



DEPARTMENT OF AEROSPACE ENGINEERING
Navigation & Electronic System Lab

Smartphone-based SNU NESL PDR for Real Time Indoor Navigation

IPIN competition, track 1, Sep. 21st, 2017

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SNU NESL Introduction

■ Research interests

- Micro/nano satellite
- INS/GPS integrated navigation system
- Estimation theory (EKF, UKF, PF, PMF, etc.)
- Vision-aided navigation system
- MEMS-based PNS (Personal Navigation System)

■ Previous works in PNS

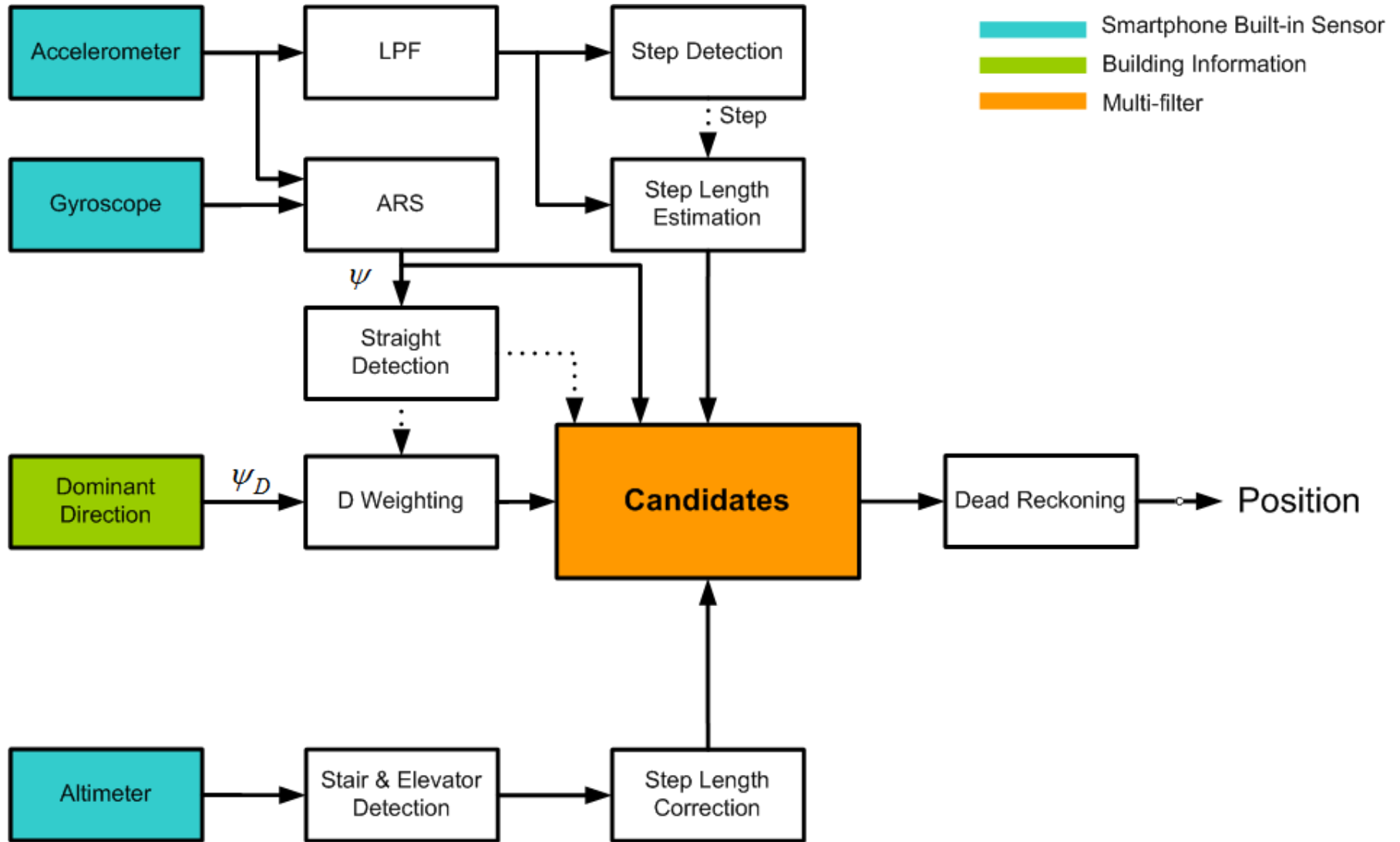
- PDR using portable devices
- Smartphone based indoor navigation
- Lower body motion capture system using multiple IMUs
- Foot-mounted indoor navigation for firefighters
- Map-aided PDR

