Networking conference for NEFP

Session Parallell 1 – UAV-development
2021-04-15 11.00-12.00

David Gundlegård, Assistant Professor in Division of Communication and Transport Systems at LiU

*The presentations in the session will be **recorded** and presentations will be accessible after the conference*

Hålltider UAV-utveckling

- 11.00-11.10: David Gundlegård (LiU) – Välkommen/Introduktion till projektet RASP

- 11.10-11.25: Lars Grantinger och Jennie Larsson (SjöV) - Två projekt från Sjöfartsverket: Terrängpejlen & SAR UAS

- 11.25-11.35: Fredrik Gustafsson (LiU) – Radiospaning med Recco och BLE

- 11.35-11.45: Rickard Henningsson (Polisflyget) - UAV inom Polisen

- 11.45-11.50: Hans Hedin (SRD): Lägesbild och AI i samband med EFP

- 11.50-12.00: Frågor/diskussion med presentatörer och Håkan Nilsson-Ranta, drönarpilot från Missing People

Radio surveillance for search of missing persons (RASP)

Radiospaning för eftersök av saknade personer

NEFP

2021-04-15

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RASP - Project overview

- Funded by Vinnova
  - 1.1 MSEK from 2020-12-01 until 2021-11-30
- Demonstration of drone based radio surveillance for SAR support
  - Lightweight sensing platform
  - Software for localization, route planning and visualization
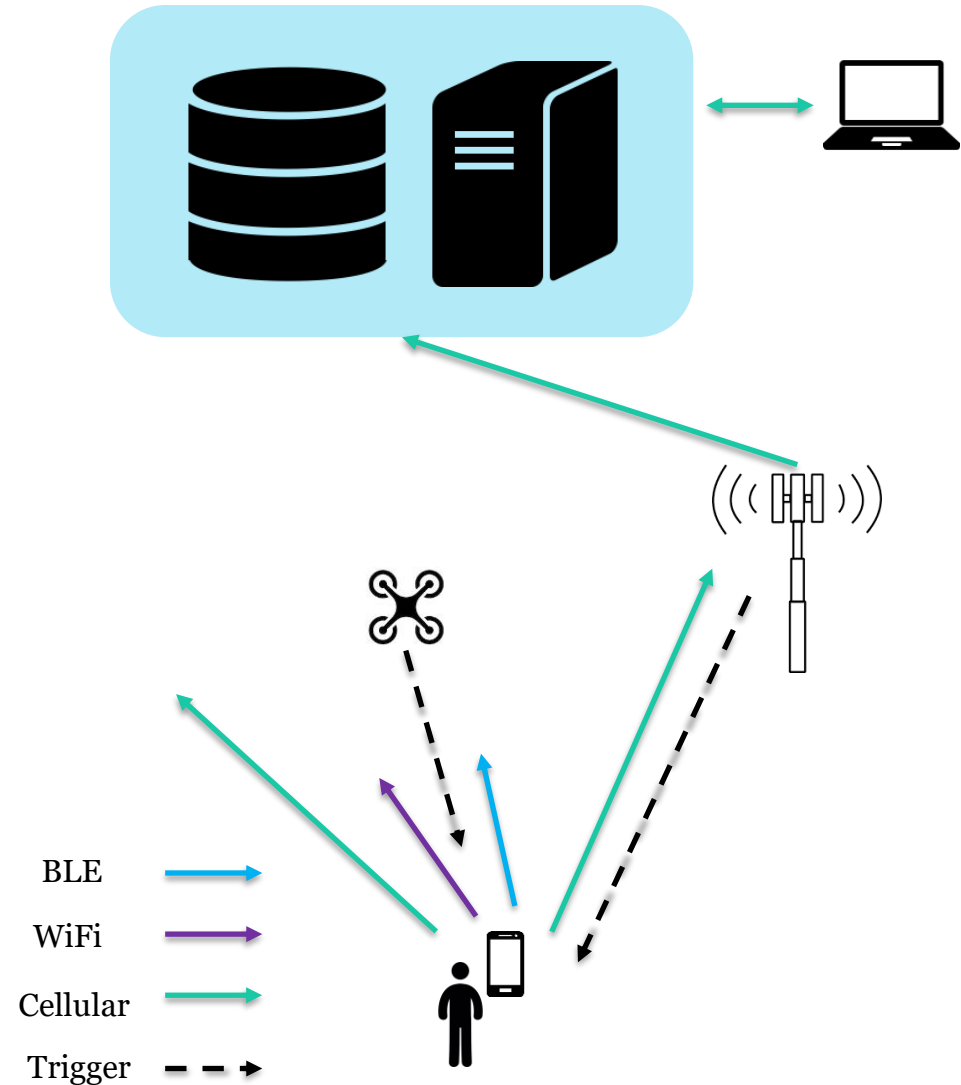 - First live demonstration in October

