

Diplomové práce - ponuka

Miroslav Opiela

16.10.2025

P01?





M Sciences

SCIENCES Vidéos Archéologie Astronomie Biologie Cerveau Géophysique Les défis de la science

ÉDITION
ABONNÉS

S'orienter là où le GPS est aveugle

Une compétition a mis aux prises des prototypes de navigation « indoor ».

LE MONDE | 03.10.2018 à 06h00 |

Par David Larousserie

Abonnez vous à partir de 1 €

Réagir ★ Ajouter



f Partager (6)

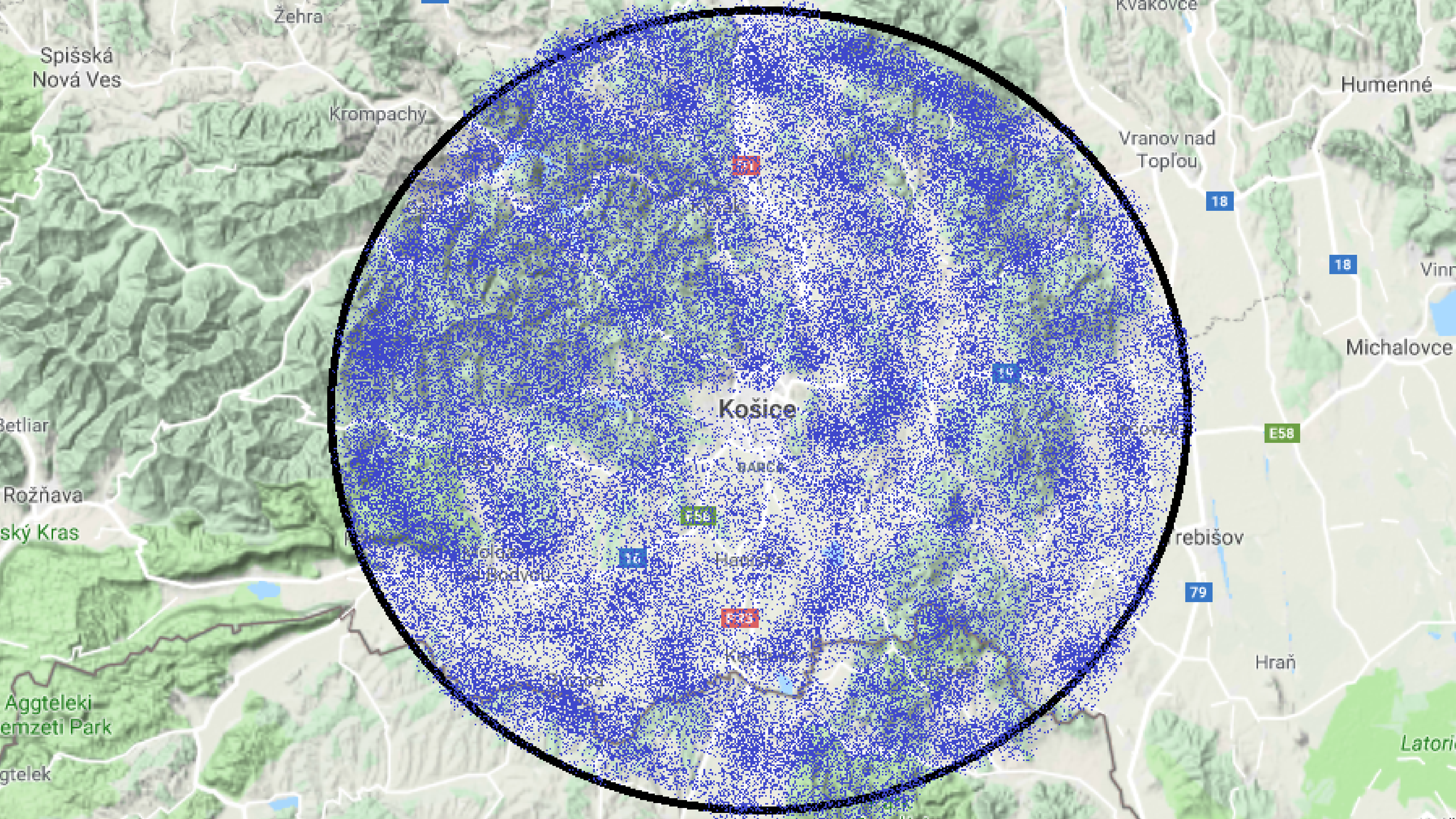
Tweeter

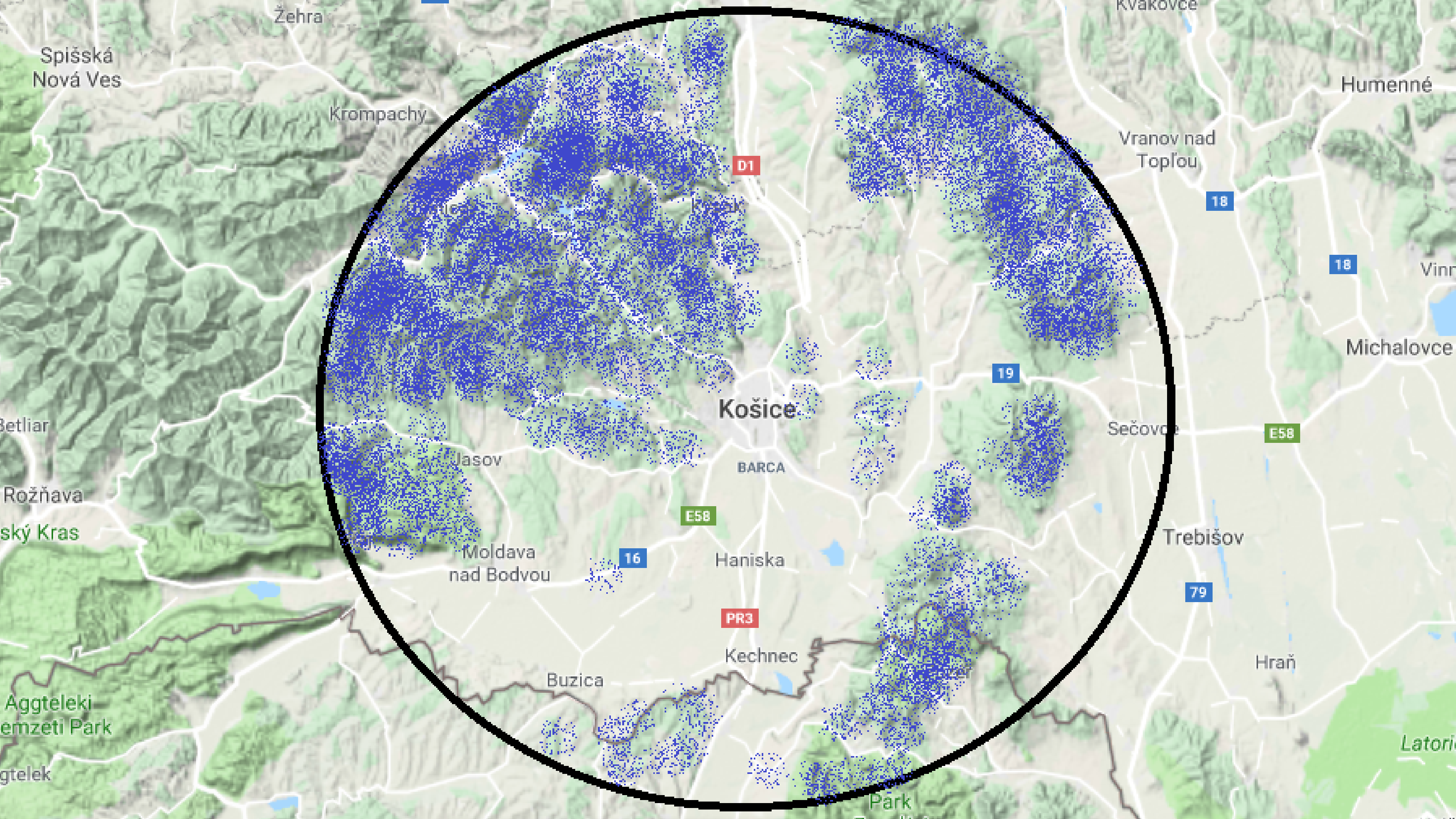


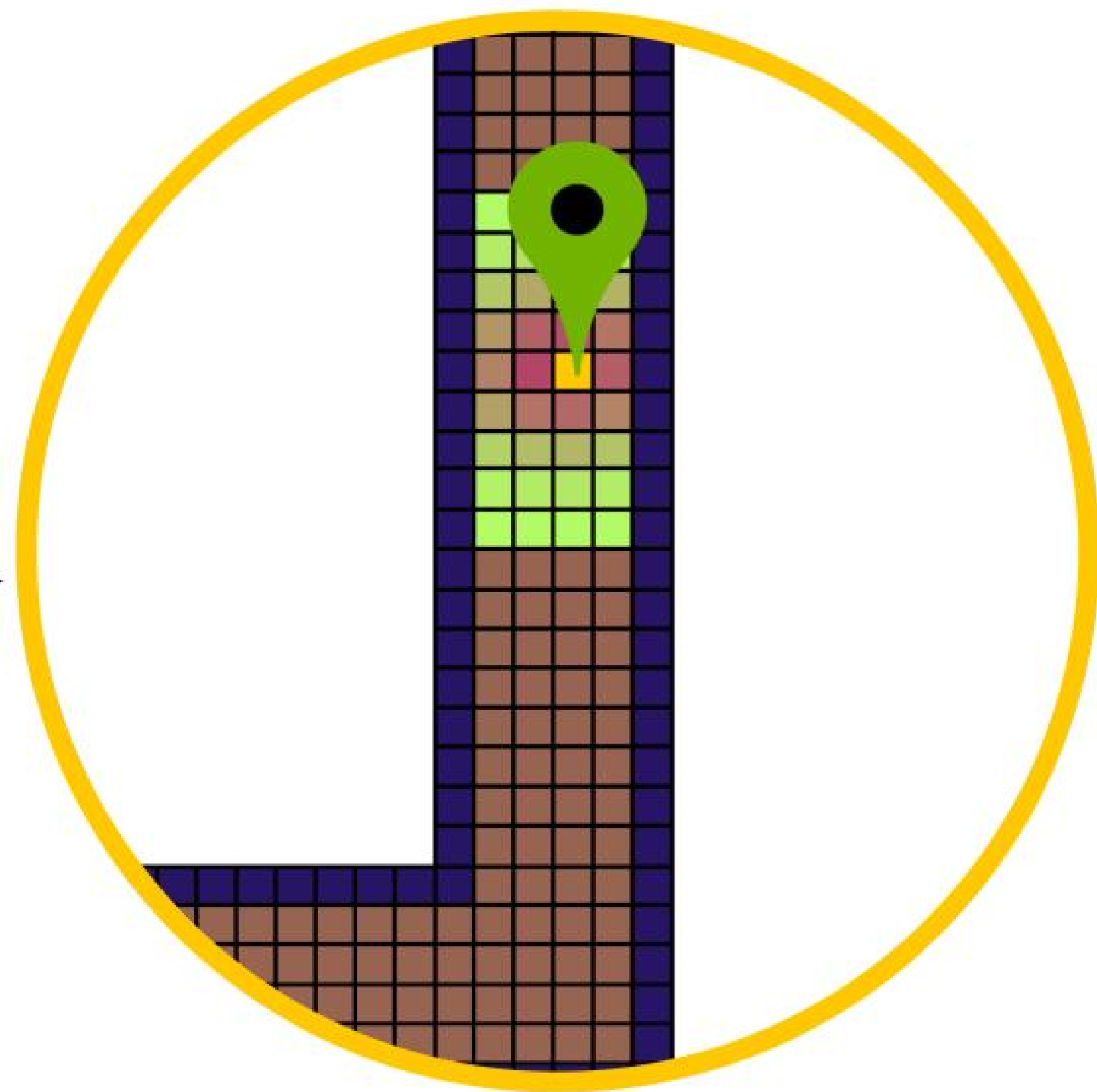
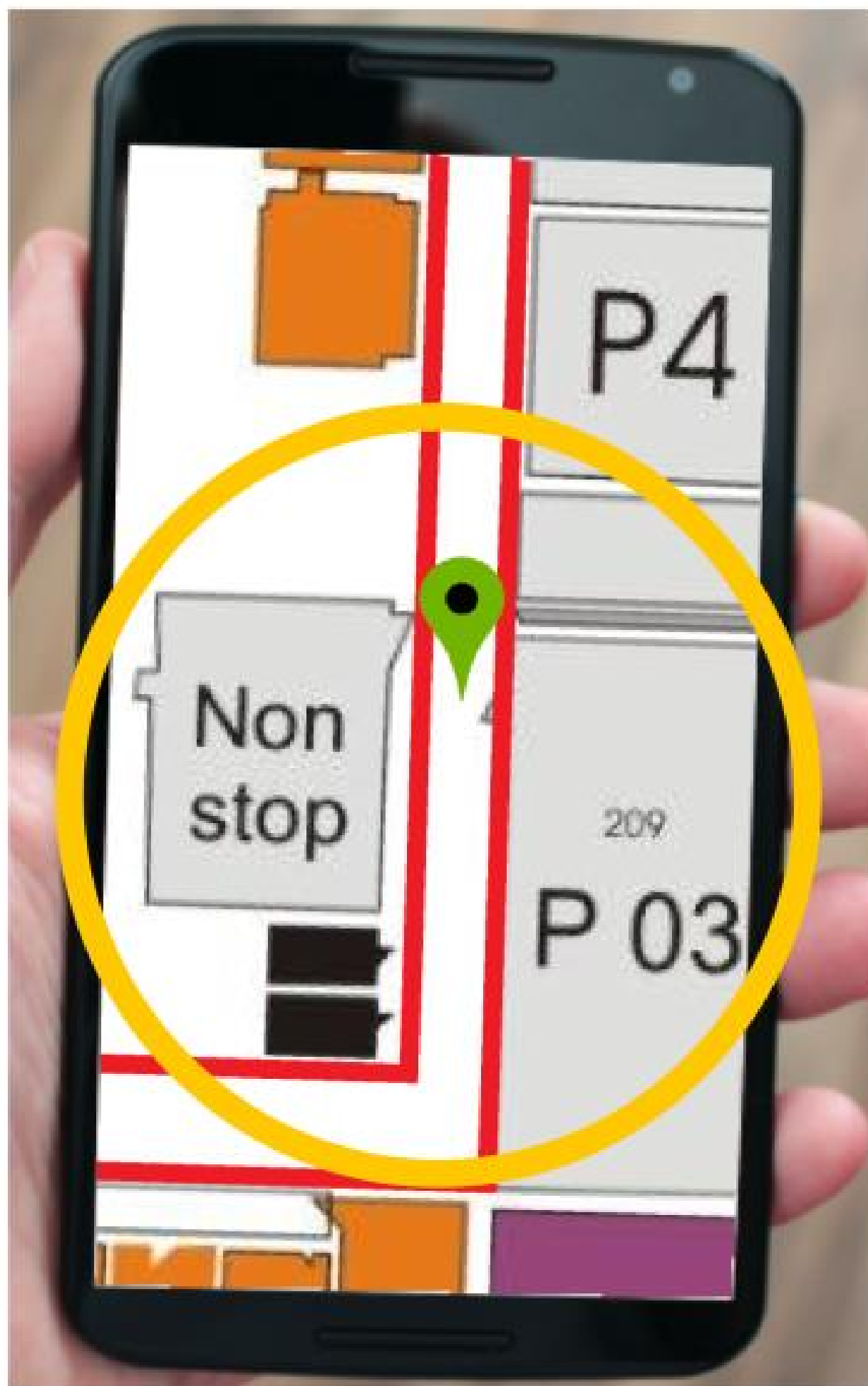
Les clients du centre commercial Atlantis de Nantes ont assisté, samedi 22 septembre, à une étrange première mondiale. Des jeunes en tee-shirt bleu

