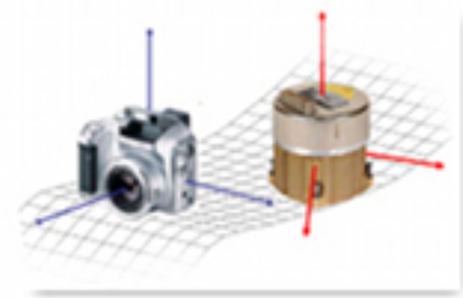

Sensor Orientation - Applications

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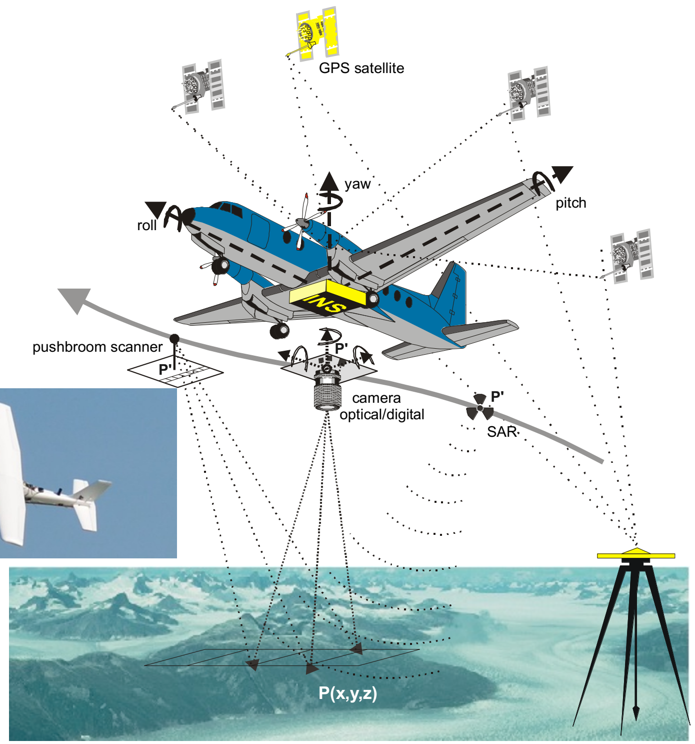
EPFL, spring semester 2024

École polytechnique fédérale de Lausanne

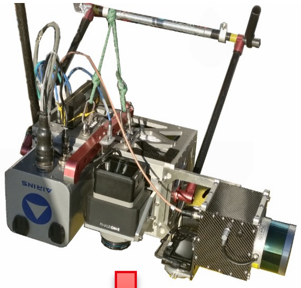
SIE/RO: mapping/monitoring

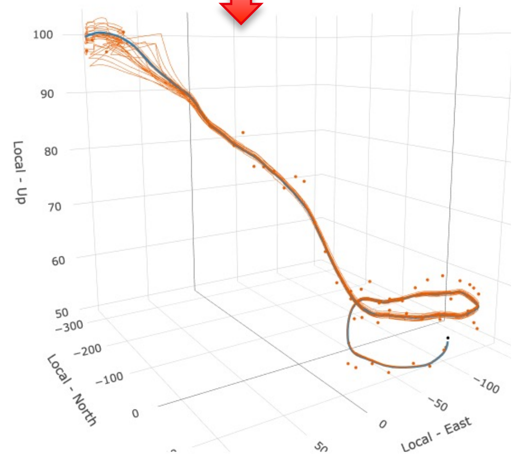
Optimal sensor-orientation

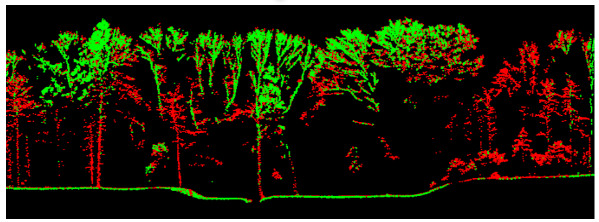
- Enables precise navigation & observations from mobile platforms (airborne, space).



