egeniouss

A REAL-TIME VISUAL LOCALISATION FRAMEWORK FOR SATELLITE-BASED NAVIGATION

ABOUT

Whether travelling by bike or on foot, working as a city surveyor, architect, or construction manager, or even the operation of autonomous drones and vehicles — all these tasks depend on **accurate** and **reliable** satellite-based navigation and positioning.

Struggling with navigation in the city? Urban canyons can easily interrupt satellite signals, limiting the full potential of both **professional** and **consumer** services.

egeniouss will change that by offering a reliable, precise, and cost-effective

MAJOR USE CASES

PERFORMANCE

API-enabled platform-independence to run on **smartphones**, **drones**, **in-vehicle-systems**

Absolute **localisation accuracy** of up to **10 cm** with **99% reliability**

Visual localisation service to **solve known GNSS issues**, i.e. NLOS, multipath, jamming and spoofing

Machine Learning for reliable **scene understanding** and accurate **feature repeatability**

Surveying-grade aerial and terrestrial **reference data** stored in the **Cloud**

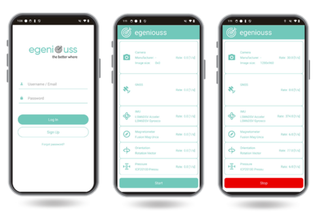
Tight integration with European GNSS and augmentations, e.g. HAS

Bike Navigation High real-time requirement **Low accuracy** requirement

Smartphone-based surveying High accuracy requirements **Low real-time** requirement

Drone-based delivery High availability & continuity requirement **Low TTFF WS*** requirement

*Time to first fix warm start



Galileo and EGNSS

- egeniouss relies on the European GNSS Galileo and its augmentations, e.g. the High Accuracy Service (HAS), as its backbone.
- egeniouss' multi-sensor navigation system integrates code and carrier phase measurements, along with HAS, into a unified, general, and generic sensor-agnostic real-time trajectory determination module.
- egeniouss combines various GNSS measurements, augmentations and visual localisation, and thus enhances precision, accuracy, and robustness.
- egeniouss is adaptable to different sensors and operational environments.

API

- egeniouss is an application-independent service, highly advantageous for a wide array of location-dependent or location-reliant applications.
- designed with platform independence in mind, egeniouss is accessible through a versatile API.
- egeniouss ensures seamless deployment across various devices, including: Mobile phones, Drones, and a wide range of robots
- leveraging the Robot Operating System (ROS), leads to a flexible and adaptable solution that can be easily integrated into different platforms.

AI Machine Learning

- AI enhanced image descriptors for visual localisation: more salient, repeatable and reliable.
- pivotal for maintaining accurate positioning and navigation in complex environments and for semantic understanding of images

Cloud

- robust cloud solution to ensure scalability, reliability and high performance
- manages extensive reference data, also in offline mode
- database is built using: stablished open-source and proprietary solutions
- bi-directional communication with the edge device

Data

- highly accurate geo data as a reference for visual localisation:
  - official Level of Detail (LOD2) models
  - high-quality aerial nadir and oblique imagery and survey-grade mobile mapping imagery, combined into a 3D textured mesh.

Examples

Dataset:
3D textured mesh derived from airborne oblique imagery @7.5cm GSD, combined with Cyclomedia mobile terrestrial imagery.

Mesh of area in Braunschweig, based on aerial, terrestrial imagery;LOD2 model; Data: Geofly and Cyclomedia, Processing: Skyline Software, city of Braunschweig

Left: reference trajectory of the camera in blue, the smartphone's internal GNSS pose estimate in red, and the sampled views in orange.
Right: examples of the query images and the view rendered from its reference pose.

Vultaggio, F., Fanta-Jende, P., Schörghuber, M., Kern, A., and Gerke, M.: Investigating Visual Localization Using Geospatial Meshes, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-2/W8-2024, 447-454, https://doi.org/10.5194/isprs-archives-XLVIII-2-W8-2024-447-2024, 2024.

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