

The Integrated Tracking System Based on GPS

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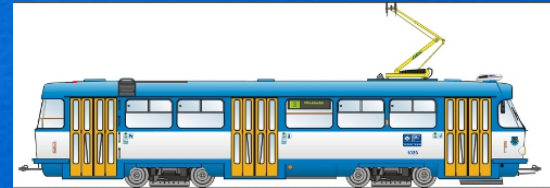
Advisors

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Czech Technical University in Prague

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University of Iceland

Motivation

- Moving object localization by GPS
- Tram tracking



Expectation

- Result position lies on a track
- Reliable also in problematic space
e.g. narrow streets with high buildings

Ordinary Tracking



moving object



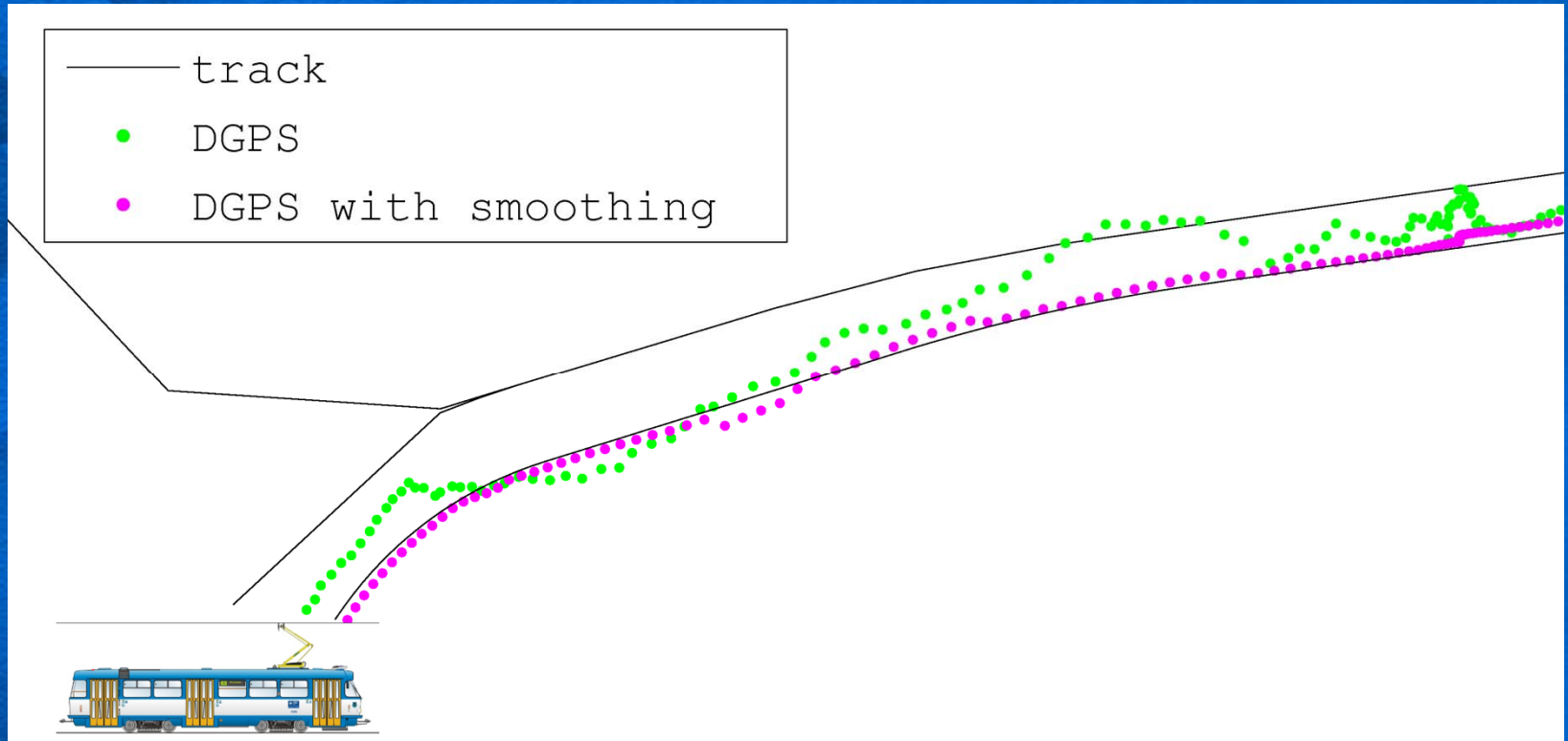
GPS measurements



$n \geq 4$



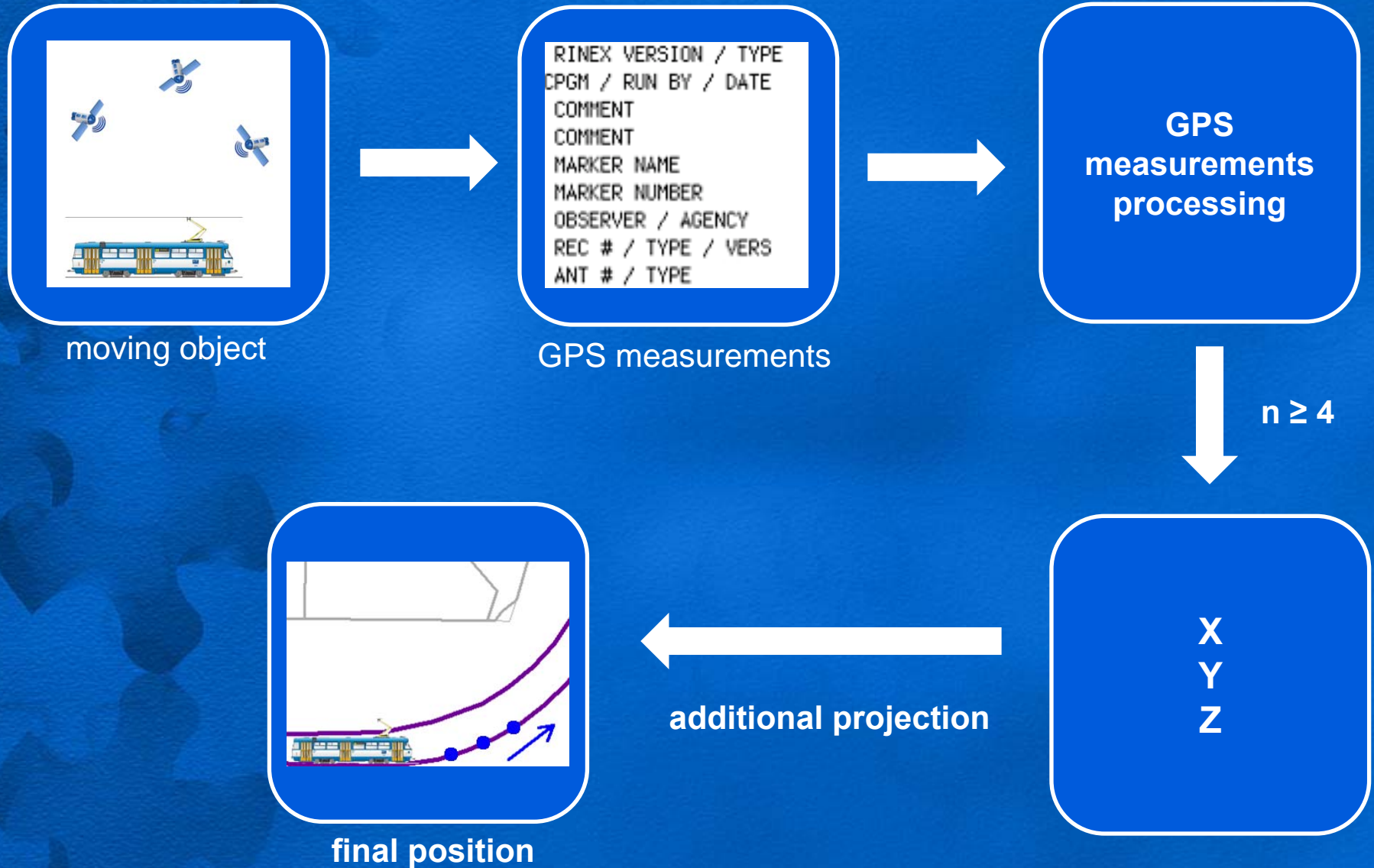
