithms are not supposed to embed or access maps to enhance positioning.
- As Track4 is an off-line competition, we encourage competitor to use maps in a validation purpose (only).

Description of the Output File

The same format is expected for all tracks. For each trial, you must submit a CSV file whose format is now described.

- 5 columns :
 - Column 1: Timestamp in ms
 - Column 2: WGS84 longitude in decimal degrees with at least 9 decimal digit resolution
 - Column 3: WGS84 latitude in decimal degrees with at least 9 decimal digit resolution
 - Column 4: Floor Number in integer (0 : Ground Floor, -1, 1, 2)
 - Column 5: index in integer (key point number from 1 to N. 0 represents no landmark. Each specific integer represents the specific key point)
- Comma (",") used as data delimiter
- No header

Example :

| | |
|---|------------------------------------|
| 1505633871558,141.346908569,43.070758819,-1,0 | |
| 1505633872089,141.346893310,43.070755004,-1,0 | |
| 1505633872627,141.346893310,43.070755002,-1,0 | |
| 1505633873156,141.346893308,43.070755003,-1,0 | |
| 1505633873692,141.346893310,43.070755004,-1,1 | Estimated position for key point 1 |
| 1505633874227,141.346908569,43.070758819,0,0 | |
| 1505633874774,141.346908570,43.070758817,0,0 | |
| 1505633875316,141.346908579,43.070758819,0,0 | |
| 1505633875840,141.346908569,43.070758815,1,2 | Estimated position for key point 2 |
| 1505633876372,141.346908565,43.070758819,1,0 | |
| 1505633876905,141.347000132,43.070770263,1,0 | |
| 1505633877448,141.347000142,43.070770261,2,0 | |
| 1505633877994,141.347000152,43.070770262,2,3 | |
| 1505633878532,141.347000162,43.070770263,2,0 | Estimated position for key point 3 |

Evaluation will only take into account the estimated position at each indexed key point position, so that each track is considered as a series of key point positions (from 1 to N).

Contact points and information

For any further question about the database and this competition track, please contact to:

- Miguel Ortiz (miguel.ortiz@ifsttar.fr) at the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR) France.
- Johan Perul (johan.perul@ifsttar.fr) at the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR) France.