■ Prize in foot-mounted PDR

- 1st prize(track 2) in IPIN 2015, 2016
- 2nd prize in Microsoft competition 2017



Basic Structures of SNU NESL PDR

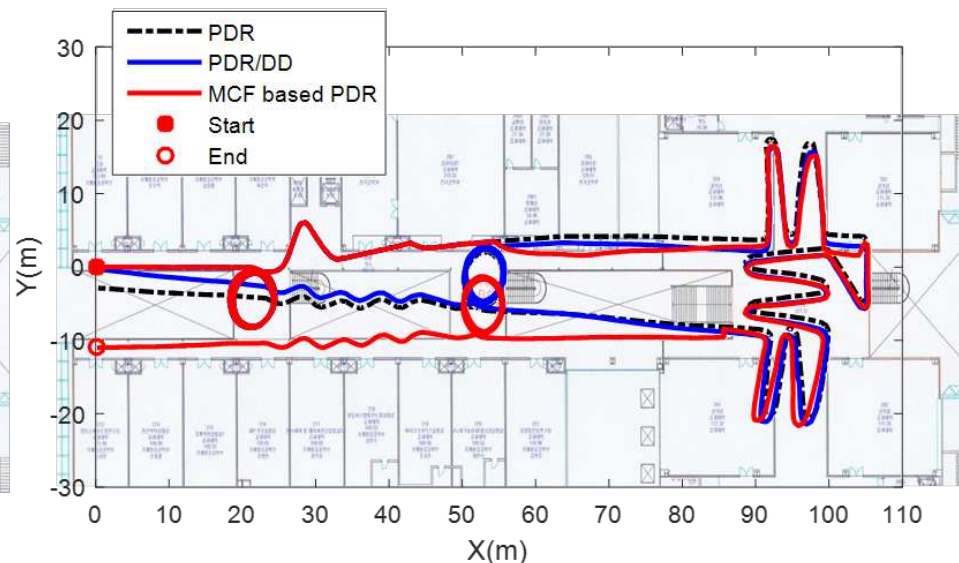
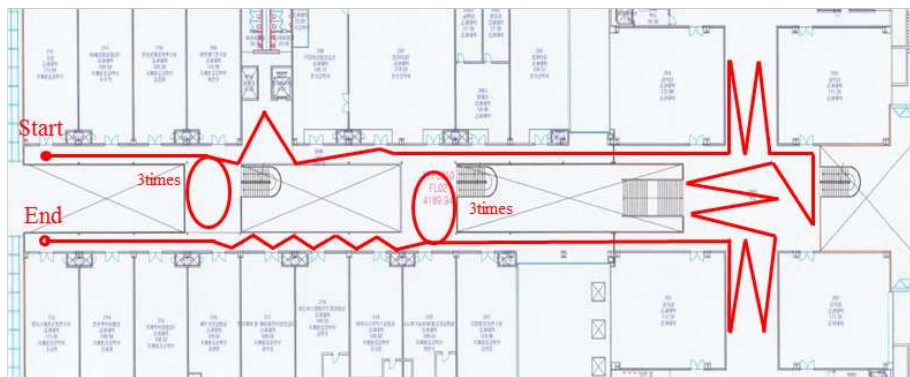


Experimental Results in SNU (Bldg. 301)

Test condition and results

- Device: Samsung Galaxy S6, 200Hz sampling rate
- Test distance and time: about 700m, 10 min.
- Position estimation of **multi-filter PDR** is better than those of PDR, PDR/DD (especially when **gyro bias** is wrongly estimated)

