Towards a scalable and hybrid positioning system for urban and mass-market applications

First results from BANSHEE and UNION

Fifth GNSS Raw Measurements Task Force Meeting
May 17th 2022
Mass market applications

What do mass-market and automotive applications demand from navigation solutions?
- Accuracy, availability, robustness
- For automotive, also integrity

What are some major challenges?
- Scalable decimetric accuracies
- Indoor/outdoor seamless navigation
- Reliability of position estimates

These are smartphones and wearable devices!
Approach: Positioning engine + Augmentation service

Tight hybridization of GNSS + Wi-Fi RTT (range) measurements

Metric-level indoor/outdoor seamless navigation

SPEAR Positioning Engine

is being modified

Undifferenced and Uncombined PE + Permanent VRS network

Scalable decimetric navigation

Funded by EUSPA, GSA/GRANT/04/2019/BANSHEE

Funded by EUSPA, GSA/GRANT/06/2019-UNION
BANSHEE Processing Engine

Tight Hybridization of
GNSS raw measurements +
Wi-Fi RTT ranges

For this test, a Google Pixel 4 placed indoor on desk (non-moving) processed with random walk (pedestrian dynamics)

Rokubun GNSS Medea Receiver being upgraded to be compliant with 802.11mc protocol

⚠️ RTT ranges have decimetric noise but hardware biases are present (need calibration!)

Link to video [https://youtu.be/4QmhquPMQW0?t=62](https://youtu.be/4QmhquPMQW0?t=62)
BANSHEE Service (WALS)

BANSHEE WALS service
https://banshee.rokubun.cat

ingests geolocated Wi-Fi RTT measurements to compute Wi-Fi Access Points (WAP) position and hardware (calibration) biases

💡 Wardriving campaign to scan for Wi-Fi RTT routers. Later to be served to terminals in the navigation engine

⚠️ As of today, still limited set of hardware devices (smartphones and Access Points) support 802.11mc

Green marks indicate 802.11mc compatible Wi-Fi RTT
UNION Processing Engine + Permanent VRS network

Objective:
- Operational location engine based on Undifferenced and Uncombined strategy
- Support for both OSR (RTK-like) and SSR corrections (PPP-like)
- Overcome limited scalability of Virtual Reference Station (VRS) technique used in RTK networks

⚠️ VRS requires two-way communication, which limits scalability (specially critical in mass-market application)
UNION Permanent VRS network

🌐 Permanent VRS network
Builds a network of predefined virtual networks

⬇️

The receiver does not need to send its position, simply pick the closest mount point in the Main UNION caster

http://caster.rokubun.cat:2101/
Thanks!

Further questions? Drop me an e-mail
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