Direct sensor orientation







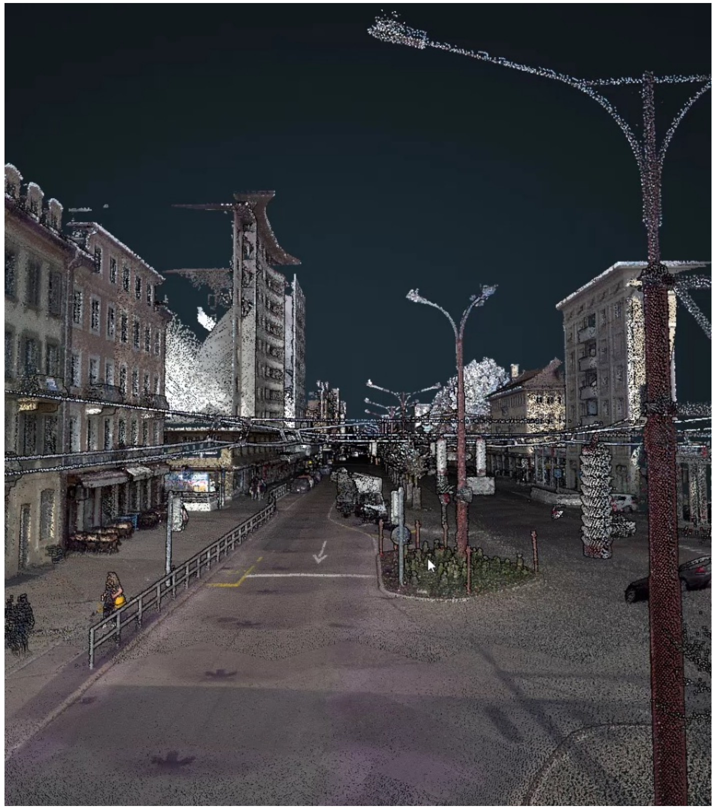
1. Requires a *precise approach* of **sensor sensor-fusion** with applications to environmental monitoring/mapping, robot/machine guidance, automated driving, etc.

2. Needs to **model sensors** and determine **3D motion** with respect to global frames by an **autonomous and integrated sensor-fusion**

3. Employs **modeling** and **estimation** via **Kalman filtering**

SIE: mapping/monitoring

- optimal sensor-fusion
  - Enables precise remote observations from mobile platforms (terrestrial).



Where is it used?

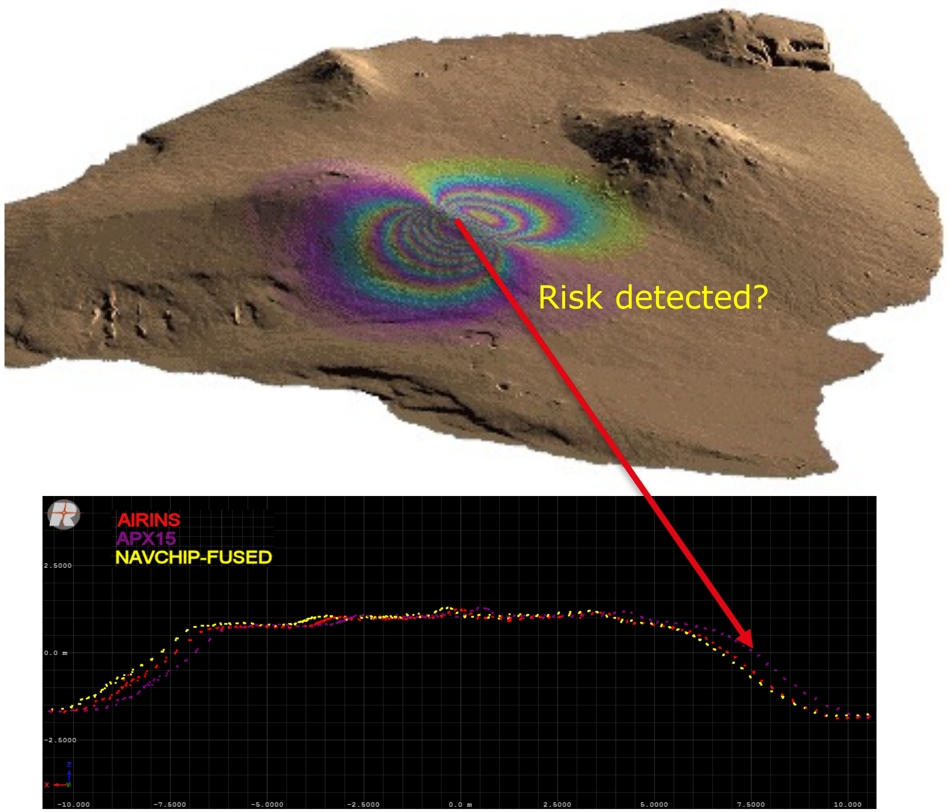
SO is the enabling force behind:

- mobile mapping & remote sensing

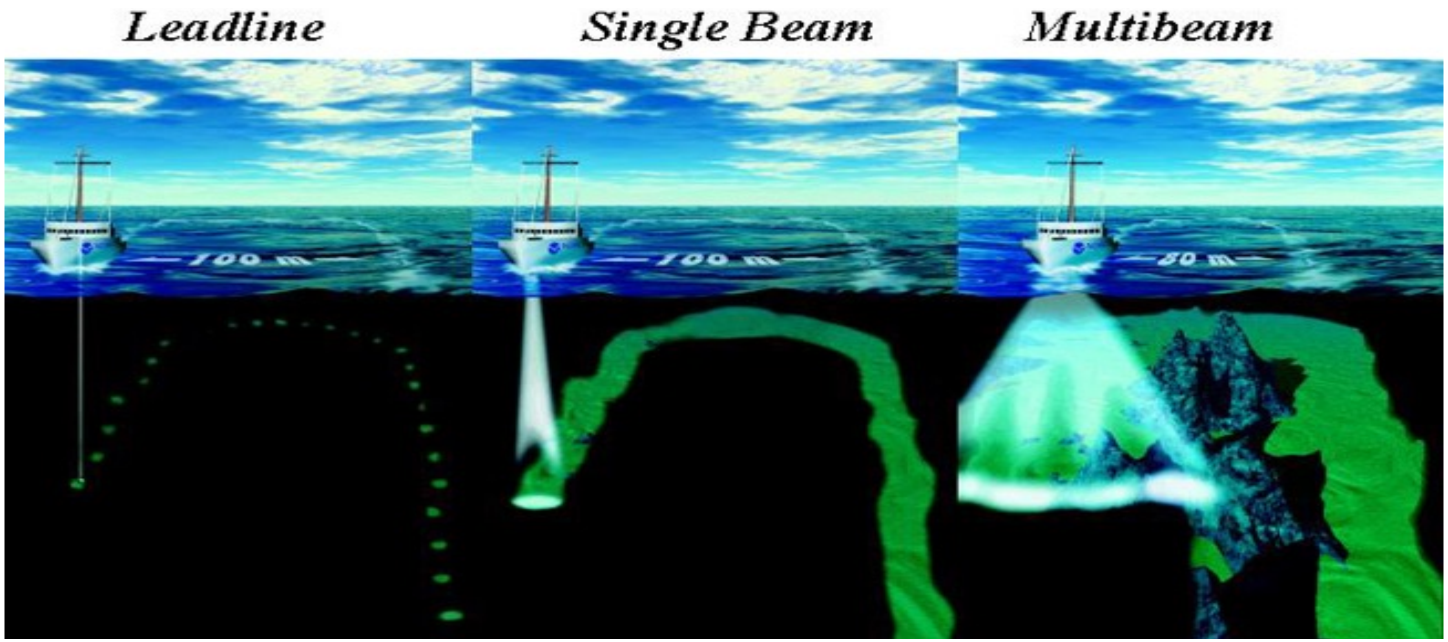
as well as

- automated **driving**,
- machine guidance**,**
- **robot** control,
- **navigation**,
- timing,
- **satellite** manouvers,