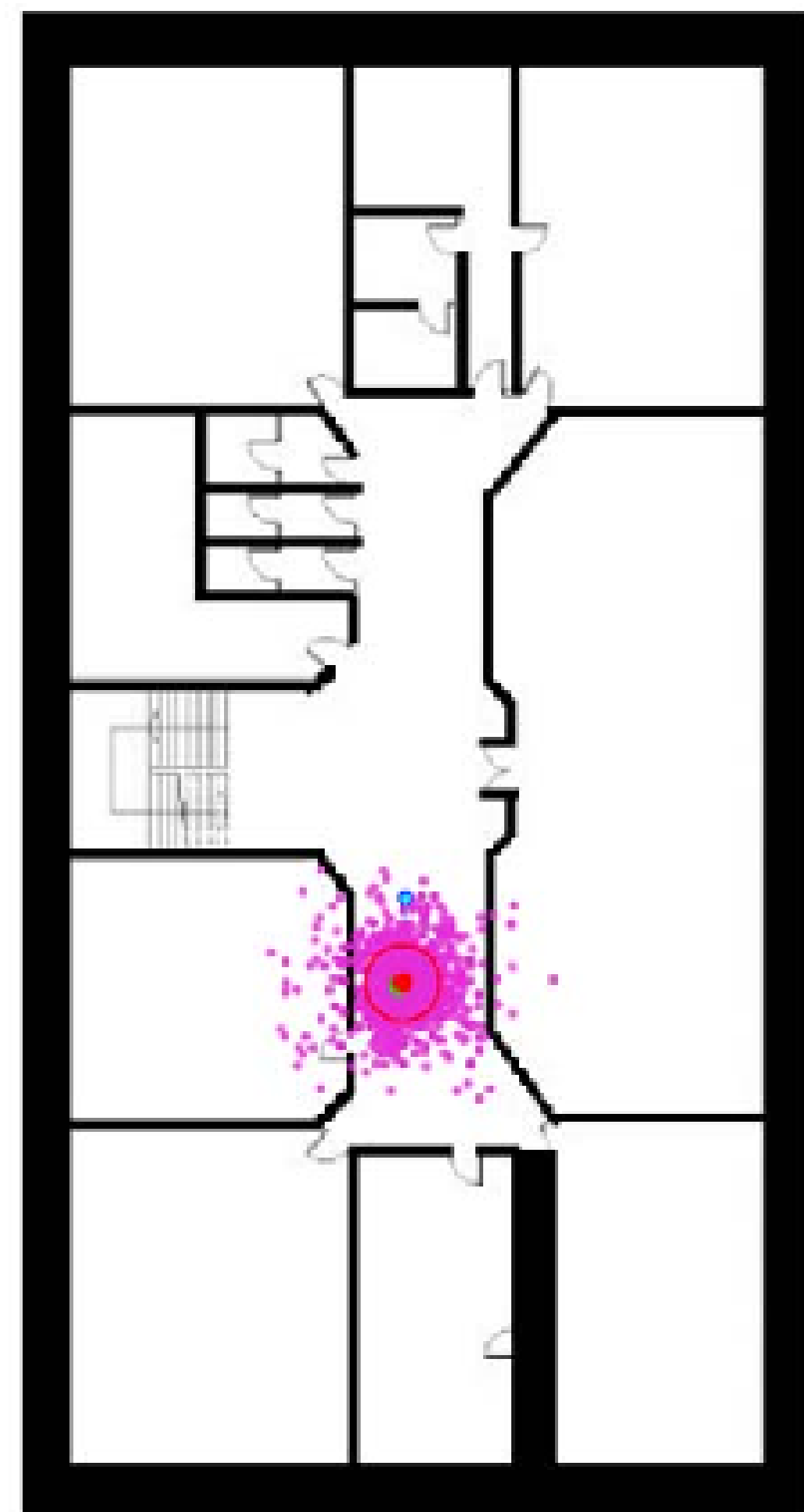
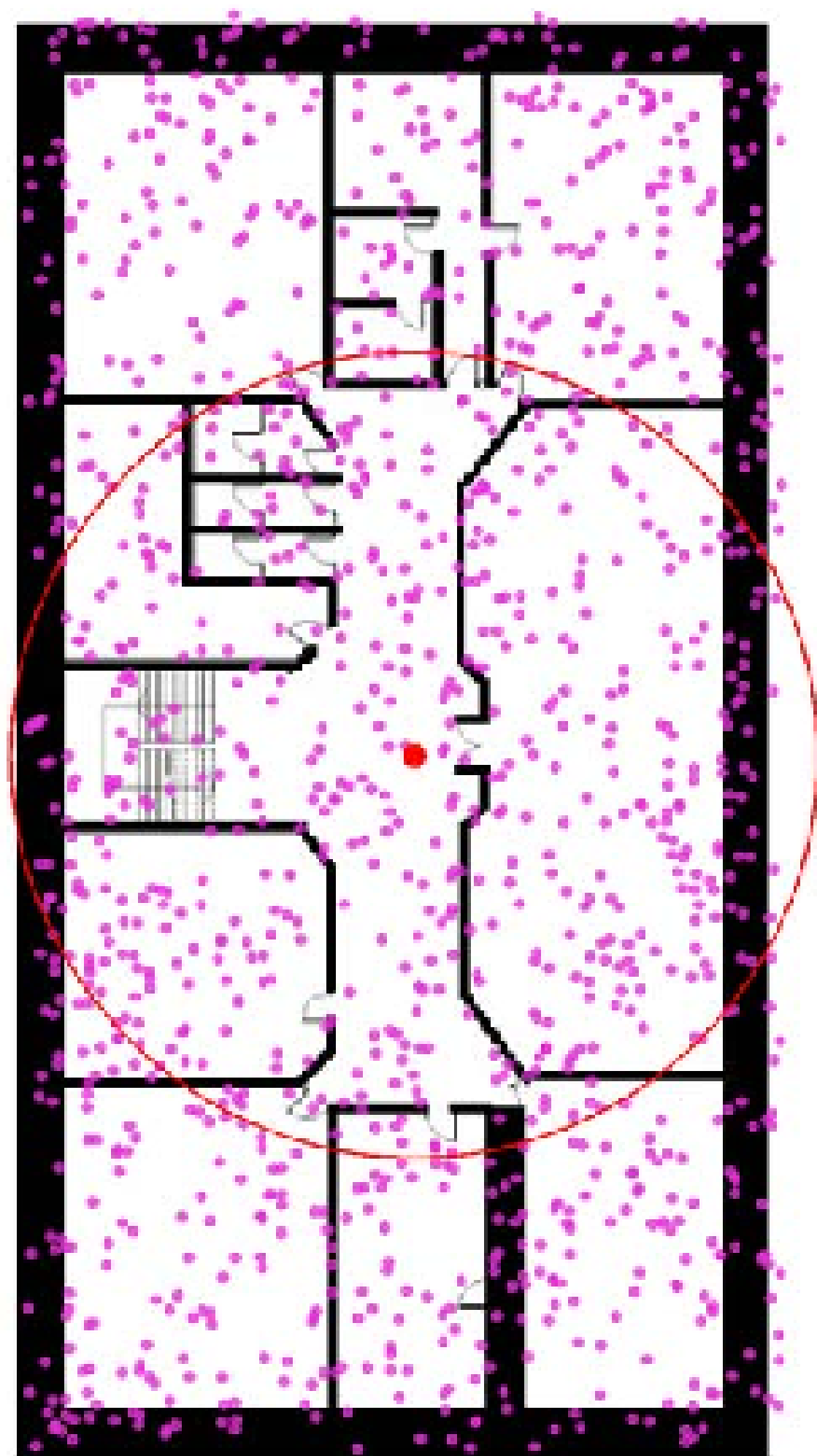
Bayesian filtering