Methods	PDR	PDR/DD	Multi-filer PDR
Pos. Err [m]	9.907	11.18	4.06

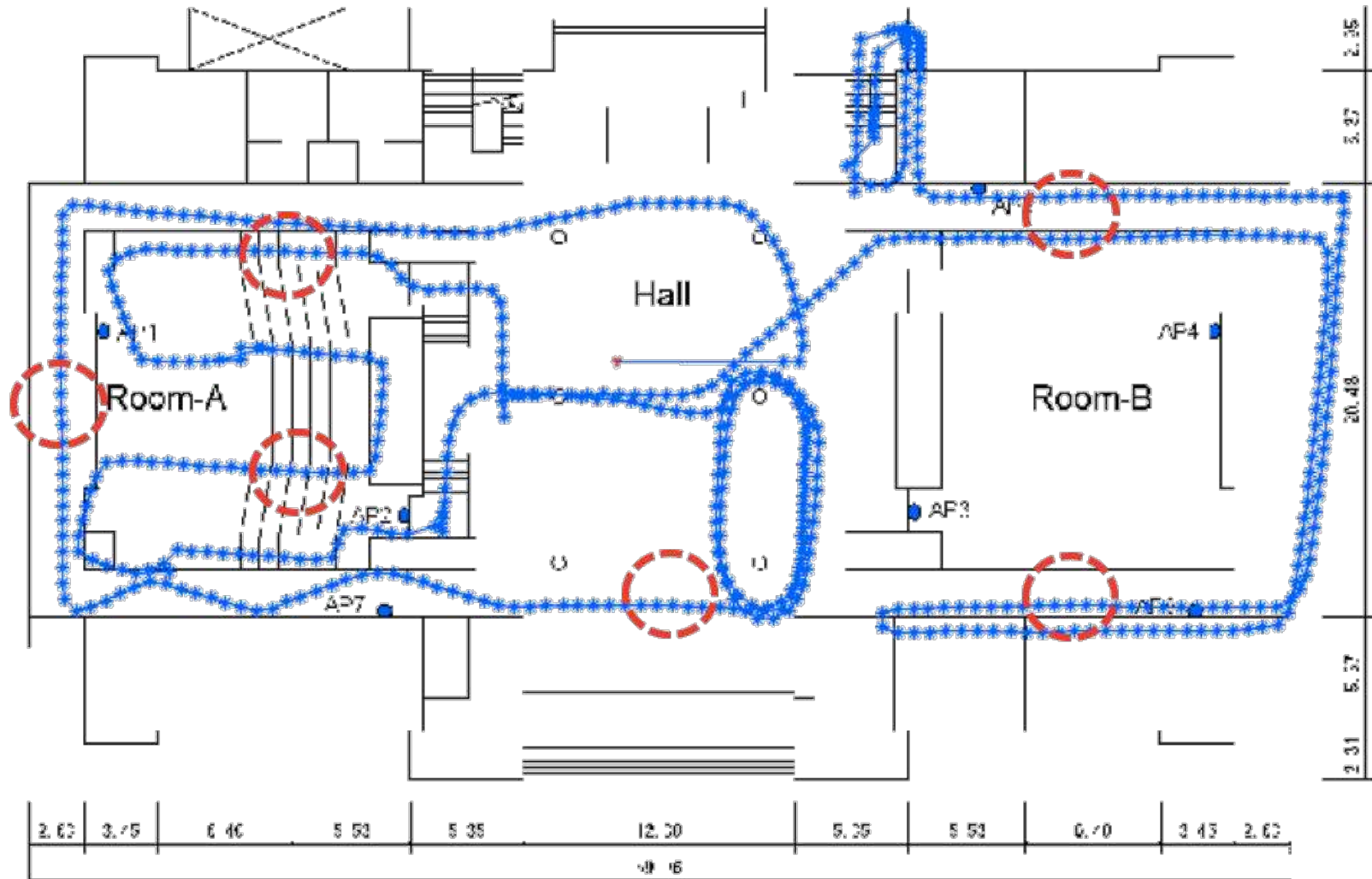


<True Trajectory (Left) and Estimated Position Result (Right) >

Experimental Results in Conference Hall

--- Dominant direction

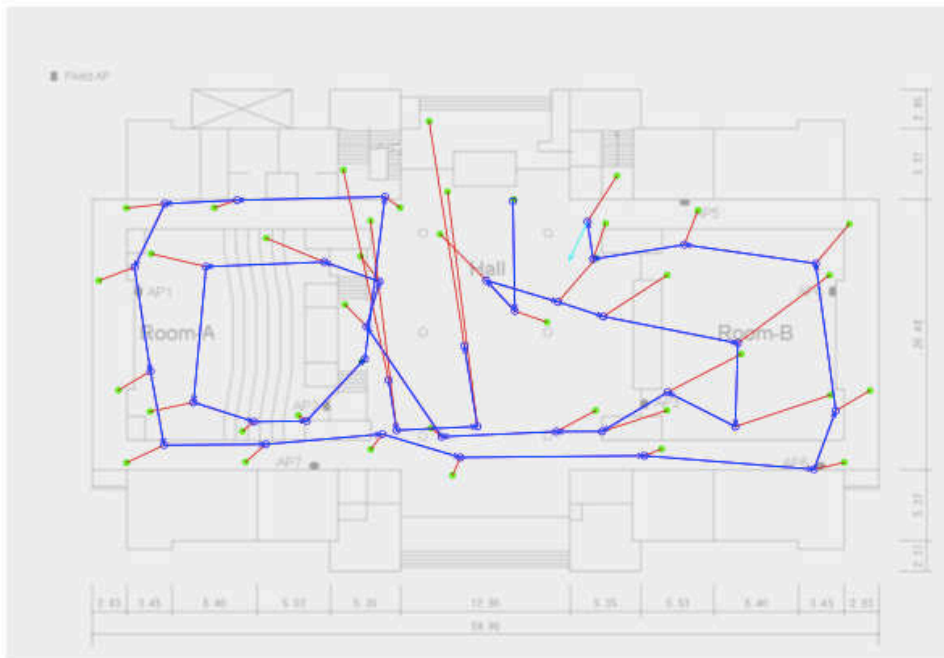
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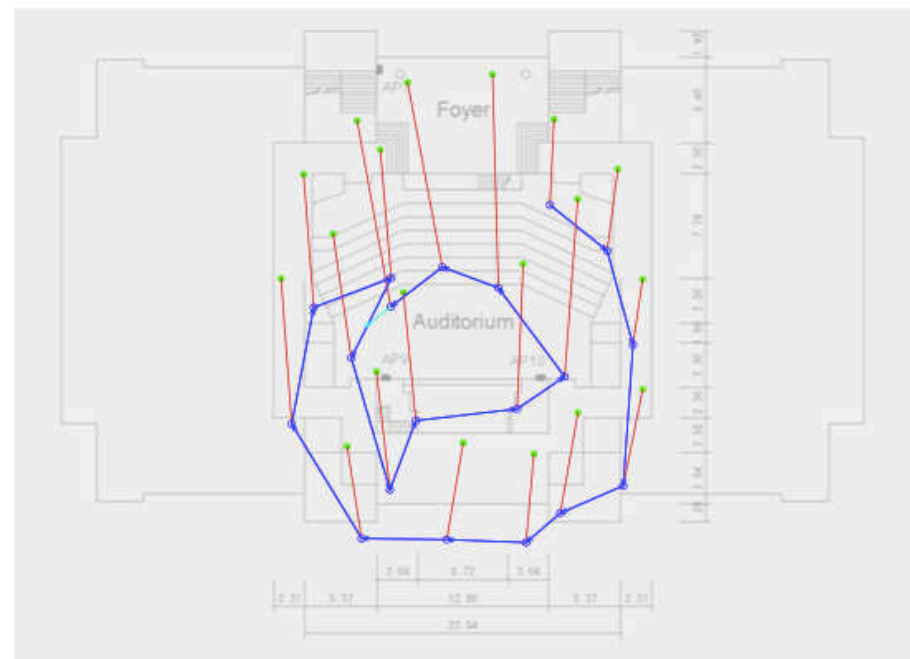
Competition Results in Conference Hall

- Errors in competition results
 - Step length is estimated **shorter than** the actual walk in ground floor.
 - Step length errors are accumulated in **slope, staircase in Room A, Auditorium.**
 - Mis-detected steps while sitting down with shake one's leg.
 - Mean error: 6.2m, median error: 4.9m, rms error: 4.7m

Ground floor



First floor



Thanks for your attention!

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