Differential GPS



Result position does not lie on a track

GPS solution does not exist if a number of available satellites is < 4

Ordinary Tracking



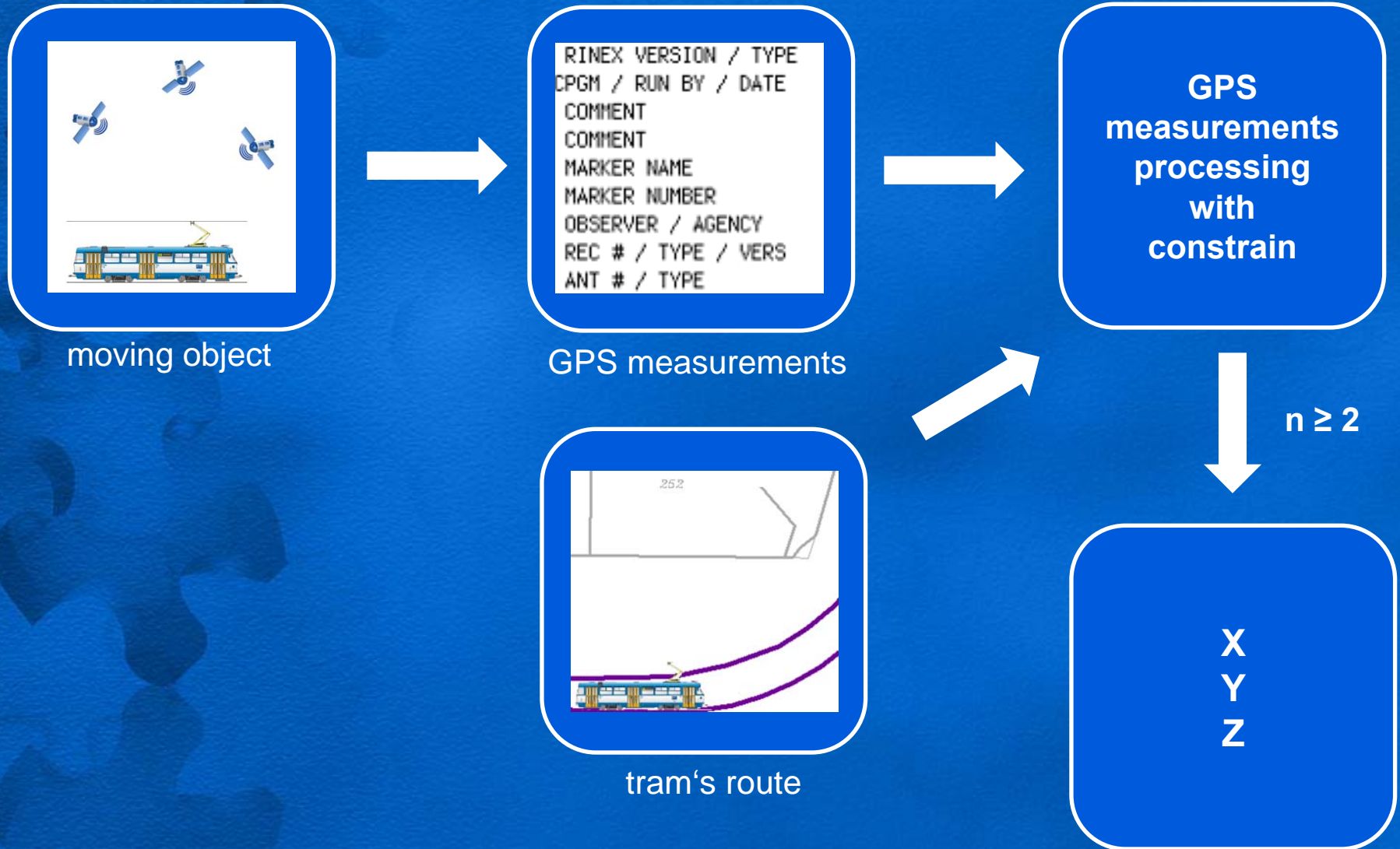
Tracking with constrain

- Information about the tram trajectory is processed simultaneously with GPS measurements (constrain)

