

15/04/2024  
Séminaire So-MSH!

Zhu Ni  
Chargée de Recherche  
AME-GEOLOC-UGE

# Dataset of the Intermediate Competition in Challenge MALIN: Indoor-outdoor Inertial Navigation System Data for Pedestrian and Vehicle with High Accuracy References in a Context of Firefighter Scenario



« Zhu, N., Ortiz, M., Renaudin, V., Ichard, C., & Ricou, S. (2021). Dataset of the intermediate competition in challenge malin: Indoor–outdoor inertial navigation system data for pedestrian and vehicle with high accuracy references in a context of firefighter scenario. *Data in brief*, 34, 106626. »



## Summary of the data

## Context

- **Intermediate competition of the Challenge MALIN (MAîtrise de la Localisation Indoor), aiming at designing a real-time positioning system for the military or the first response emergency services.**
- **Multisensor-data equipped on a human subject;**
- **Firefighter scenario**



# Type of data

- **Table, Figure, Map, Video, Rosbag, from which the following sensor data can be extracted:**
  - Ublox-M8N GNSS receiver: GPS and GLONASS data;
  - Realsense D435i: tri-axis accelerometer, tri-axis gyroscope, compressed infrared stereo images, compressed depth image;
  - Xsens MTi-300: tri-axis accelerometer, tri-axis gyroscope, tri-axis magnetometer, barometer, thermometer;
  - PERSY: tri-axis accelerometer, tri-axis gyroscope, tri-axis magnetometer, GNSS receiver: GPS and GLONASS data



|   |  |
|---|--|
|  | <b>Ublox NEO-M8N</b><br>Gnss receiver, deported antenna on right shoulder.   |
|  | <b>Realsense D435i</b><br>IR Stereo camera with embedded 6-degrees-of-freedom inertial unit (3-axis gyrometer, 3-axis accelerometer). On left shoulder, facing backward.                       |
|  | <b>Xsens MTi-300 (3X)</b><br>9 DOF IMU (3-axis gyrometer, 3-axis accelerometer, 3-axis magnetometer), barometer and temperature sensor. On right shoulder, under the sternum and on left foot. |
|  | <b>PERSY</b><br>State-of-the-art 9 DOF Inertial Navigation System and gnss receiver. On right foot.  |

## Data accessibility

- **Repository name: Zenodo**
- **Data identification number: 10.5281/zenodo.3785046**
- **Direct URL to data: <https://zenodo.org/record/3785046>**



# Structure of the Zenodo repository

# Structure of the Zenodo repository

Published November 25, 2020 | Version 1.1

Dataset

Open

## Datasets and Supporting Materials for the MALIN-ANR 2019 Competition (French national research agency)

Ortiz, Miguel<sup>1</sup> ; Renaudin, Valérie<sup>1</sup> ; Zhu, Ni<sup>1</sup> ; Ichard, Cécile<sup>2</sup>; Ricou, Sander<sup>2</sup>; Kone, Yacouba<sup>1</sup> 

Hide affiliations

1. Univ. Eiffel, AME, GEOLOC
2. SGME

This "ZENODO deposit" provides a multiple sensor dataset collected by the CyborgLOC team during the intermediate competition of the Challenge MALIN (*MAîtrise de la Localisation INdoor*), which is a competition for indoor/outdoor real-time positioning. The sensors, including a GNSS receiver Ublox NEO-M8N, a Realsense D435i stereo camera, three Xsens MTi-300 and one PERSY (**PE**destrian **R**eference **S**Ystem), are mounted on different parts of the subject's body. The PERSY is a foot-mounted positioning device with a tri-axial accelerometer, a tri-axial gyroscope, a tri-axial magnetometer as well as a GNSS receiver Ublox M8T. The two scenarios are designed in a training center of firefighters CFIS (Fire and Rescue Training Center) in Blois, France to simulate the situation of firefighters during interventions. With total distances around 2 km for each scenario, the travelled trajectories passed through challenging environments including indoor, outdoor, urban canyon. The indoor part contains different stair levels, from the underground up to the 6th floor. The travel modes are vehicles and pedestrians. Several classical activities of firefighters are realized such as walking, running, stair-climbing, side-walking, crawling, passing above/below obstacles, carrying a stretcher, ladder climbing, etc. High accurate ground truth of stationary points and enclosing volumes are provided by the organizers of the competition, i.e., the French Ministry of Defense (DGA: Direction Générale de l'Armement). Provided with raw data, they allow the evaluation of the positioning performances.

To facilitate the use of our dataset under Rosbag format, a toolkit of python scripts named *MALIN Data Processing Tools* is provided on GitHub ([https://github.com/4g-group/malin\\_data\\_processing\\_tools](https://github.com/4g-group/malin_data_processing_tools)). It allows merging Rosbags, converting Rosbag files to CSV files as well as republishing camera's topics as decompressed data. Details about these processing tools could be found in the Readme file on the Github page.

