Post-processing software ADMA-PP

Topics

- Ground Truth
- Simulation
- RDE (Real Driving Emissions)
- Offline RTK2 via RINEX
- Track visualization

The challenge

The increase in the variety of vehicles and the rising demands on advanced driver assistance systems (ADAS) and autonomous driving lead to ever higher development requirements. As a result, post-processing is playing an increasingly important role in the automotive industry. The precision of the ADMA is limited by the quality of the IMU and the duration of a GNSS outage. The performance of the system can be greatly improved through post-processing. In doing so, ADMA-PP further reduces the position solution drift during GNSS outage and provides a step-free solution. To achieve this, the ADMA-PP calculates the input data in the time domain forward and backward and combines both results.

Advantages of the ADMA-PP

▲ Signal optimization

The greatest benefit of ADMA-PP is the signal optimization. Because of the complex calculation algorithm, the position accuracy can be significantly improved by combining the navigation solution forwards and backwards. Another advantage is the compensation of position steps after GNSS reentry (e.g. after passing through a tunnel).

▲ Offline RTK2 calculation through RINEX data

So-called RINEX data can be procured from RTK service providers. The ADMA-PP can improve the position accuracy to 1 cm 1 sigma even after a test drive. This means that the NTRIP or radio modem can be omitted in the test setup - but most importantly there are no RTK failures during post-processing due to the mobile radio network.

▲ Subsequent modification of the ADMA configuration

Errors in the ADMA configuration can ruin the results of a test drive. With the ADMA-PP, all parameters can be adjusted afterwards.

▲ Partial obsolescence of the initialization

The initialization drive to set up the Kalman filter is particularly difficult on public roads. A logic integrated in the ADMA-PP makes this initialization obsolete - more about this in the chapter "Operating principle".

▲ Extending capabilities such as Moving BASE and DELTA

Functional enhancements are possible with the help of ADMA-PP, such as DELTA Multi[1] and Moving BASE[2].

[1] **DELTA Multi:** Distance calculation to any number of objects with a relative position accuracy of 1 cm 1 sigma. Online RTK correction data is required for each object. This enables a highly accurate absolute positioning solution to be realized.

[2] **Moving BASE**: Distance calculation to any number of objects with a relative position accuracy of 1 cm 1 sigma. Online RTK correction data is not required here, accuracy is achieved by combining Hunter and Target ADMA pseudorange, carrier phase and Doppler measurements. However, no highly accurate absolute positioning solution can be realized.

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Tool chain

The ADMAnet and GNSS raw data are acquired via Ethernet during a test drive.
An ADMA-PP project wizard enables fast and productive processing.

Operating principle

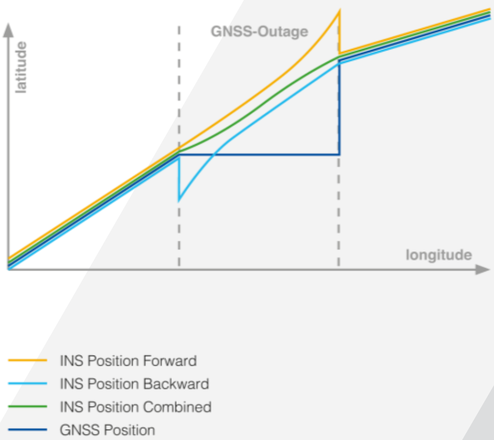
The ADMA-PP completely maps the function of the Kalman filter and the GNSS receiver in one software solution. With the ADMAnet and GNSS raw data of a test drive, the algorithms for the calculation of the system states can be repeated afterwards. This enables a high degree of flexibility as well as the option to calculate data in the time domain forward and backward with subsequent combination of the individual solutions.

I) Forward 1: The results of the first forward calculation equal those of the online drive. In the meantime, however, the software learns all transient parameters of the Kalman filter.

II) Backward: In backward calculation, the test drive is run backward in the time domain - as if you were driving through a tunnel from the other end, for example. The drift effects during a GNSS outage are different compared to forward motion.