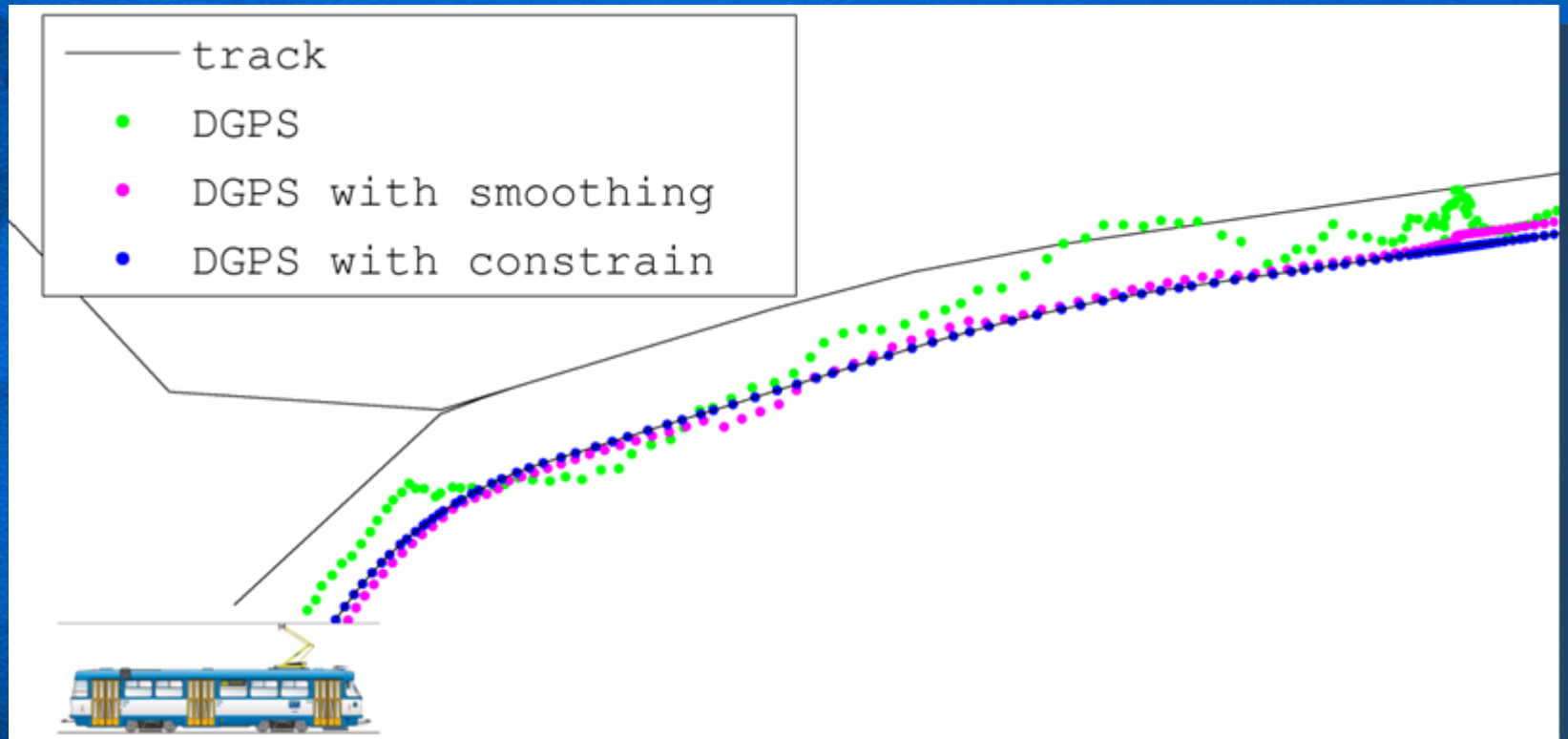


digital map

Tracking with constrain



Differential GPS with constrain



Result position lies on a track

GPS solution does not exist if a number of available satellites is < 2

The integrated tracking system contains:

Methods, algorithms and software solution:

- for the digital map processing,
- for GPS measurements processing (SPP, DGPS, constrained),
- for junction problem solution.

The integrated tracking system:

may be useful for:

- active preference of public city transportation,

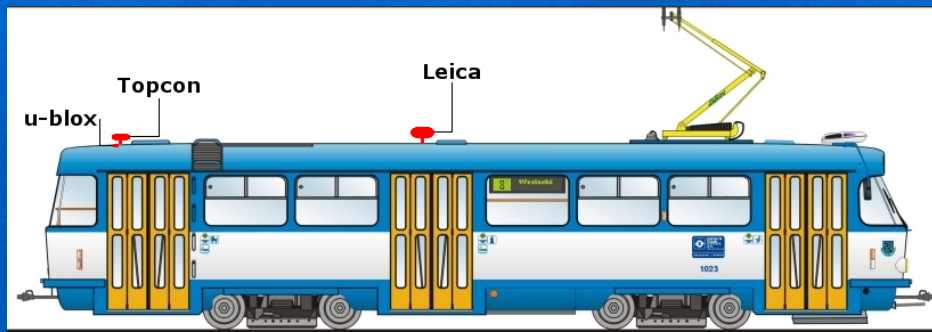


- dangerous freight monitoring.