Project objectives

- Long-term
  - Drone-based radio surveillance research platform for localization and route planning

- Demonstration
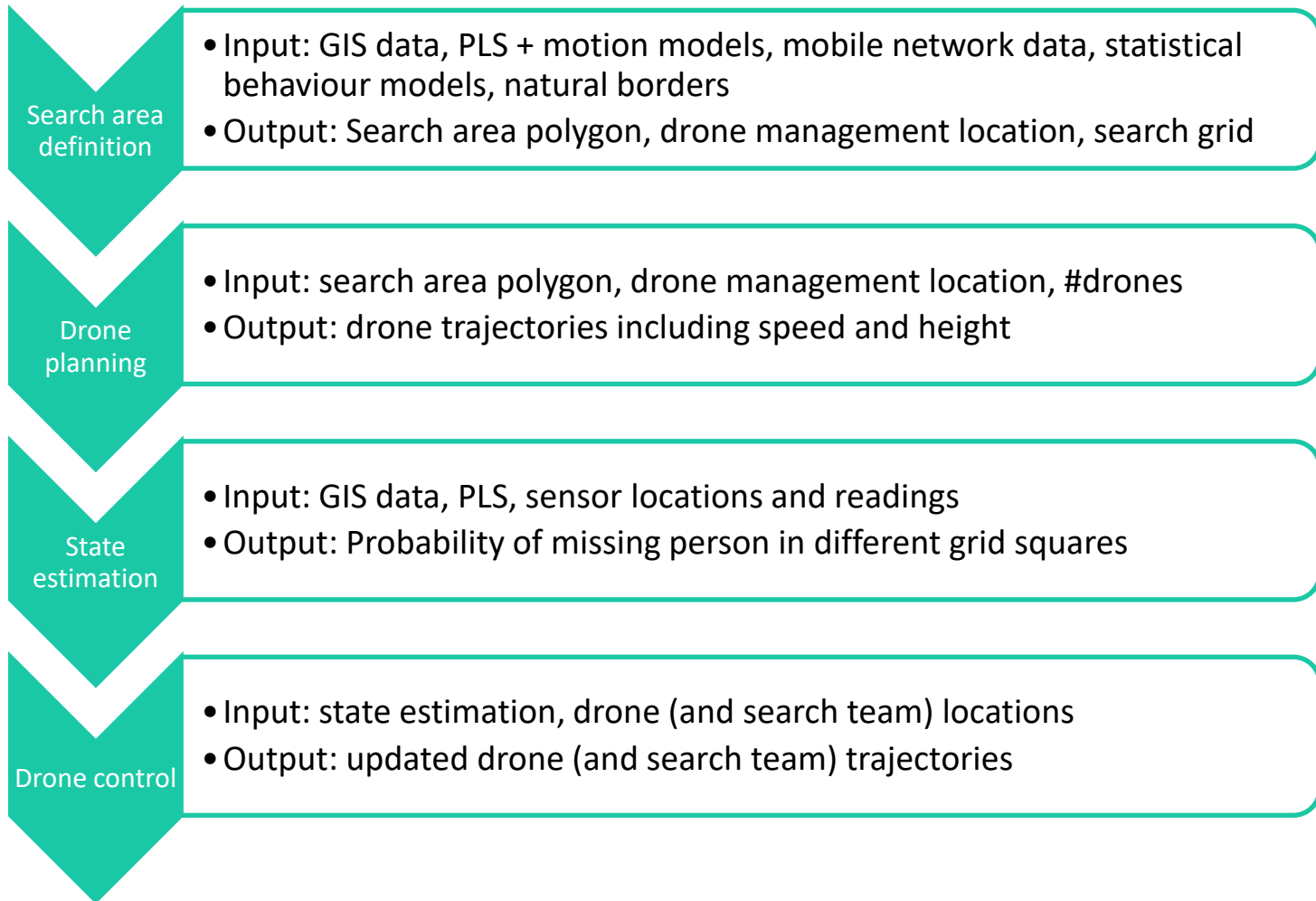 - Drone-based sensing of oppurtunistic WiFi-signals for SAR support

