LED Based Indoor Navigation

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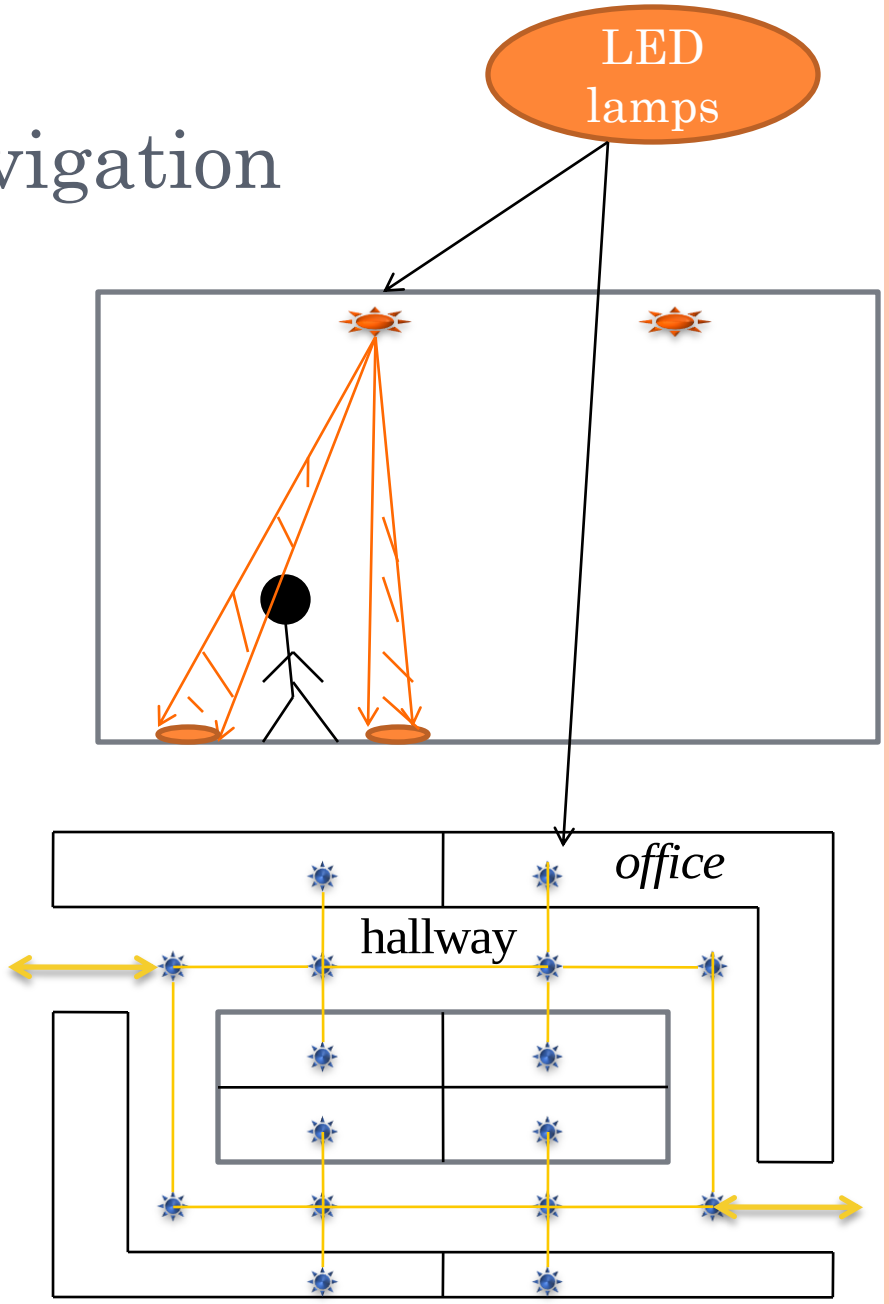
LED Based Indoor Navigation

- **Applications:**

- Automated vehicles for office functions
- Patient tracking in hospitals
- Indoor navigation for the visually impaired people
- Emergency guidance systems for people in the building
- Automated tour guides
- Profiling customers' habits or shopping assistance



Indoor Navigation Methods (1/2)

- Global Positioning Systems (GPS) cannot provide location information indoors or in many urban areas