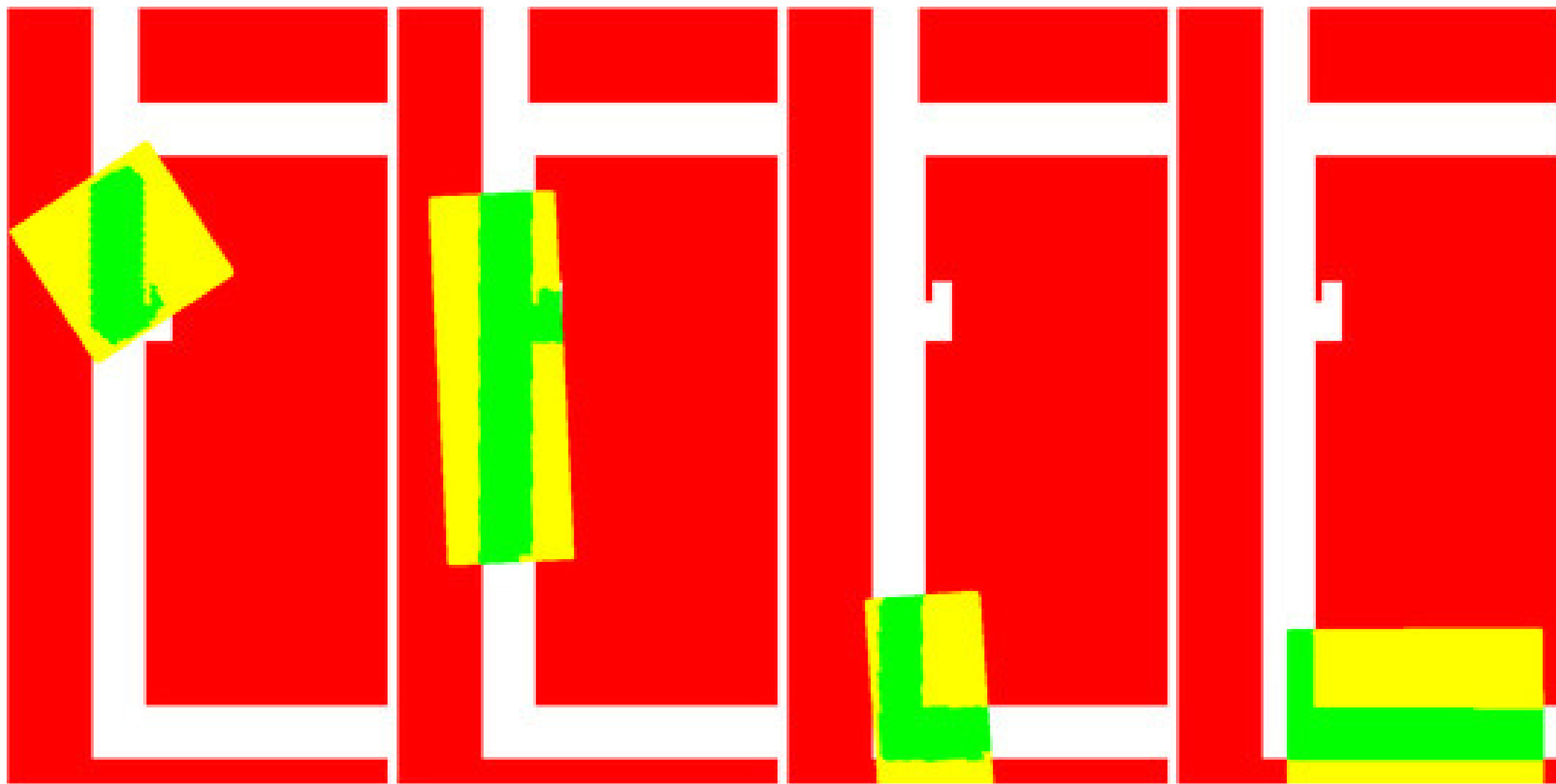


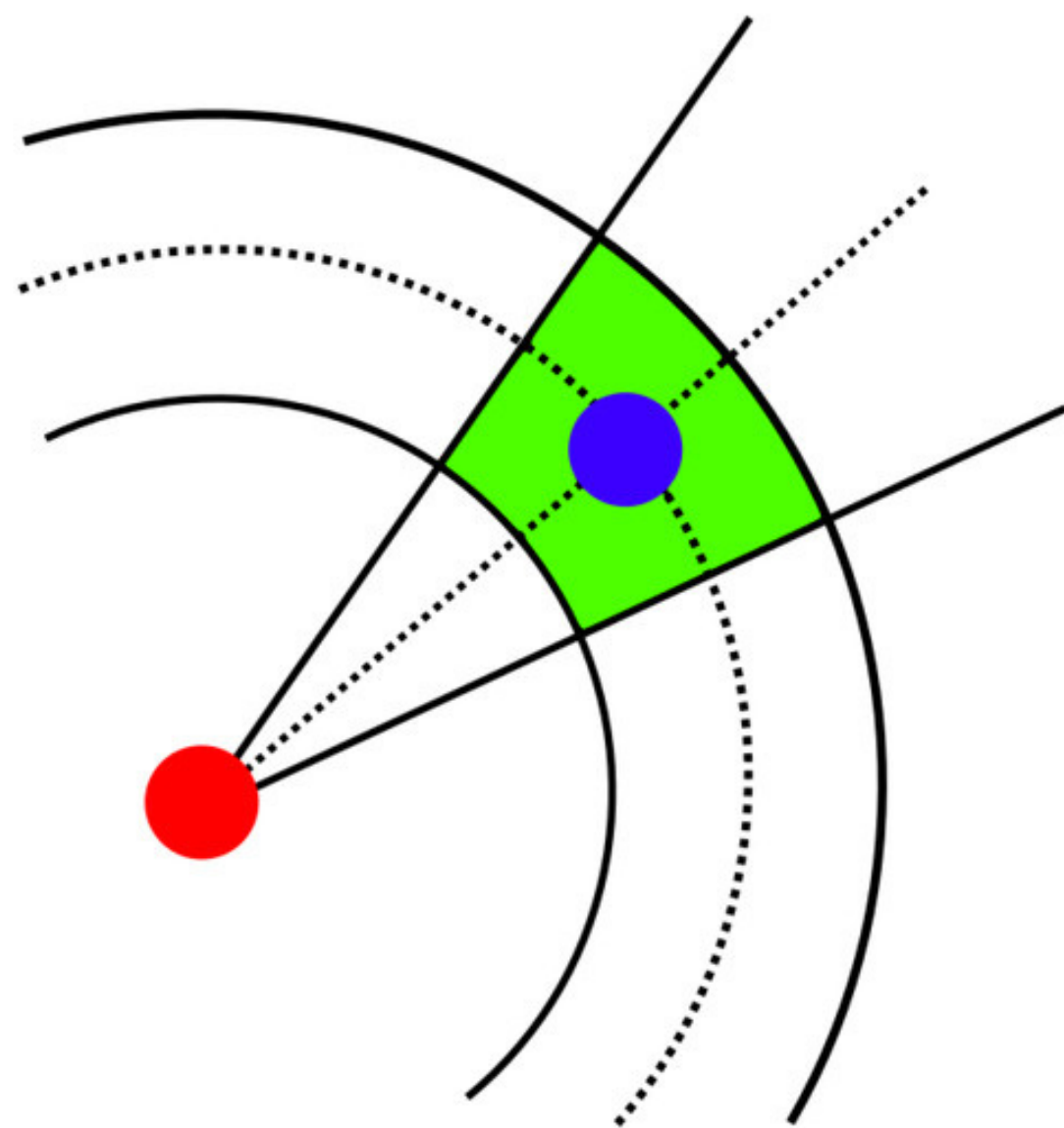