SAR/EFP sensing

- **Mobile phones**
  - **Cellular**
  - **WiFi**
  - Bluetooth
- Image processing
  - Video
  - Heat camera
- Other
  - Emergency transponders
  - Radar
 - Recco
  - …

BLE

WiFi

Cellular

Trigger

System overview

Search area definition
- Input: GIS data, PLS + motion models, mobile network data, statistical behaviour models, natural borders
- Output: Search area polygon, drone management location, search grid

Drone planning
- Input: search area polygon, drone management location, #drones
- Output: drone trajectories including speed and height

State estimation
- Input: GIS data, PLS, sensor locations and readings
- Output: Probability of missing person in different grid squares

Drone control
- Input: state estimation, drone (and search team) locations
- Output: updated drone (and search team) trajectories

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Hardware

- WiFi scanning currently implemented in two devices

  – Raspberry Pi 3B+

  – Raspberry Pi Zero W

- Multiple devices with directional antennas

- 4G communication

- GPS + IMU localization
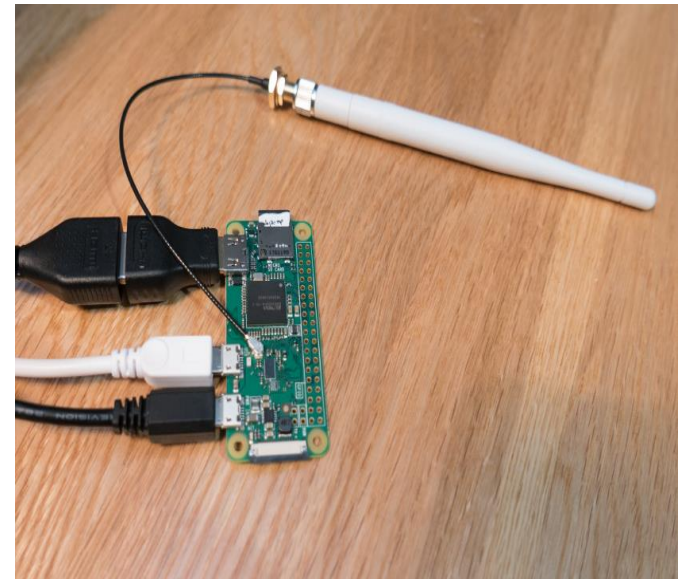
Localization

- Point last seen + motion model
  - Time causes uncertainty
- Mobile network data (from operator)
  - Connected antenna
  - RSS and neighbour antennas
- WiFi probe request scanners
  - RSS-based lateration
  - Direction data?