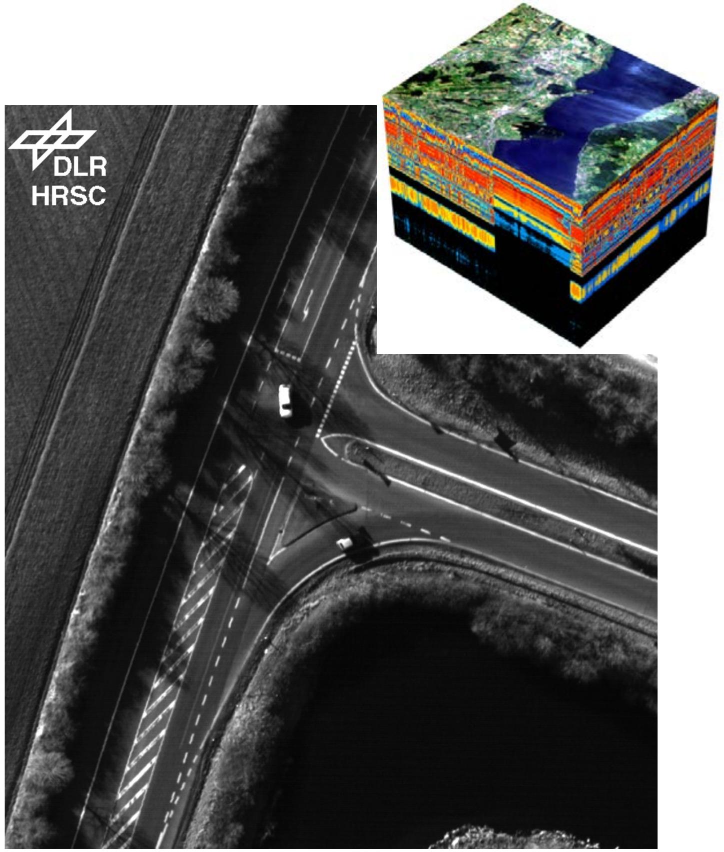
…



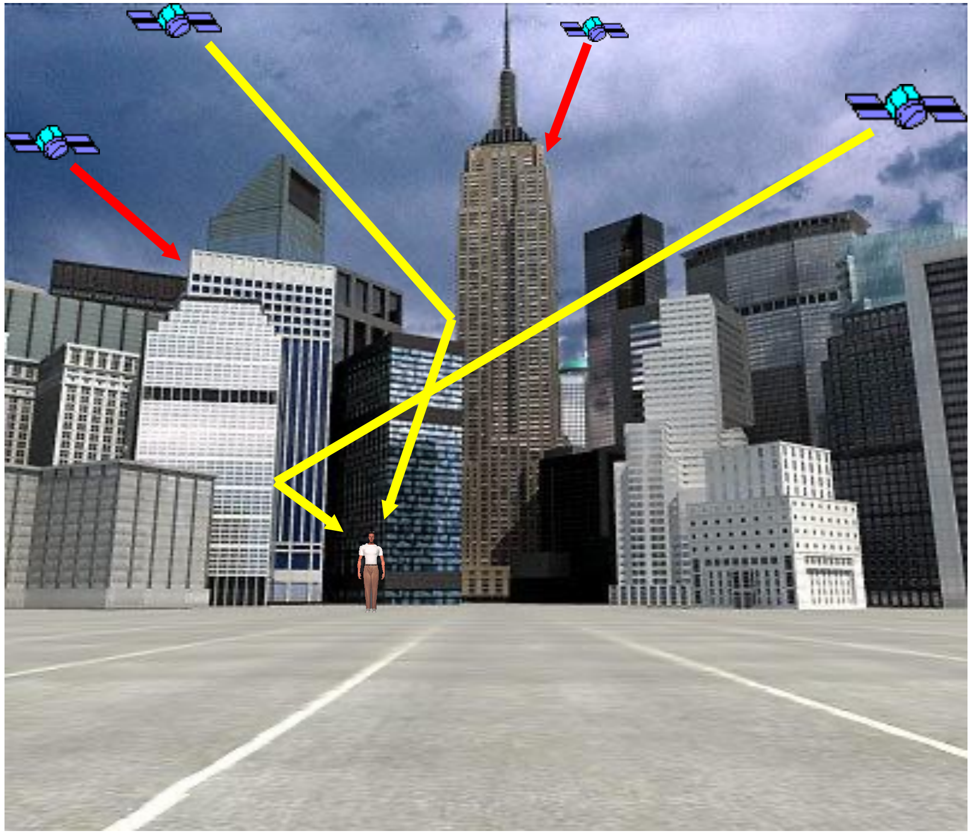
Example: seafloor/lake mapping

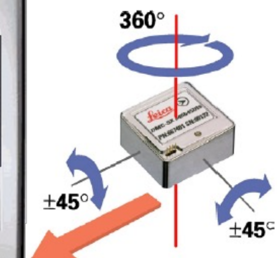


Example: pushbroom (multi-spectral)