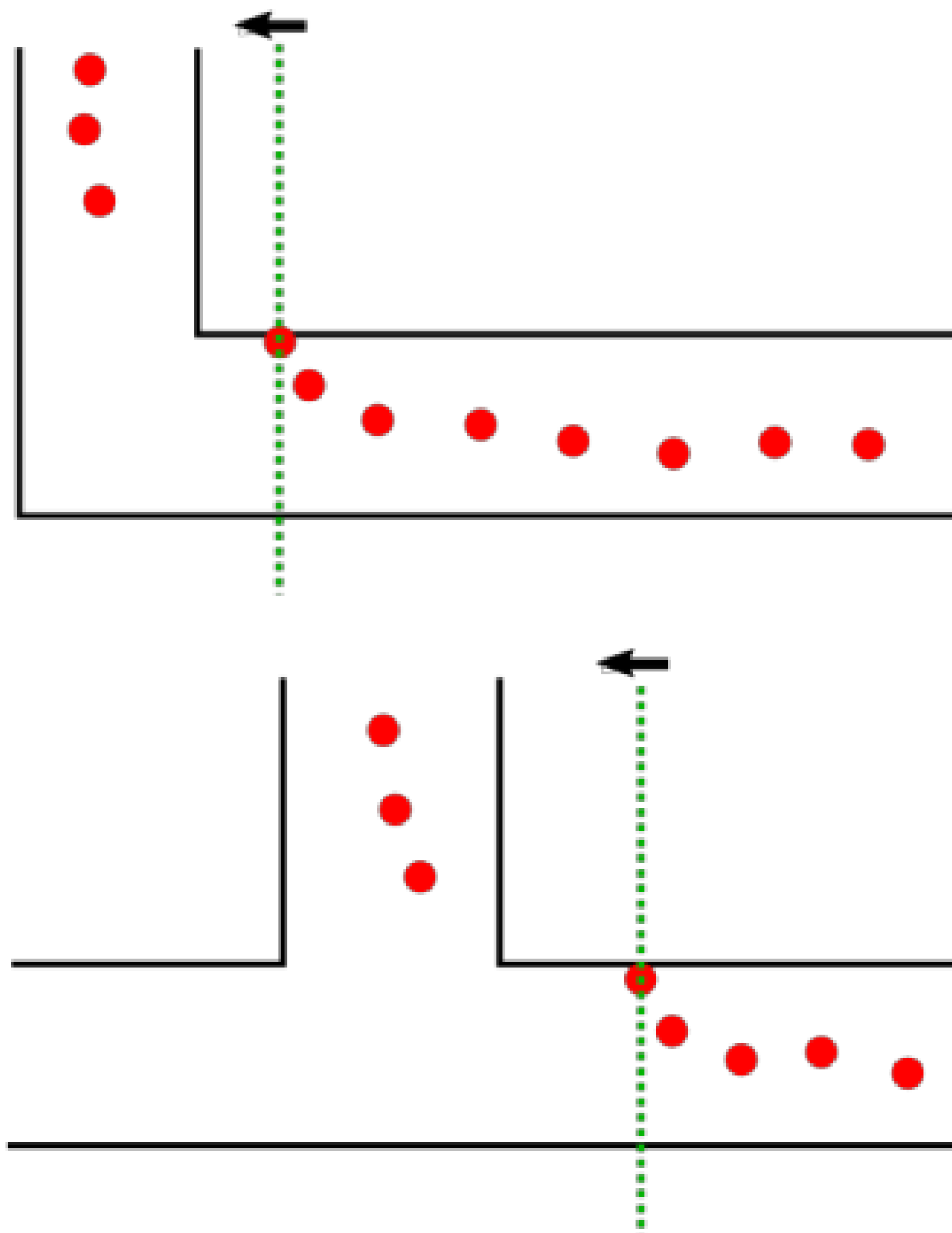
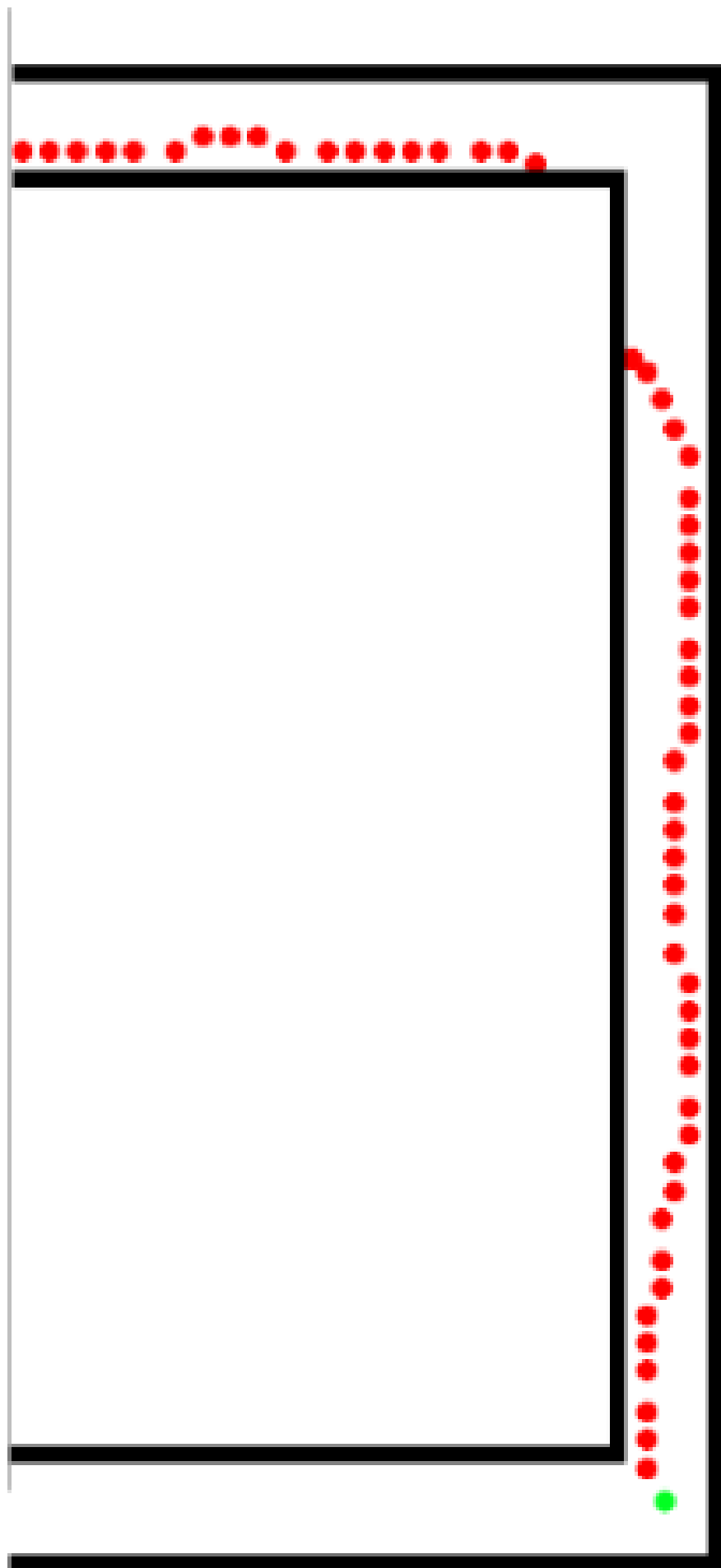