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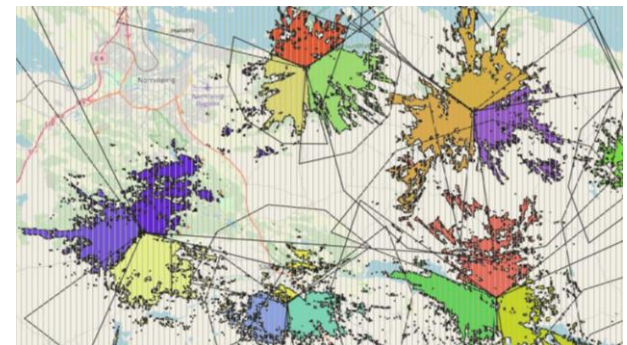
Initial results - WiFi scanning

- WiFi probe requests
  - Transmitted by phones to quickly detect WiFi networks
  - Literature
    - Minute-level resolution (depends on OS, phone state, saved networks etc.)
    - Several hundred meter range
  - Experiments
    - Large variation in transmission interval
    - ~100 m range -> better antennas
    - MAC randomization from Android 6 and Iphone 5 causes association problem

Initial results - Drone planning

- Simulation of WiFi probe scanning for drone planning and localization
  - Exploration VS exploitation
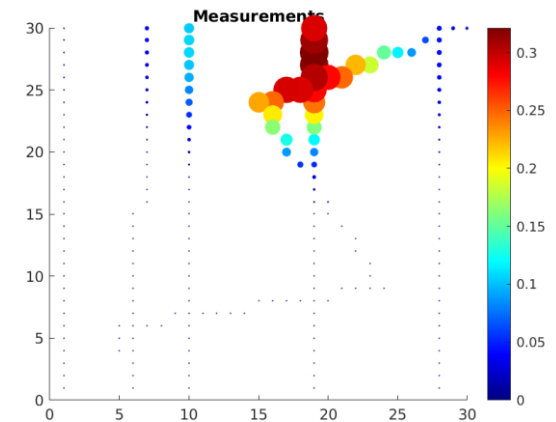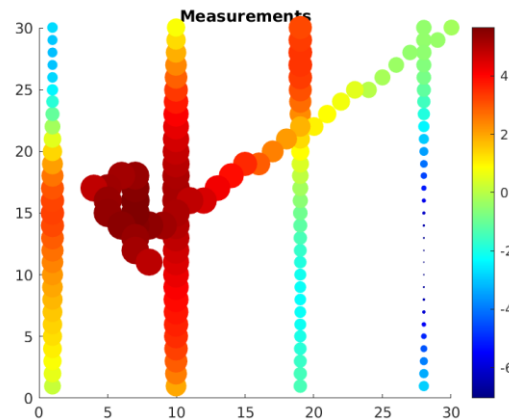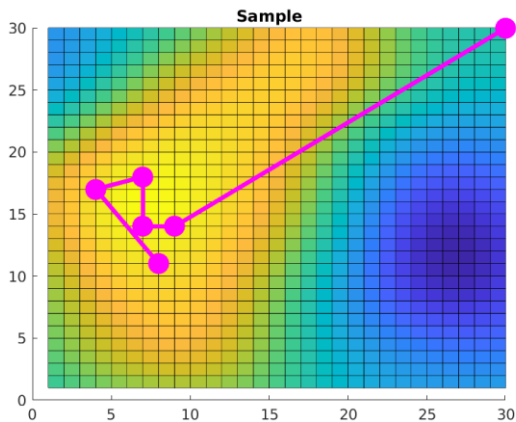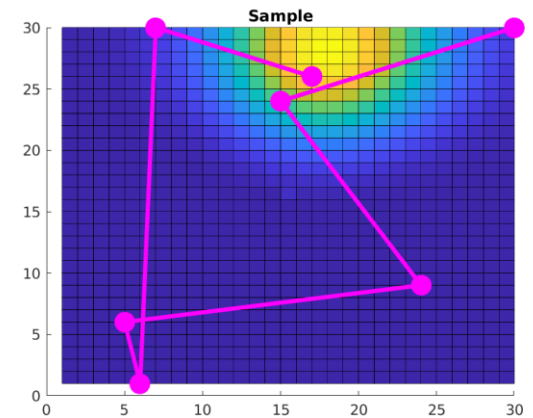
Coming activities

- Test of mobile WiFi-scanner

- Drone-based experiments

- Sensing platform for estimating spatiotemporal footprint of WiFi probe request signals

- First version of combined drone planning and localization software

- User workshop

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Questions?

RASP