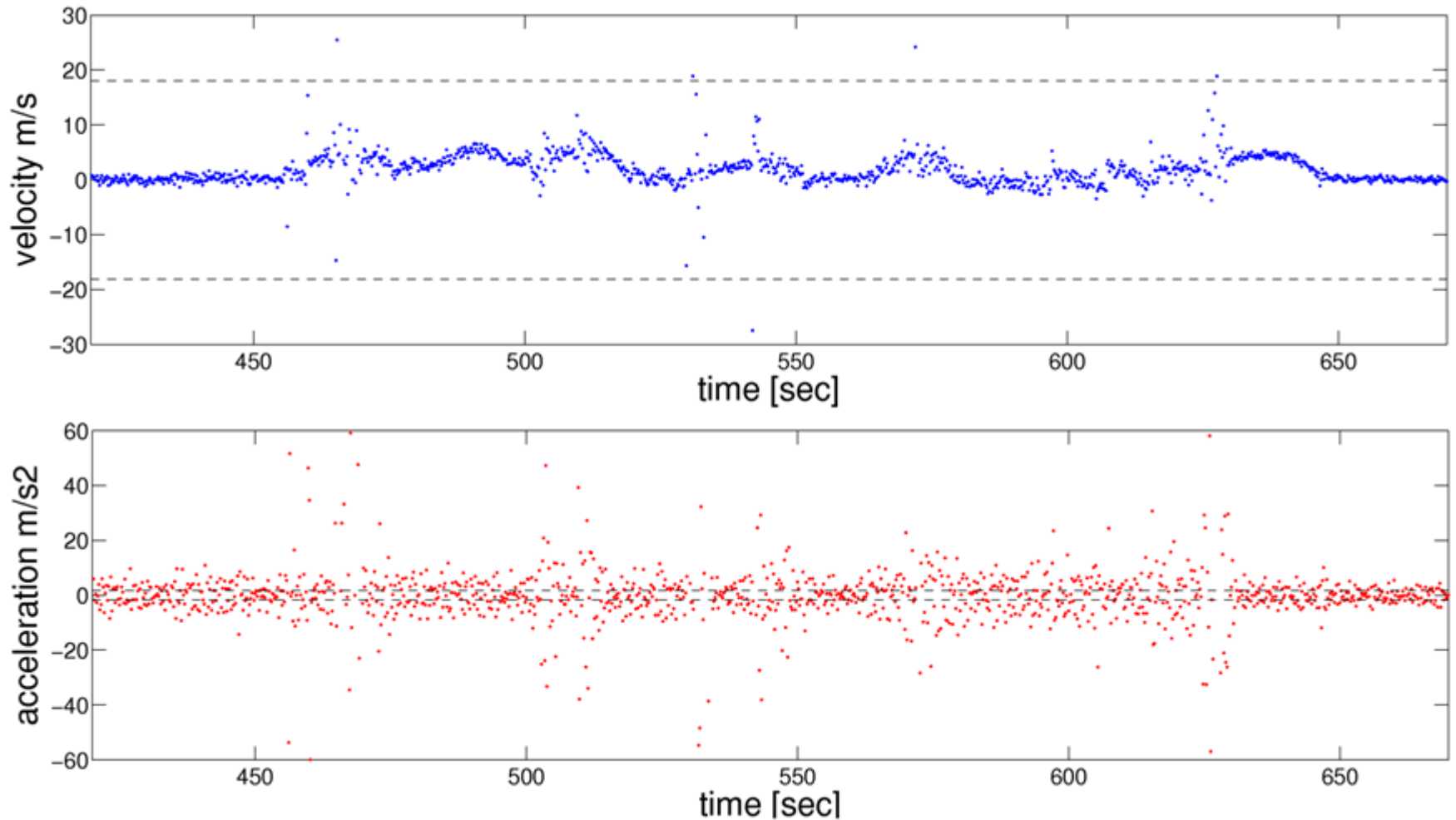
Testing

- Cooperation with Training Department of the Prague Public Transport Company
- Receivers u-blox, Topcon, Leica



