
Internship Description

1. Title: **URBAN INTEGRITY MONITORING**

2. Supervisors:

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3. Description

3.1. Context

GNSS in the urban environment is a challenge due to multipath and non-line-of-sight measurements. Various attempts have been made to achieve integrity (safe and robust localization/navigation) in the urban environment. However, integrity requires a reliable fault model and must be demonstrated in an analytical or semi-analytical manner.



In order to develop a fault model for the urban environment, we have performed some data collections and developed multipath estimation methodologies. However, further work is needed to assess the likelihood of simultaneous gross errors on multiple measurements. Moreover, methods to protect against multiple gross errors must be further developed, either through the combination of GNSS monitors or with the aid of visual sensors.

3.2. Objectives

The principal objective is determine a probabilistic model of gross errors on multiple measurements using the many hours of collected data and isolated multipath errors. An auxillary objective is then to test methods which protect against such local error faults and derive their performance.

3.3. Work plan

The tasks to be done are:

- Review the notions of urban integrity monitoring (3 weeks)
- Review the analyses already performed in the ENAC software (2 weeks)
- Implement a method to extract and analyze multiple failures/gross errors (3 weeks)
- Design and implement methods for detection of multiple failures (4 weeks)

- Test the detection methods against faults (8 weeks)
- Conclude and describe the findings (4 weeks)

3.4. References

https://hal-enac.archives-ouvertes.fr/hal-03384628/file/HeekwonNO_IONGNSS%2B2021.pdf

https://hal-enac.archives-ouvertes.fr/hal-02549100v1/file/Manuscript_Song_Navigation.pdf

Cheng Liu, Shuai Xiong, Yongchao Geng, Song Cheng, Fang Hu, Bo Shao, Fang Li, and Jie Zhang
NAVIGATION: Journal of the Institute of Navigation December 2023, 70 (4) navi.607; DOI:
<https://doi.org/10.33012/navi.607>

4. Period

- Starting date: flexible T0
- Duration: T0 + 6mois

5. Department

SINA/TELECOM/SIGNAV

The internship is proposed by the SIGNAV (SIGnals for NAVigation) research group. SIGNAV is one of three research groups of the TELECOM team in the SINA (Sciences et Ingenierie de la Navigation Aeriene) department at ENAC (Ecole Nationale de l'Aviation Civile).

6. Location

The internship will take place at main campus of ENAC in Toulouse, France. Adress: 7, avenue Edouard Belin BP 31055 Toulouse Cedex 4, building F.

7. Candidate's profile

Master/Engineering student with knowledge in statistical estimation and signal processing (knowledge of GNSS is a plus but not mandatory). Good coding skills in Matlab and/or Python.