FRANÇAIS ENGLISH

Vehloc

Hardware and software platform for designing and evaluating vehicle-localization solutions

What is Vehloc?

Vehloc is CEA-Leti's localization solution designed to support the next generation of Intelligent Transport System (ITS) applications and services. It includes:

- **Ground truth**: tactical-grade navigation unit with associated post-processing software providing centimeter-level accuracy:
  - Dual-frequency RTK-GNSS receiver, Dual antenna for true heading and fusion with tactical grade IMU
  - Position accuracy: 2 cm / attitude accuracy: 0.03 deg
- **Target platform**: a flexible embedded platform for vehicle localization that integrates:
  - Standard and high-accuracy GNSS receivers
  - Consumer and tactical grade IMU
  - An impulse radio-ultra-wideband (IR-UWB) transceiver
- **Localization algorithms**: advanced navigation and localization algorithm libraries:
  - State-of-the-art GNSS-IMU loose & tight coupling fusion
  - Cooperative algorithms, including GNSS, IMU and IR-UWB

Applications

Vehloc accelerates positioning and navigation-system product design from algorithm development to implementation, relying on highly flexible online/offline validation. It helps explore advanced cooperative or hybrid data-fusion systems suitable for harsh operating environments, such as:

- Assisted or autonomous driving
- Infrastructure requirements and associated algorithms for vulnerable road users' (VRU) safety
- Localization and navigation resilience under GNSS outage (e.g., deep urban canyons)

CEA-Leti's solution helps generate test vectors and databases for evaluation purposes with respect to "ground truth" and relative benchmarks of advanced fusion algorithms.

What's new?

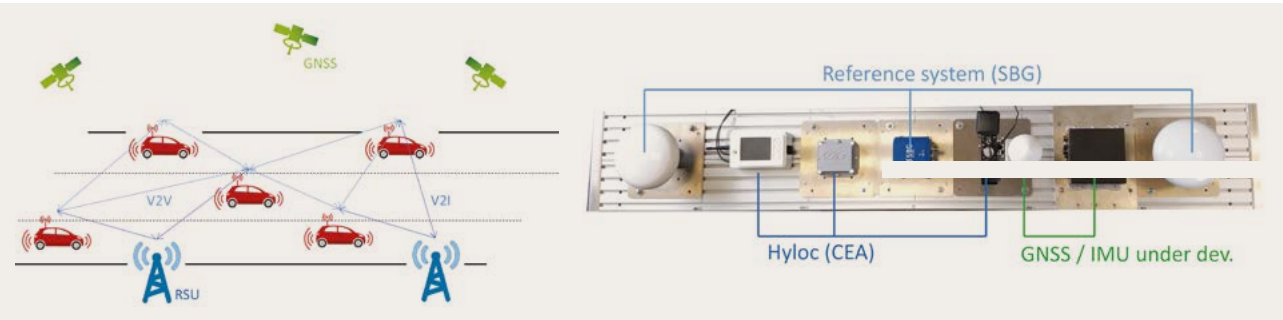
A complete vehicle test platform, including a ground-truth system
- Hardware comes with extensive know-how to carry out in-the-field performance tests and related metrology tasks. This includes database management, performance-indicator selection and automated algorithm optimization.

Flexibility and modularity of validation procedures
- Localization scenarios can be recorded in log files for consumer metrics and high-end components. Fusion algorithms can then be fine-tuned offline.
- Sensor choice and dimensioning may be selected based on application performance specifications and final product implementation constraints.
- Multiple levels of cooperative deployment are supported, from pure standalone to vehicle-to-vehicle (V2V) in VANETs or even vehicle-to-infrastructure (V2I) (with various infrastructure densities).

Unique possibility to evaluate most innovative localization approaches and advanced technologies in a realistic vehicular context, such as:
- Accurate V2V/V2I IR-UWB ranging under representative mobility
- Context-aware multi-sensor fusion
- V2V/V2I cooperation

Experience in the field:

- **Radio-based localization:** 5 PhDs, 65 conference papers, 5 journal articles, 15 patents
- **Fusion-based hybrid localization:** 3 PhDs, 17 conference papers, 3 journal articles, 4 patents
- **Sensor-based localization:** 5 PhDs, 6 conference papers, 2 journal articles, 25 patents



What's next?

Future developments will include:
- Localization-oriented optimization of ITS messages and protocols, anticipating the emergence of new vehicular wireless communication standards
- Application of the most demanding location-based features of autonomous driving (e.g., cooperative mapping, decentralized fleet control and platoon/group coordination, trajectories synchronization…)
- Extension to other emerging localization and navigation fields: smart road, drone and fleets of drones

Interested in this technology?

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