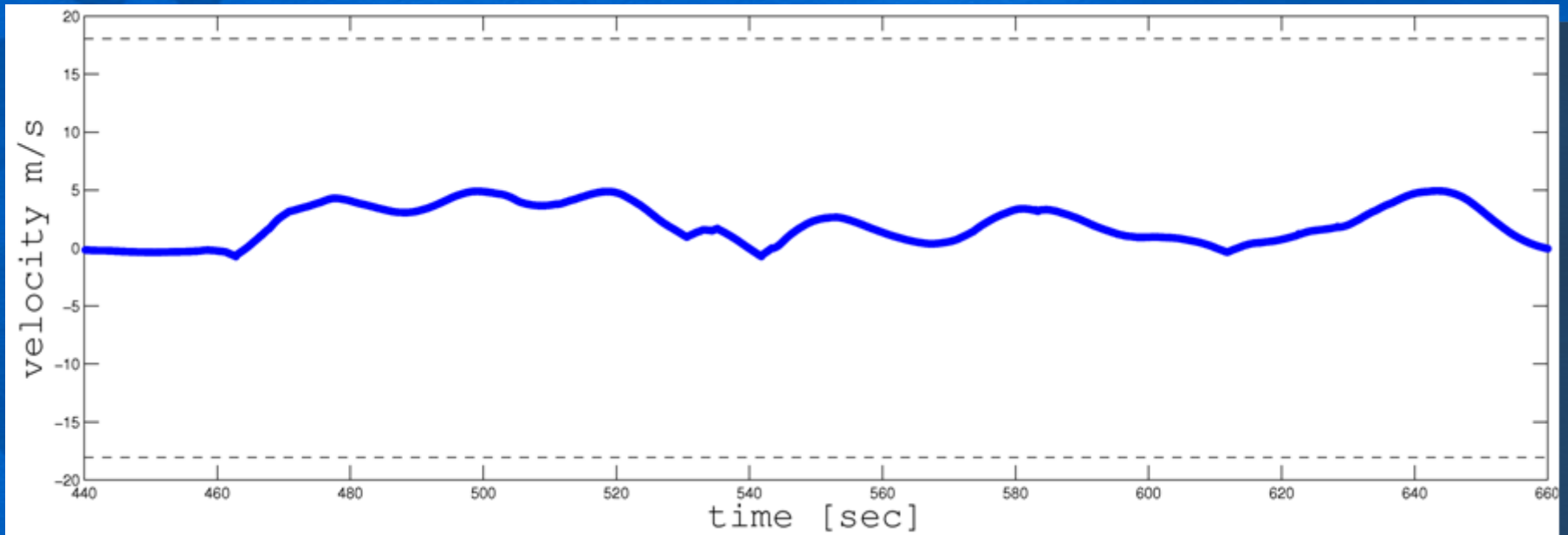
Evaluation – DGPS with constrain

- Velocity and Acceleration (LSM)