### Notes

v1.1: minor changes in ZENODO Repo1 wo\_camera.zip (folders 4\_CyborgLocTeam\_output) v1.0: initial version

# Structure of the Zenodo repository

## ■ E\_scenario\_data

### ■ 1\_Sensors\_readings

- Annex\_2\_RosTopic\_description.pdf
- E\_scenario\_data\_wo\_camera.bag

### ■ non\_standard\_ros\_message

#### ■ cbl\_msgs

- Gpvtg.msg
- Gpzda.msg
- Ploc.msg

#### ■ persy\_msgs

- UbxNavOrbitDatabaseInfo.msg
- UbxNavOrbitDatabaseInfoEntry.msg
- UbxNavTimeUTC.msg
- UbxRxmBroadcastNavigationDataSubframe.msg
- UbxRxmMultiGNSSRawMeasurementData.msg
- UbxRxmMultiGNSSRawMeasurementDataEntry.msg

### ■ 2\_Sensors\_calibration\_and\_configuration

#### ■ calibration

- E\_scenario\_camera\_calibration\_data\_allan.yaml
- E\_scenario\_camera\_calibration\_data\_kalibr.yaml
- E\_scenario\_persy\_calibration\_data.bag
- E\_scenario\_persy\_static\_calibration\_raw\_data.bag
- PERSY\_calib\_determinist\_error.txt

#### ■ configuration

##### ■ realsense\_d435i

- challenge\_config.json

## ■ 3\_Ground\_truth

- Annex\_3\_Ground\_truth\_file\_description.pdf
- E\_scenario\_BASE\_3D\_CFIS41.xml
- E\_scenario\_TimeStamp.txt

### ■ maps

- BASE\_PLAN\_CFIS41.xml
- E\_scenario\_level\_-1.kml
- E\_scenario\_level\_0.kml
- E\_scenario\_level\_1.kml
- E\_scenario\_level\_2.kml
- E\_scenario\_level\_3.kml
- E\_scenario\_level\_4.kml
- E\_scenario\_level\_5.kml
- E\_scenario\_level\_6.kml
- sdis\_-1.png
- sdis\_0.png
- sdis\_1.png
- sdis\_2.png
- sdis\_3.png
- sdis\_4.png
- sdis\_5.png
- sdis\_6.png

### ■ video

- 10\_GYROPHARE\_MALIN\_CyborgLOC\_BLUR.mp4
- 11\_PODIUM\_MALIN\_CyborgLOC\_BLUR.mp4
- 1\_DEBARQUEMENT\_MALIN\_CyborgLOC\_BLUR.mp4
- 2\_BRANCARD\_MALIN\_CyborgLOC\_BLUR.mp4

## ■ 4\_CyborgLocTeam\_output

- Annex\_4\_PLOC\_description.pdf
- E\_scenario\_cyborgloc\_output.bag
- E\_scenario\_cyborgloc\_output.ploc
- E\_scenario\_cyborgloc\_output\_PLOC\_Altitude.png
- E\_scenario\_cyborgloc\_output\_PLOC\_Displacement.png
- E\_scenario\_cyborgloc\_output\_PLOC\_Environment.png
- E\_scenario\_cyborgloc\_output\_PLOC\_ErrorThirdQuartile.png
- E\_scenario\_cyborgloc\_output\_PLOC\_Error\_Scoring.txt
- E\_scenario\_cyborgloc\_output\_PLOC\_WGS.png
- E\_scenario\_cyborgloc\_output\_PLOC\_orientation.png
- E\_scenario\_cyborgloc\_output\_PLOC\_orientation\_error.png
- E\_scenario\_cyborgloc\_output\_PLOC\_topological.png
- E\_scenario\_cyborgloc\_output\_PLOC\_trace.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_-1.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_0.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_1.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_2.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_3.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_4.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_5.kml
- E\_scenario\_cyborgloc\_output\_PLOC\_trace\_level\_6.kml
- Annex\_1\_E\_scenario\_description.pdf





# Structure of the data paper



ELSEVIER

Contents lists available at ScienceDirect

Data in Brief

journal homepage: [www.elsevier.com/locate/dib](http://www.elsevier.com/locate/dib)



## Data Article

Dataset of the intermediate competition in challenge MALIN: Indoor–outdoor inertial navigation system data for pedestrian and vehicle with high accuracy references in a context of firefighter scenario



Ni Zhu<sup>a,\*</sup>, Miguel Ortiz<sup>a</sup>, Valérie Renaudin<sup>a</sup>, Cécile Ichard<sup>b</sup>, Sander Ricou<sup>b,\*</sup>

<sup>a</sup>AME-GEOLOC, Université Gustave Eiffel, IFSTTAR, 44344 Bouguenais, France

<sup>b</sup>SGME, France

## ARTICLE INFO

**Article history:**  
Received 14 October 2020  
Revised 27 November 2020  
Accepted 2 December 2020  
Available online 8 December 2020