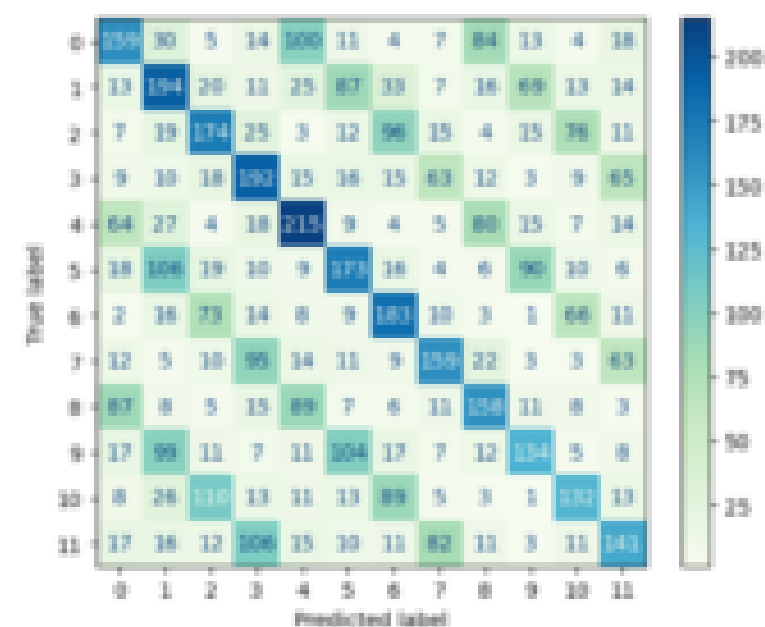
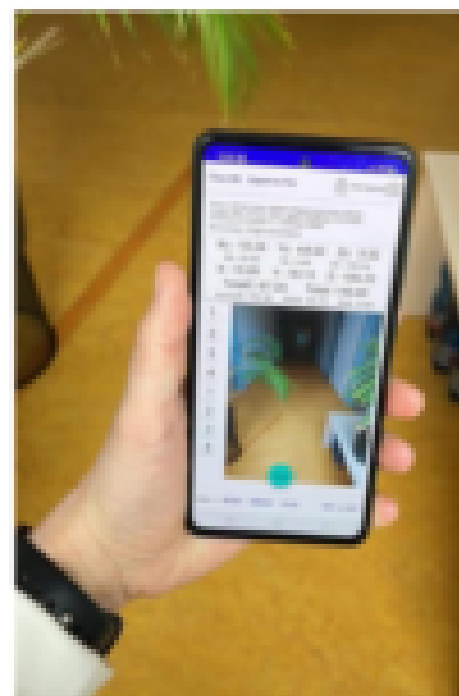
Magnetometer

try)

er

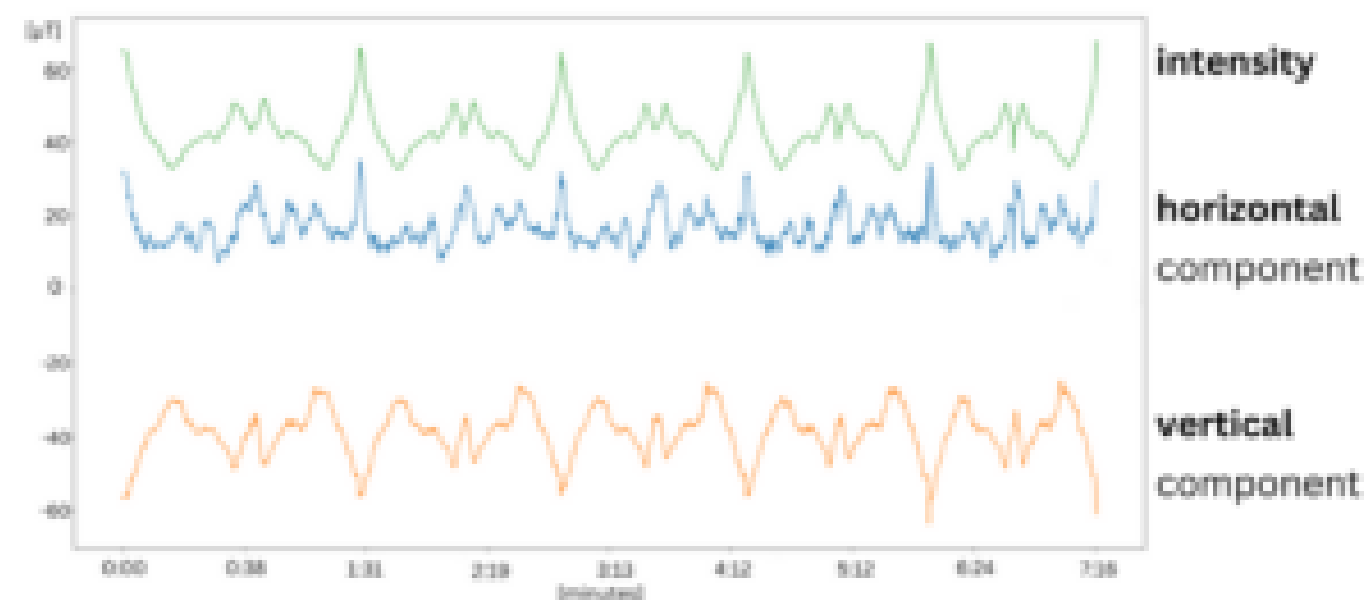
|

t:



$t) \in \mathbb{R}^{3 \times 1}$

inate system



conds)

5 trajectories both directions on the same corridor



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Doors as Visual Landmarks for Indoor Positioning

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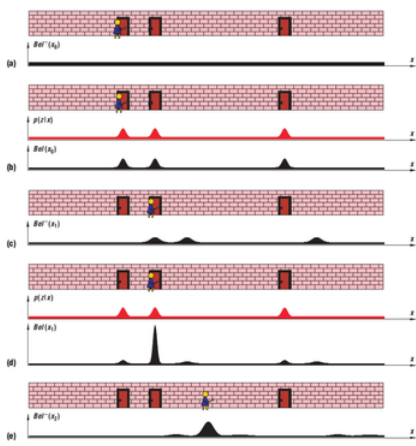
Bayesian Filtering

implementations:

- Kalman filter
- particle filter
- grid-based filter

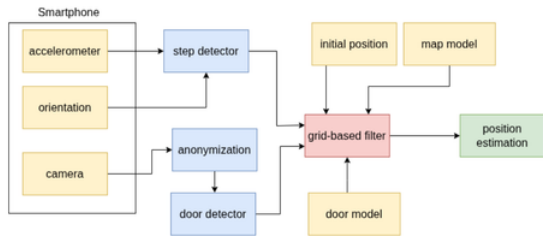
Iteration:

- **transition** (prediction)
- **correction** (observation)



V. Fox, J. Hightower, L. Liao, D. Schulz, G. Barriello, Bayesian filtering for location estimation, IEEE pervasive computing 2 (2003) 24–33.

Positioning Framework



Transition

PDR

Step detection from smartphone sensors. Step length and heading estimated.

Position

Initial - provided

Estimated - grid cell with highest belief value

Correction

MAP

Accessibility of the position (or transition) based on floor plan.

DOOR

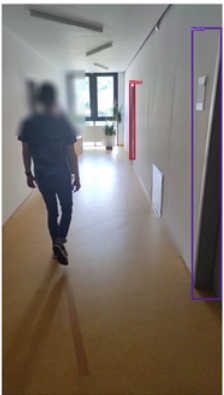
Comparing **visible detected doors on camera image** with **known door positions in the map model**.

Grid-based filter

Floor plan tessellated into a grid. Belief calculation for all positions (grid cell centers) triggered by step detection.

Door detection

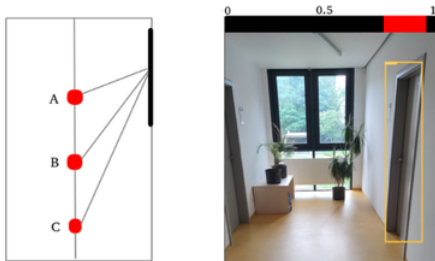
Anonymization



Blurring based on Haar features detection for upper bodies.

- Visible angles in range <0, 1>
- Depends on camera field of view (56° for Xiaomi Mi 10)
- Grounding DINO with prompt *door*

Match between detected doors in image and visible doors from map position



Belief for a grid cell

$$B(x)^t = \sum_{x' \in G} B(x')^{t-1} M_t(x, x') \prod_{d \in D_t} \prod_{e \in E} P(d, e) C(d), \forall x \in G$$

Probability of transition from another grid cell

For each detected door in the image

For each door within the visible range

Detection confidence

Probability of the match derived from normal distribution

Evaluation

Setup

- 1D scenario designed to highlight the effect of door detection
- **30-meter-long corridor**
 - First 12 m: error accumulation from step length estimation
 - **8 doors** (5 on the right, 3 on the left) at various positions
 - 2.75 m from finish point to corridor end
- Grid-based filter with **10 cm resolution**

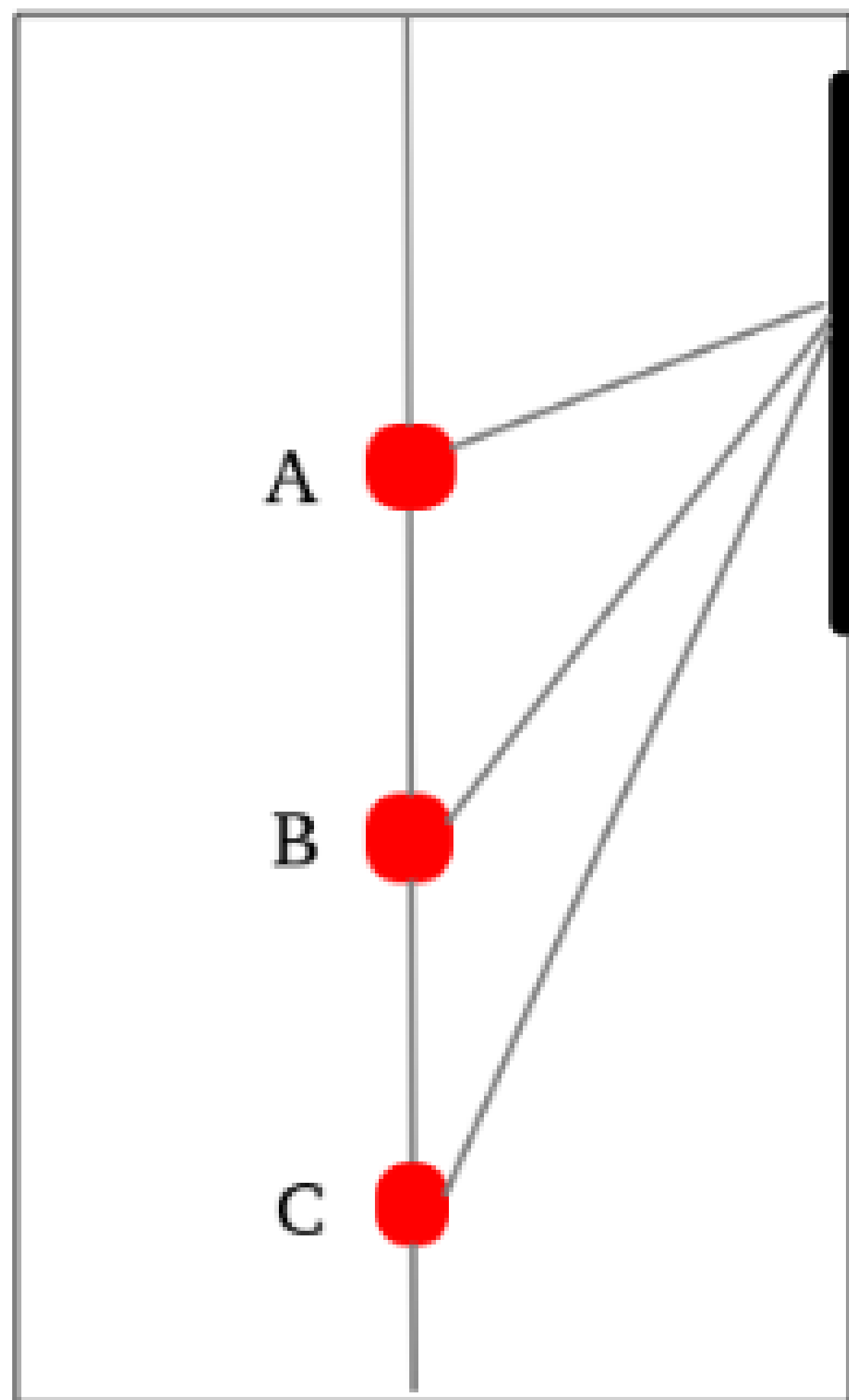
Door detection results

- Confidence: 30 - 69% (threshold-dependent)
- **Max 3 doors** per frame detected
- Up to **10 m** from camera