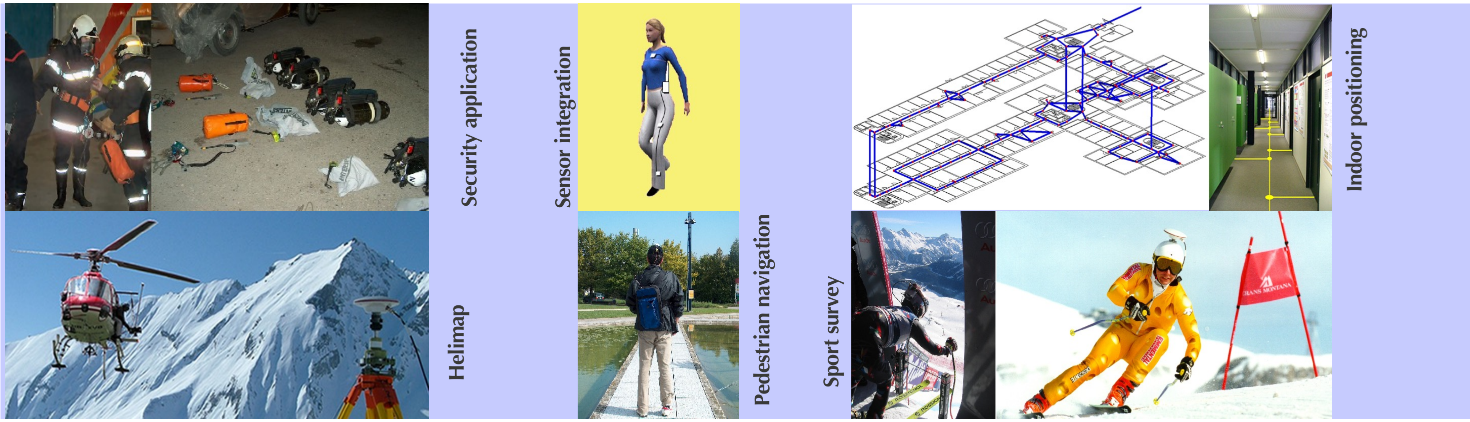
IC: positioning/navigation timing & communication = one thing



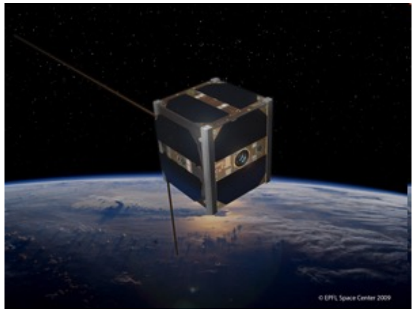


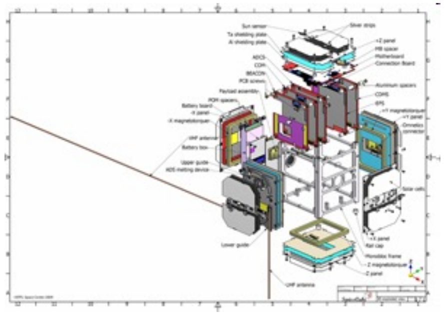
Basis for many applications, examples @ EPFL

