High-precision, cost-effective inertial navigation with tightly-coupled GNSS

Harrison Coley
Oxford Technical Solutions

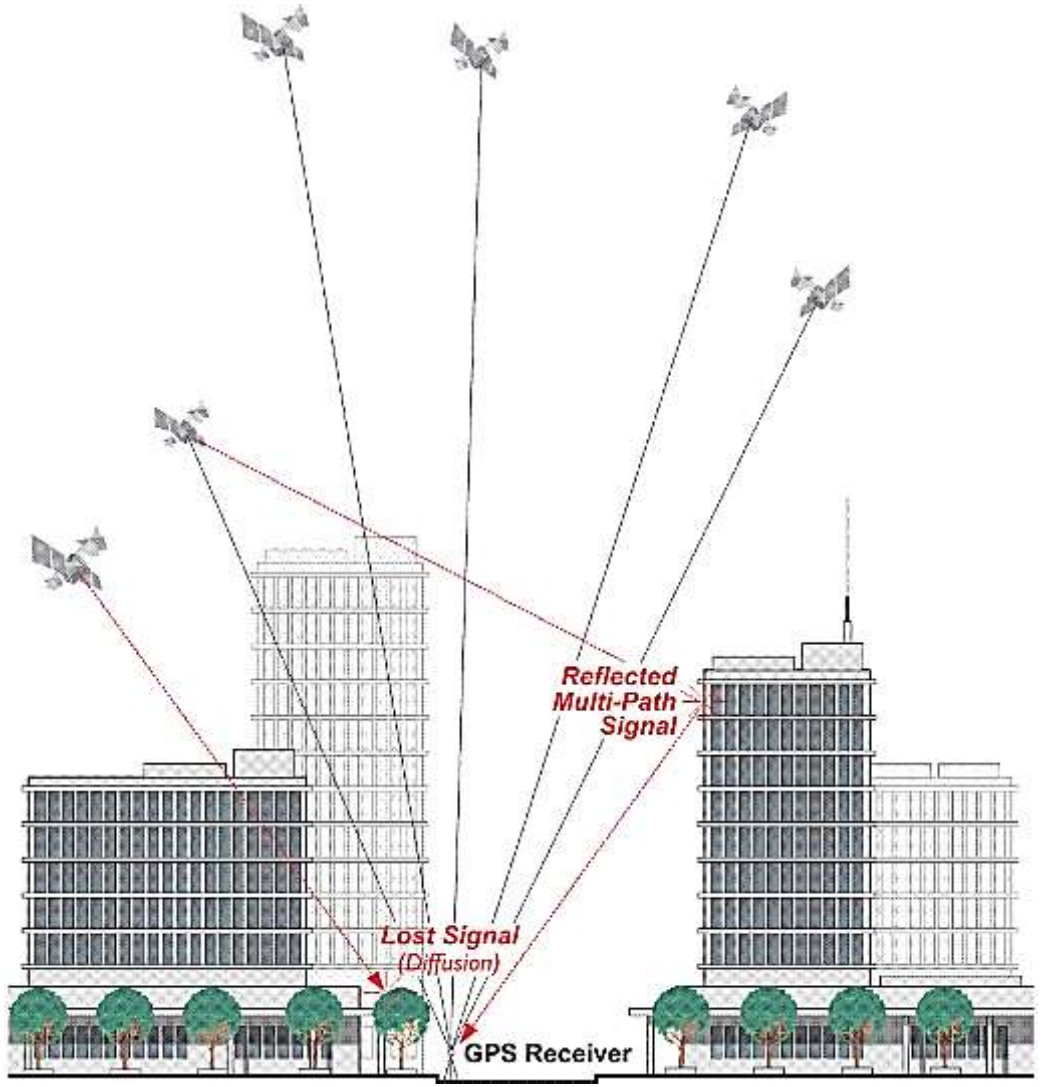
About OxTS

OxTS designs and manufactures precision Inertial Navigation Systems, combining the best of GNSS technology with custom built IMUs for robust positioning in a range of markets and applications.