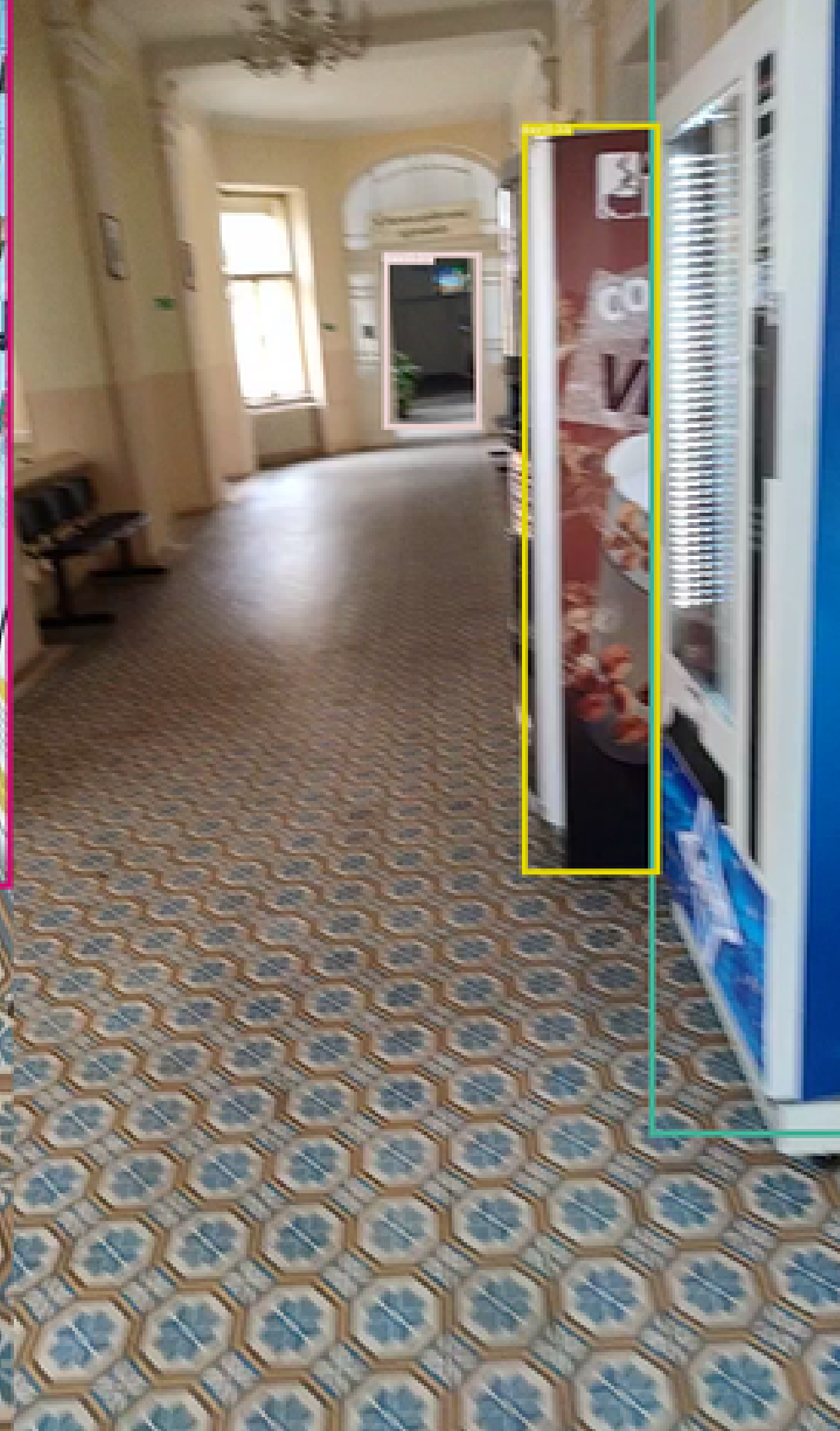
Errors in meters	Scenario 1	Scenario 2	Scenario 2 + anonymization
Grid	3.75	5.25	5.25
Grid + map correction	3.35	3.35	3.35
Grid + door detection	1.15	3.45	3.45
Grid + door detection + map correction	1.15	3.25	3.35

Scenario 1 - empty corridor, first door open

Scenario 2 - same path, 2 people (one walking, one standing)







Building-Specific Door Detection for Indoor Positioning Based on Computer Vision

1. Analyze existing door detection approaches, encompassing both traditional computer vision methods and neural network-based techniques, with attention to their applicability in indoor positioning contexts.
2. Propose a door detection method tailored for a known indoor environment, utilizing images captured by a smartphone camera.
3. Evaluate the proposed approach within a specific building, assessing its performance in terms of detection accuracy, computational efficiency, and robustness to visual anonymization of individuals. Further, investigate the method's potential for generalization to other buildings or unseen environments.

Building-Specific Door Detection for Indoor Positioning Based on Computer Vision

1. Existujúce riešenia - tradičné computer vision & neural network
2. Vymyslieť detekciu dverí v konkrétnej budove
3. Otestovať. Dá sa zovšeobecniť?

open research

Grigorios G. Anagnostopoulos



Reproduction and Validation of Open Research in Indoor Positioning

1. Describe and analyze selected indoor positioning solutions with respect to the openness of their research artifacts, including availability of source code, datasets, and methodological descriptions.
2. Implement the selected positioning methods based on their published descriptions, evaluate them on publicly available datasets, and identify any missing implementation details (e.g., hyperparameters or preprocessing steps) that may influence reproducibility and performance.
3. Evaluate the reproduced methods in a custom indoor environment or dataset. Analyze and compare their accuracy, robustness, and computational performance against the published results.
4. Summarize key challenges and best practices identified during the reproduction process, offering guidelines for future research aiming to enhance reproducibility and comparability in indoor positioning.

Reproduction and Validation of Open Research in Indoor Positioning

1. Existujúce riešenia - sú dostupné kódy, datasey, popis?
2. Naprogramovať podľa publikovaných článkov.
Sú tam všetky detaily? Vieme dosiahnuť rovnaký výsledok?
3. Otestovať v našej budove.
4. Spísať postrehy, čo je podstatné pri publikovaní open research

Diplomová práca v angličtine

Predbežný záujem dajte vedieť čím skôr

<https://ics.science.upjs.sk/opiela>

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