**Keywords:**  
Pedestrian navigation  
Inertial sensors  
GNSS  
Indoor & outdoor positioning  
Infra-red stereo

## ABSTRACT

This paper provides a multiple sensor dataset collected by the CyborgLOC team during the intermediate competition of the Challenge MALIN (MAîtrise de la localisation INdoor), which is a competition for indoor/outdoor real-time positioning. The sensors, including a GNSS receiver Ublox NEO-M8N, a Realsense D435i stereo camera, three Xsens MTi-300 and one PERSY (PEdestrian Reference SYstem), are mounted on different parts of the subject's body. The PERSY is a foot-mounted positioning device with a tri-axial accelerometer, a tri-axial gyroscope, a tri-axial magnetometer as well as a GNSS receiver Ublox M8T. The two scenarios are designed in a training centre of firefighters CFIS (Fire and Rescue Training Centre) in Blois, France to simulate the situation of firefighters during interventions. With total distances around 2 km for each scenario, the travelled trajectories passed through challenging environments including indoor, outdoor, urban canyon. The indoor part contains different stair levels, from the underground up to the 6th floor. The travel modes are

- ⊕ DATA DESCRIPTION
  - ⊕ 1.1 General description and structure of the repository
  - ⊕ 1.2 Experimental setup
- ⊕ EXPERIMENTAL SCENARIOS
  - ⊕ 1.3 Scenarios
  - ⊕ 1.4 Sensors reading
  - ⊕ 1.5 Sensors calibration and configuration
  - ⊕ 1.6 Ground Truth
- ⊕ EVALUATION METRICS
  - ⊕ 1.7 Proposed evaluation metrics
    - ⊕ • Location accuracy scoring - geometric criterion
    - ⊕ • Location accuracy scoring - topological criterion
    - ⊕ • Orientation accuracy scoring
  - ⊕ 1.8 CyborgLOC Team output
- ⊕ Acknowledgment
- ⊕ Reference

The background features a dark blue upper section and a teal lower section. Large, overlapping white and light blue curved shapes are positioned on the right side, creating a modern, abstract design.

**Some statistics**

## Some statistics

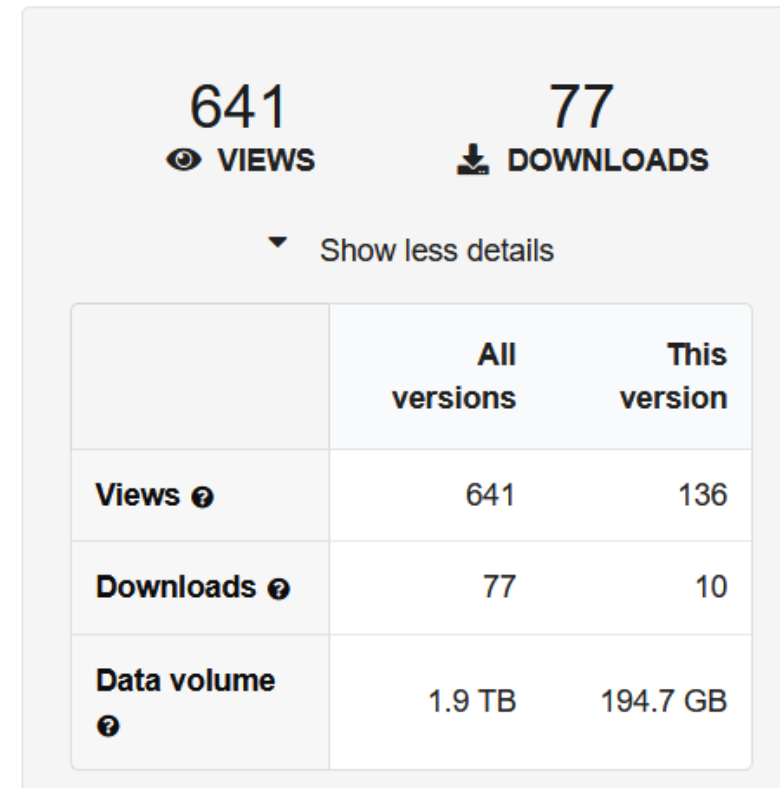
Article submitted in October 2020, accepted in December 2020 after one revision

### From Zenodo:

- 641 Data views
- 77 data downloads

### From Google scholar:

- 5 paper citations



641  
👁️ VIEWS

77  
📄 DOWNLOADS

▼ Show less details

|               | All versions | This version |
|---------------|--------------|--------------|
| Views ⓘ       | 641          | 136          |
| Downloads ⓘ   | 77           | 10           |
| Data volume ⓘ | 1.9 TB       | 194.7 GB     |

Statistics provided by Zenodo



# **Motivations of publishing data papers**

- **Research visibility: enable benchmark research using the shared data**
- **Reproducibility**
- **Increase citation**
- **Diversify the research results**
- **Sustainability: avoid duplicative efforts for data collection**

**Ni Zhu**

[ni.zhu@univ-eiffel.fr](mailto:ni.zhu@univ-eiffel.fr)