- Experts in sensor fusion, positioning and navigation
- Founded 15+ years ago by two Oxford University graduates
- Based in Oxfordshire, UK
- In-house manufacturing and calibration facilities
- 900+ customers in over 40 countries
- World class products, service, and support

Problems with standalone GNSS

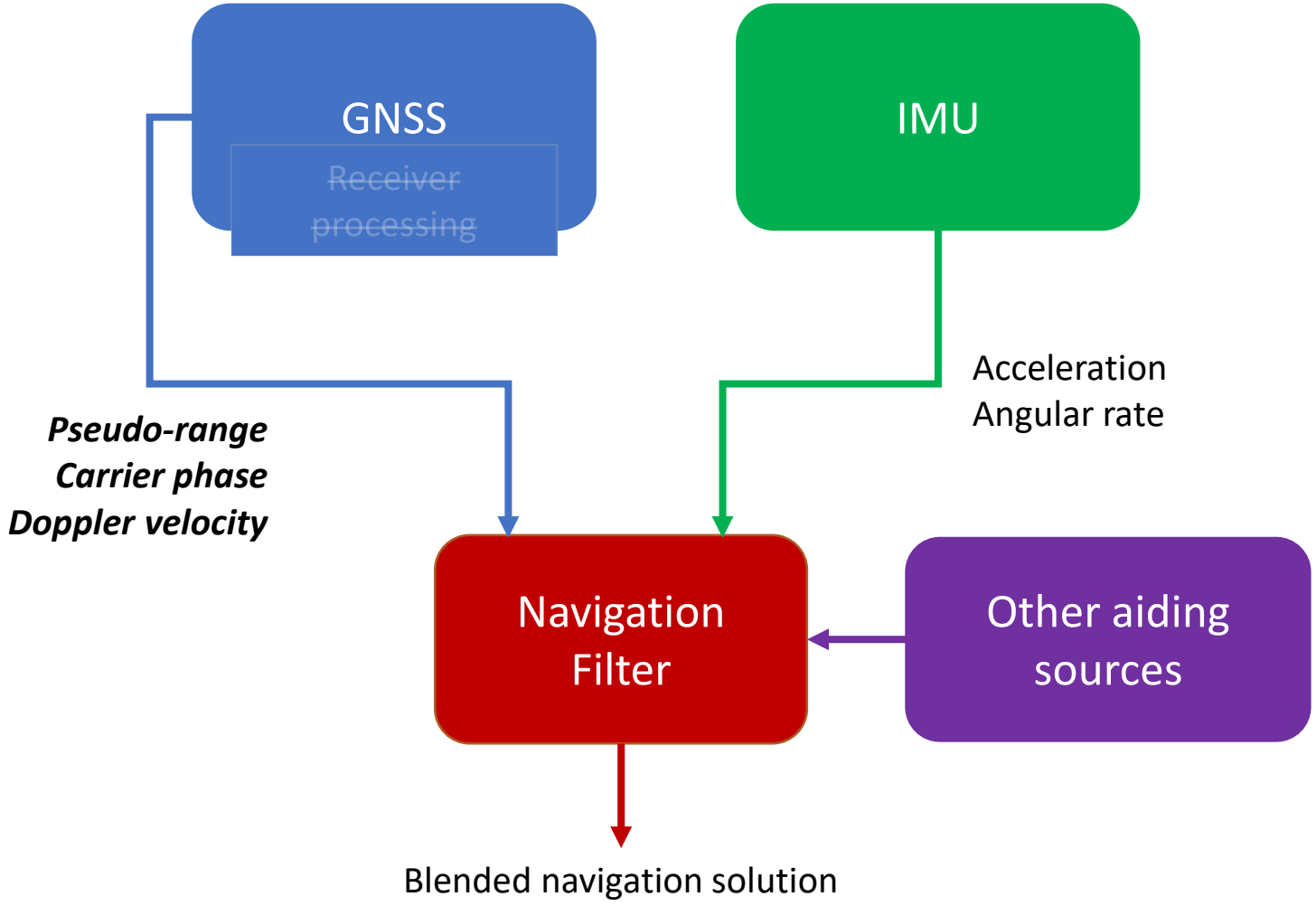
- Works fine in open sky
- Susceptible to obstructions
- Urban canyons, vegetation, bridges, tunnels etc. block or reflect signals
- Poor signals degrade performance
- <4 satellites in view loses solution completely