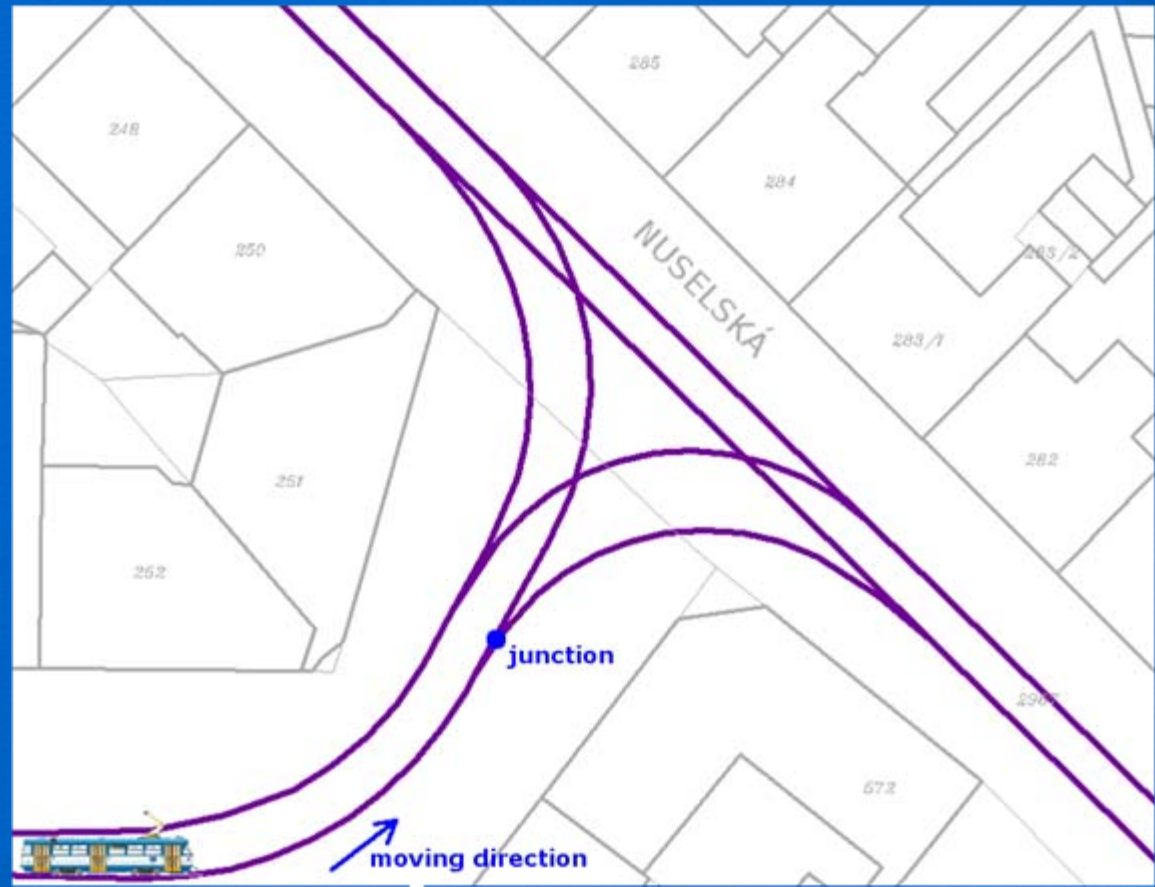
Evaluation - DGPS with constrain

- Velocity (Kalman Filter)
Linear Motion Model



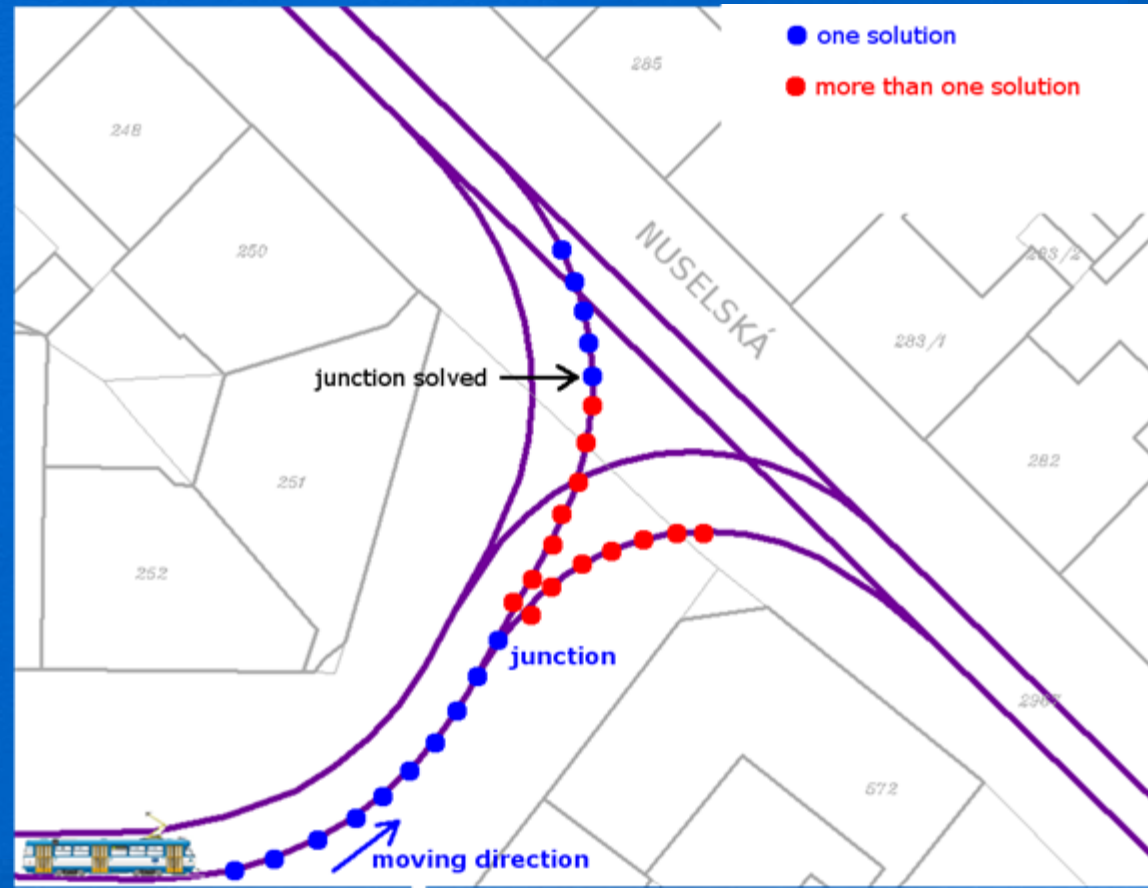
Junction problem

- Solution exist on the both branches.
- How to choose the correct branch?



Junction problem

- All available trails are considered.
- Solutions on every trail are systematically compared between themselves.



Expectation

- Reliability
(only two satellites are necessary, system is more reliable in GPS problematic space, e.g. narrow streets with high buildings)
- High precision
(future: to demonstrate the precision)

Thank you for your attention

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