- ESO (past) research

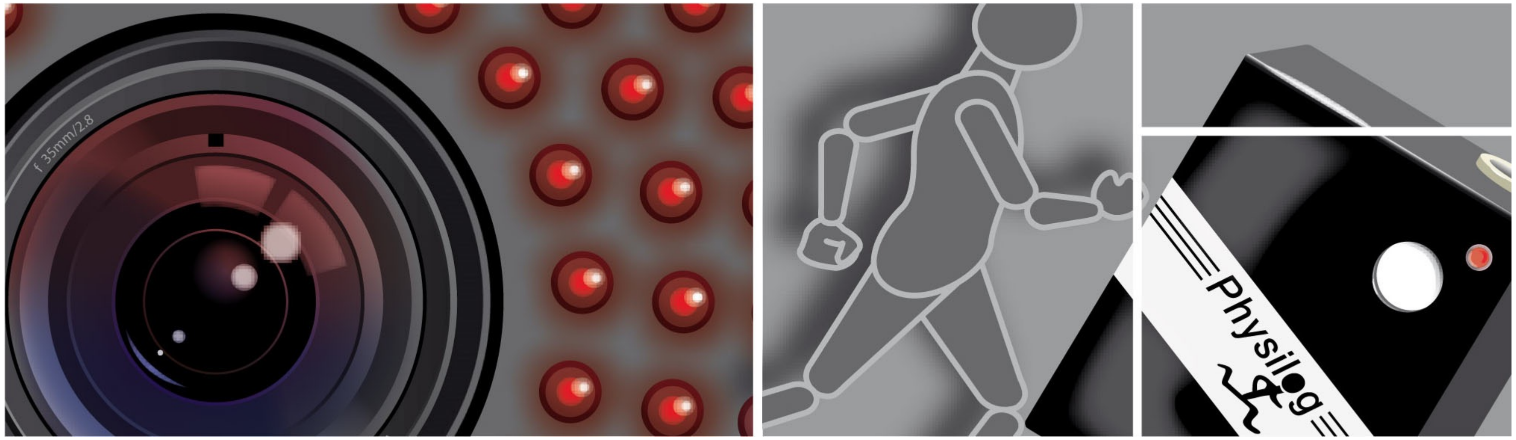


- Space centre
  - Swisscube
  - Clean space





@ EPFL: LMAM, LIS, LSRO, DISAL, …

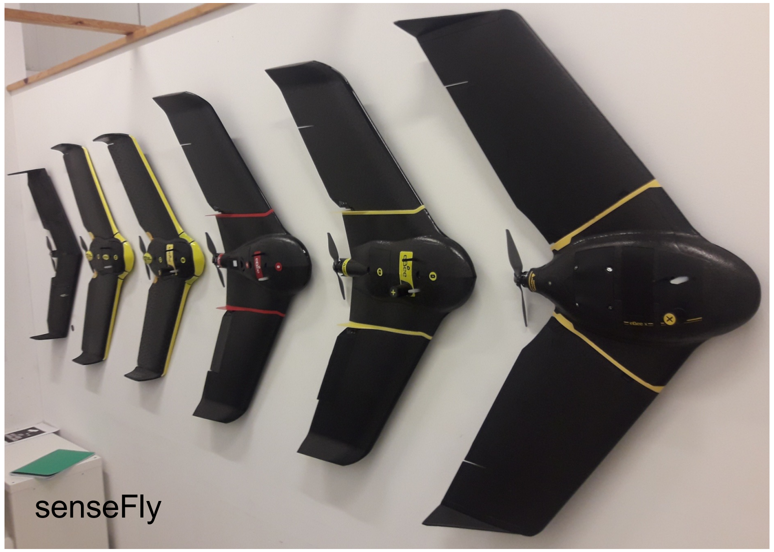


In engineering

Why not only satellite positioning?