The OxTS algorithm: gx/ix™

Tight coupling

- gx/ix™ ignores GNSS solution and uses raw observables
- Each satellite in view individually integrated into solution
- Solution still updated when <4 satellites in view



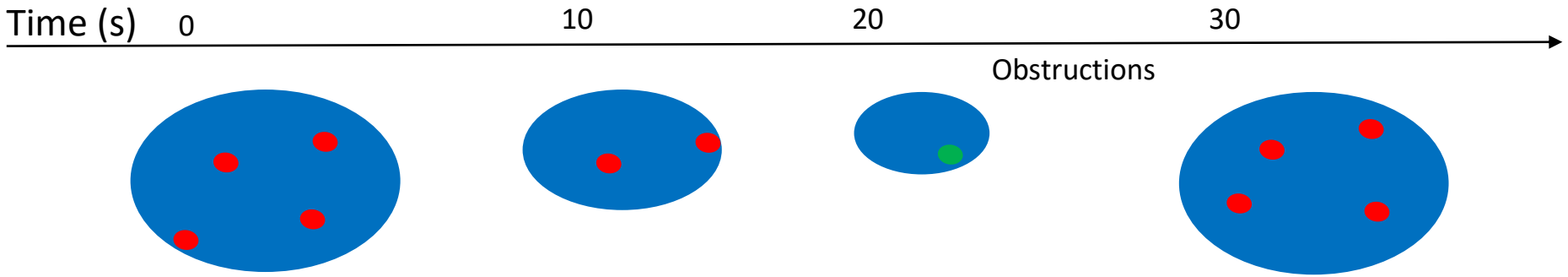
Receiver mode

gx/ix real-time

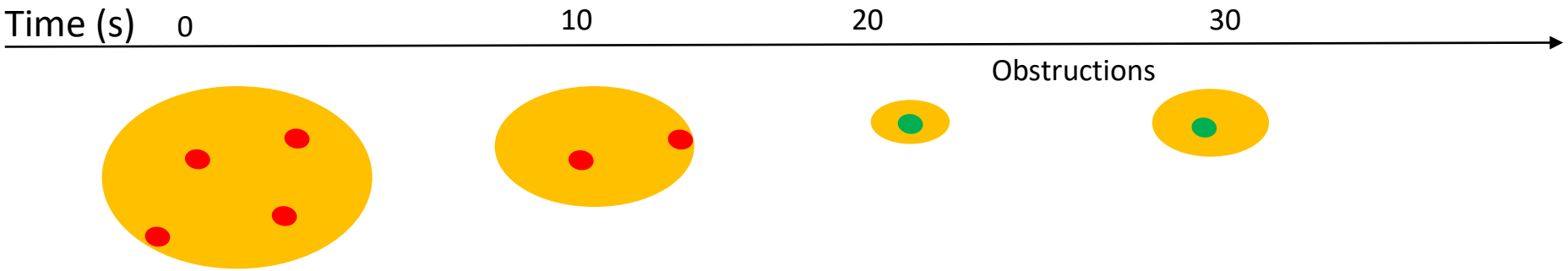
gx/ix post-processed

RTK and inertial relock

- With normal RTK, when signal is lost ambiguity search restarts from scratch



- With ix processing, solution is constrained by inertial measurements



Looking to new applications

- Code is generic
  - IMU at the core of the Navigation Engine
    - Not reliant on GNSS
    - Indoor solutions possible

- Current applications:
  - Surveying
  - Vehicle dynamics
    - Chassis development
  - Automotive active safety testing
    - Benchmarking external sensors

Summary

- OxTS gx/ix™:
  - Tightly-coupled IMU + GNSS
  - Not reliant on GNSS
  - Fast solution re-lock

- OxTS:
  - Experience in a range of markets, especially automotive
  - Experts in sensor fusion, positioning, orientation and motion
  - Looking for new Inertial Navigation applications

Harrison Coley, OxTS applications team:
applications@oxts.com