IMAGE FUSING TECHNIQUES (IMFUSING)

Goal of the project

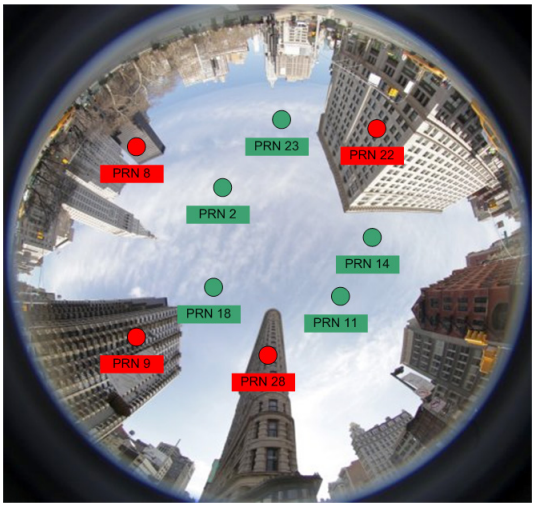
The Line of Sight (LoS) of a satellite could be disrupted by obstacles, reducing the accuracy of the information provided to a Global Navigation Satellite System (GNSS) receiver. The first objective of the project is to eliminate or weight the signals coming from these satellites. To simplify the identification of satellites having a direct LoS with the GNSS receiver, this project proposes, as a supplementary sensor, to use a fish eye camera.

Short description of the project

To provide sufficient information to the GNSS receiver, at the image processing level, the algorithms conceived will include the calibration of the camera sensor, image segmentation techniques, and distance and angle measurements deduced from calibrated image analysis. The algorithms at user sensor level will use camera information to discard measurements, will estimate boundaries of accuracy, will build a Quality of Service (QoS) indicator on the computed position and will authenticate the position.

The algorithms at tracking loop level will use camera information to adjust the GNSS receiver correlator.

The segmentation of the image provided by the fish eye camera permits to identify the satellites that are not on the LoS of the GNSS receiver.



Original image. The satellites were marked at Thales-Alenia.

Project implemented by

- UPT as contractor
- Thales-Alenia Toulouse France as subcontractor

Implementation period

October 1 2014 – March 30 2017

Main activities

Phase I 01/10/2014–31/08/2015: State of the art analysis (already validated),
Phase II September 1 2015 – March 31 2017

- 01/09/2015–30/11/2015: Core technical development
- 01/12/2015-31/01/2016: Test campaign
- 01/12/2015-31/05/2016: Performance analysis
- 01/06/2016-30/09/2016: Dissemination and exploitation.

Segmentation result (the non sky region is colored in black) obtained applying an original segmentation method developed in our research team

Results

Deliverables:

- Report on the State of the art in Image-GNSS fusion, Preliminary Design Review Report, Test Review Board Report, MATLAB codes for developed algorithms.

Dissemination:

- Scientific paper in a scientific journal, Technical Note on synthesis of the study.

A first dissemination result:

- Naforniță C., David C., Isar A., Preliminary results on sky segmentation, Proceedings of 2015 International Symposium Signals Circuits and Systems, 9-10 July 2015, Iasi, Romania, pp. 1-4, 10.1109/ISSCS.2015.7203933, Print ISBN: 978-1-4673-7487-3

Applicability and transferability of the results

The subject is evaluated today at technology maturity level 1 (Scientific Research), and it is aimed to conclude the project at technology readiness level (TRL) 3 (Laboratory Experiments).

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- European Space Agency (ESA), contract number 10031/02.08.2013
  - UPT: 128.234 EURO,
  - Thales Alenia: 70.000 EURO

Research centre

Research Centre for Intelligent Signal Processing (ISPRC)

Research team

Prof. Miranda Naforniță, PhD
Assoc. Prof. Corina Naforniță, PhD
Prof. Andrei Câmpeanu, PhD
Prof. Ioan Naforniță, PhD,
Prof. Marius Oteșteanu, PhD
Prof. Vasile Gui, PhD,
Prof. Alexandru Isar PhD
Assist. Prof. Ciprian David, PhD

Contact information

Prof. Alexandru ISAR, PhD
Department of Communications
Address: Bd. Vasile Pârvan, No. 1, RO300223, Timisoara
Phone/Fax.: (+40) 256 403 307
E-mail: alexandru.isar@upt.ro
Web: http://www.tc.etc.upt.ro/isprc/