Development and application of an experimental data server hosting EGNOS and RTCM/RTK correction data for terrestrial navigation

Raffaela Cefalo\textsuperscript{1}, Mauro Calderan\textsuperscript{1}, Andrea Piemonte\textsuperscript{2}

\textsuperscript{1} GeoSNaV Laboratory, Department of Engineering and Architecture, University of Trieste, Italy
\textsuperscript{2} Department of Civil and Industrial Engineering, University of Pisa, Italy
EGNOS (European Geostationary Navigation Overlay System)

Kinematic Applications

Sat Nav/Sat Com technologies integration for Disaster Management

**SISA Project**

**Coordinator prof. Giorgio Manzoni†**

**Real time kinematic Applications**

**Integration with Laser Scanner data**

FRA 2014/2015 UNITS Project  
GNSS/INS innovative technologies  
application to cable cars plant monitoring for passengers safety

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Kinematic tests

Funifor - Ravascletto (UD) plant:
- 2 lead cables and 1 pulling ring cable
- 2 km length, 830 m height difference
- 1 middle station, 2 same length spans

Pian de Pezze’ - Alleghe (BL) plant:
- 2 km length, 15 spans of different length
- 1445 m msl - 1986 m msl
Catenary shape determination

Central pillar – mountain station catenary
Topcon Legacy receiver

Central pillar – mountain station catenary
Hyper Pro
Topcon receiver

Vertical cabin oscillation due to 4 sudden emergency breaks

GNSS/INS real-time integration

Applanix POSPac Software
Cable cars dynamic behaviour determination

Cable and cabins dynamic behaviour (cable cars) have been monitored, giving the following parameters:

- Catenary shape during operative phase
- Cabin oscillations due to sudden emergency breaks → effects on passengers comfort, pumping effect, structural checks to verify the norm requirements
- Dynamic torsion effects on the pillars due to cabin passage

Using the actual adopted methodologies these aspects cannot be monitored

Pillars monitoring

Pillar monitoring at the **two cabins contemporaneous passage using a robotic motorized Leica TS30**

Conclusions and future developments

Cable cars dynamic behaviour determination requires:

- satellite signals continuity
- high level of accuracy
- redundancy for safety reasons

→ sensors integration

High accuracy 3D INS (Applanix POS LV)/real-time Kalman filtering /multiple GNSS receivers/integration with classical sensors

Future developments:

standard definitions/norms updating
Experimental data server hosting EGNOS and RTCM/RTK correction data for terrestrial navigation

Cefalo R., Calderan M.
The implementation of the **EGNOS Message Server (EMS)** and the opportunities offered by the **SISNeT (Signal-In-Space through the Internet)** and **EDAS technology** have encouraged the development of a number of applications within the GNSS users community.

One possible application is to provide GNSS users with the best available correction data for their GPS measurements within the area of operations. Corrections can be based on: SBAS, RTCM and RTK data.

**Aims:** Make all correction data available on a data server, allowing GNSS users to access this server through a communication link and download the desired corrections. In this way GNSS users, depending on the application and on the operation area, can always benefit of the best available corrections.
Experimental Data Server

- An experimental Data Server making available at the same time EGNOS augmentation messages as well as RTCM and RTK differential corrections computed by dedicated receivers located at a known reference position, has been set up at GeoSNav Laboratory, Department of Engineering and Architecture, University of Trieste, ITALY.

- All the corrections available on the Data Server are made accessible via VPN (Virtual Protected Network) through the Internet to authorized users equipped with an integrated GPS/GPRS terminal.

- Depending on the operational conditions and on the operation area (distance from reference station/visibility of EGNOS satellites), the user can choose the augmentation to be included in the computation of position, velocity and time.

- The research project has encompassed: the development of the data server, the development of the user terminal, tests on the availability/accessibility of augmentations on the data server, tests on the communication link between the server and the user terminal, static and dynamics tests to assess the navigation performance of the user terminal and the integration of the user terminal with other sensors.
GeoSNav Lab Data Server

Real Time Data Processing & visualization

Novatel Millennium L1/L2 receiver
Applications to Terrestrial Navigation

Cefalo R., Piemonte A. 2014
References


Thank you for your attention!

Prof. Raffaela Cefalo, eng. Mauro Calderan
GeoSNav Lab
University of Trieste, ITALY
cefalo@dicar.units.it; calderan@iuav.it

Prof. Andrea Piemonte, DIC, University of Pisa, ITALY
andrea.piemonte@dic.unipi.it