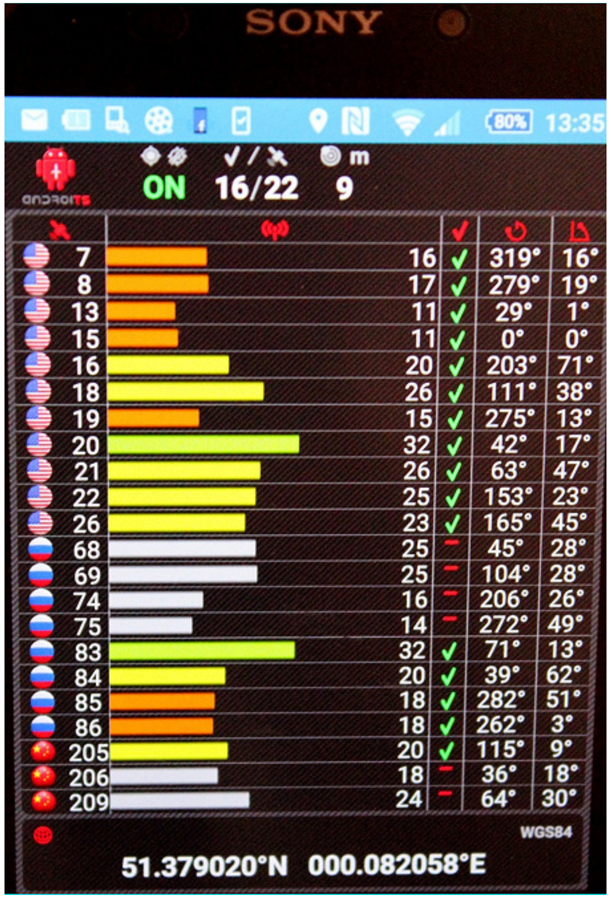
(GPS/GNSS)

In engineering



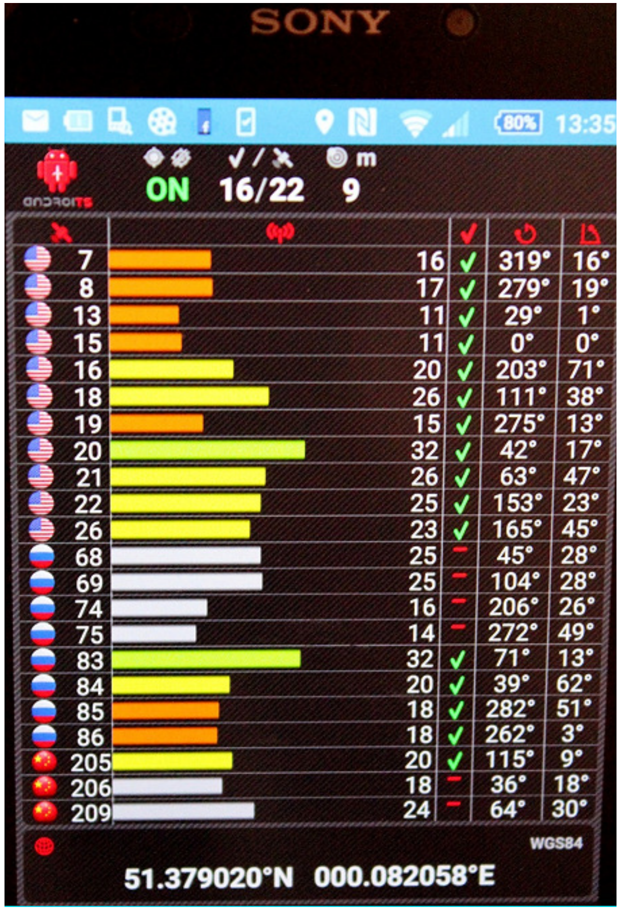
Why not only satellite positioning? (GPS/GNSS)

GNSS advantage: similar signals, redundancy



EPFL

Disadvantage: interference = all down



resilient PNT?
automated driving?

Solution – calibrated autonomous sensors

Random processes and their use for modeling (inertial) sensor behavior

Kalman Filtering – and their dynamic and stochastic models for trajectory estimation