- Localization indoors with cell phone signals is too inaccurate

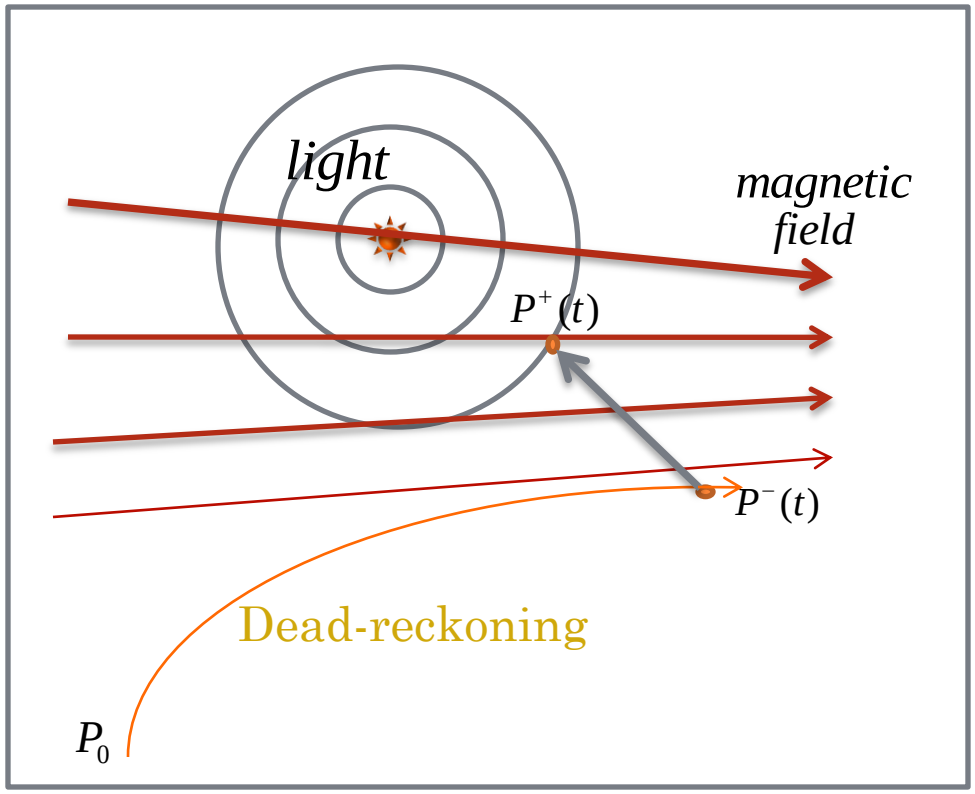
Method 1: Golding & Lesh

Aided Dead-reckoning:

- fluorescence (60 Hz Intensity)
- temperature
- magnetic field (strength, dir.)
- … …

using a Bayesian

probabilistic update method



Indoor Navigation Methods (2/2)

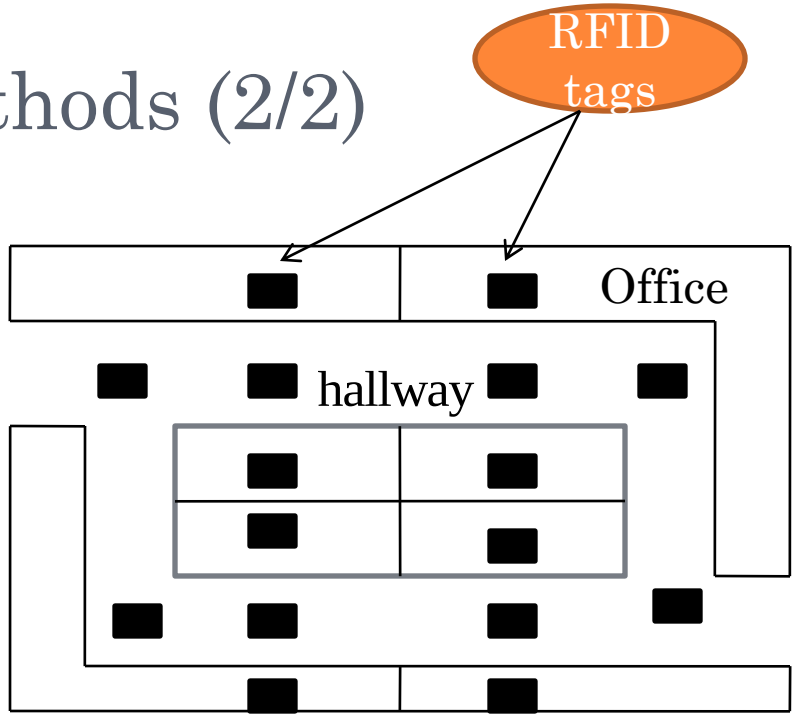
Method 2: Hahnel, Burgard, Fox, Fishkin, Philipose

Bayesian Reasoning:

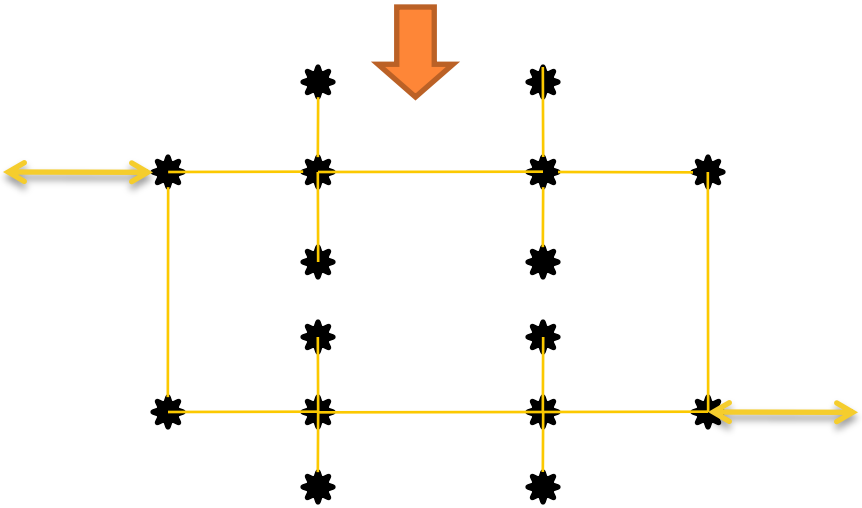
- topological map of the building
- RFID tags as landmarks

We know:

- The position of RFID tags
- Markov model that describes the likelihood of detecting an RFID tag given its location relative to the antennas.



Geographic map of the building



Topological map of the building

Pros and Cons

- The fluorescent lighting in Method 1 and RFID tags in Method 2 can be replaced by LED's.

Fluorescence	**RFID tag**	**LED**
--- No code	Coded ID	Coded ID
--- Active	Passive	Active
--- Local	Local	Local
--- Not directional	Not directional	Directional
--- Multipurpose	Single purpose	Multipurpose
----------	----------	Velocity

Physical Questions

- What is the effective range of LED's?
- What is the effective angle and width of the LED light beam? Can individual beams (or group beams) be detected?
- What is the switch rate, code rate and data rate for LED's?
- What is Interference from other LED lamps and natural light?
  - Coding, frequency selectivity
- How can we deal with the areas that LED light cannot cover?
- … …

THANKS!