III) Forward 2: In the second forward calculation, ADMA-PP runs the test drive forward again, but with the Kalman filter parameters obtained from the first forward run.

IV) Combined: The third calculation combines the forward and backward solution. This represents the final result of the ADMA-PP. All data channels are drift-minimized and step-free.



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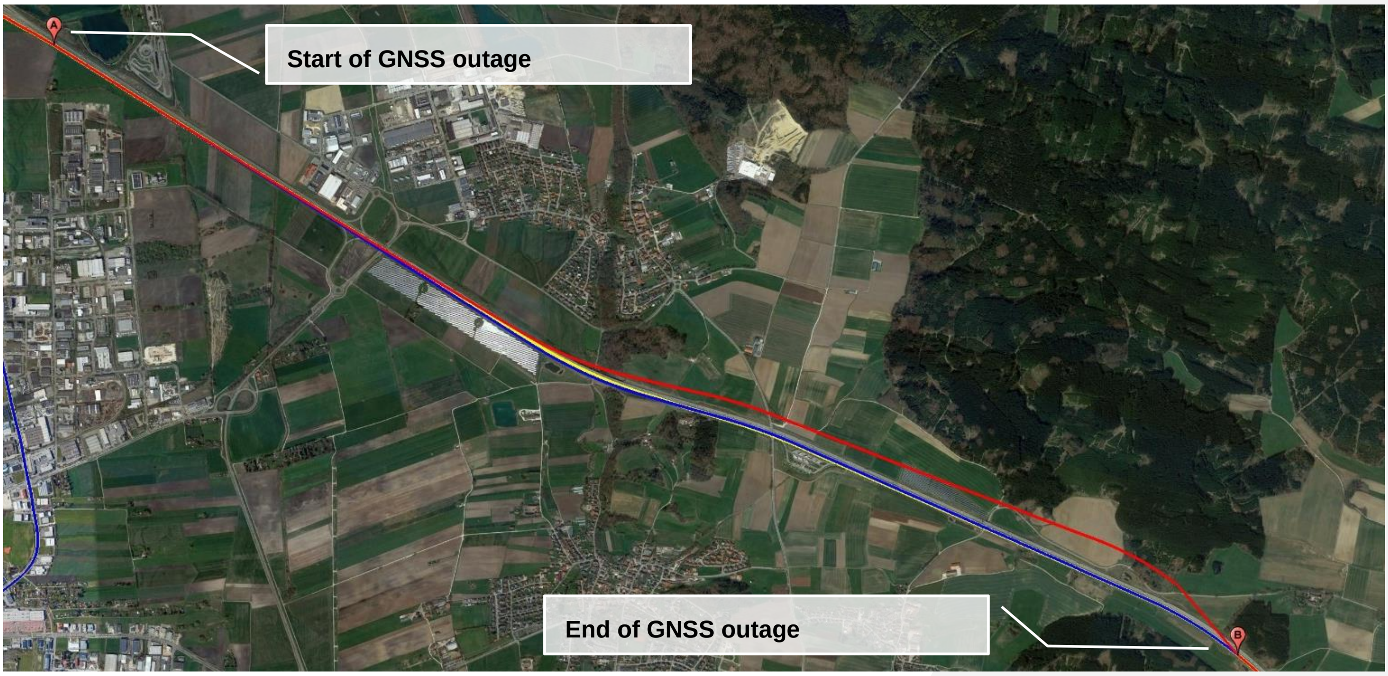
Equipment

- ADMA
- ADMA-PP
- GeneSys Ethernet Logger

Summary

The greatest benefit is the signal optimization. On the one hand, the complex calculation algorithm of the ADMA-PP improves the accuracy of an ADMA by combining the navigation solution forward and backward, especially in case of total GNSS failure. On the other hand, hard position steps after GNSS reentry are almost completely compensated.



Blue line: Reference drive with ADMA-G-Pro+ without GNSS outage
Red line: Signal sequence of live drive during five-minute GNSS outage
Yellow line: Result from ADMA-PP during five-minute GNSS outage

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The expert

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FURTHER QUESTIONS? CONTACT THE AUTHOR

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