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Blind aid

Blind aid simulation using multiple micro:bit and sensor integration

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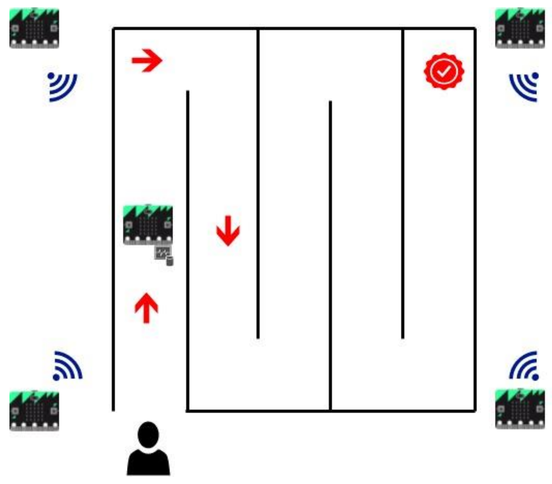
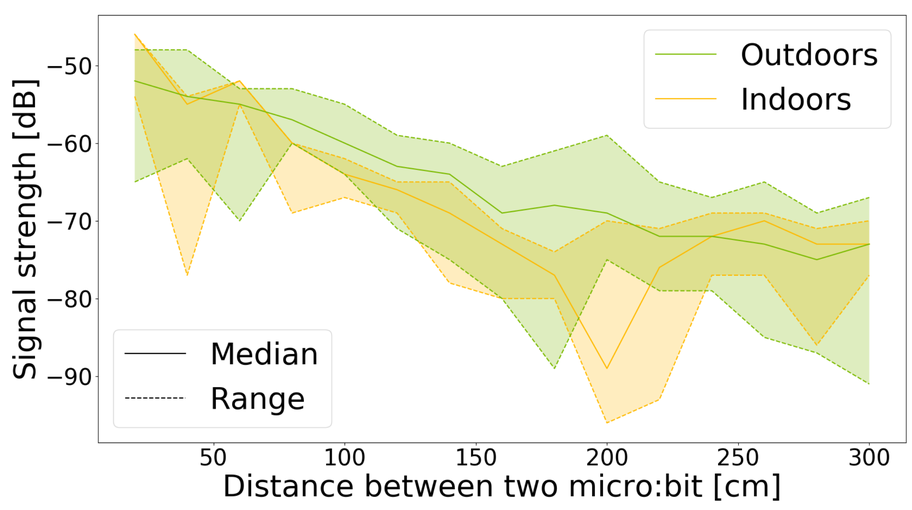
Project scope

- Utilize multiple micro:bit (4-5) to make a prototype system for aiding blind people in navigating a maze
- Design a local position system using micro:bit sensors and ultrasonic sensors
- Give audio cues to a blind(folded) person
- **Intended as an educational exercise for children.**
- Challenging project due to noisy signals, influence of environment and the real time aspect of the task



Physical approach

- Calculate distance based on signal strength & triangulate position



- Strong interference from the environment (especially indoors) & noisy measurements
- Distance estimation based on physical principles infeasible

Machine learning approach

Position based approach:

- Collect data from sensors by standing in different positions.
- Smooth data on micro:bit using running average

- Replace missing values
- Apply gaussian filter for smoothing
- Label samples with corresponding position

- Train random forest regression model to **predict position** in maze
- Signal strength, ultrasonic data, compass heading are used as features

Smart sensing → PC post processing → Machine learning

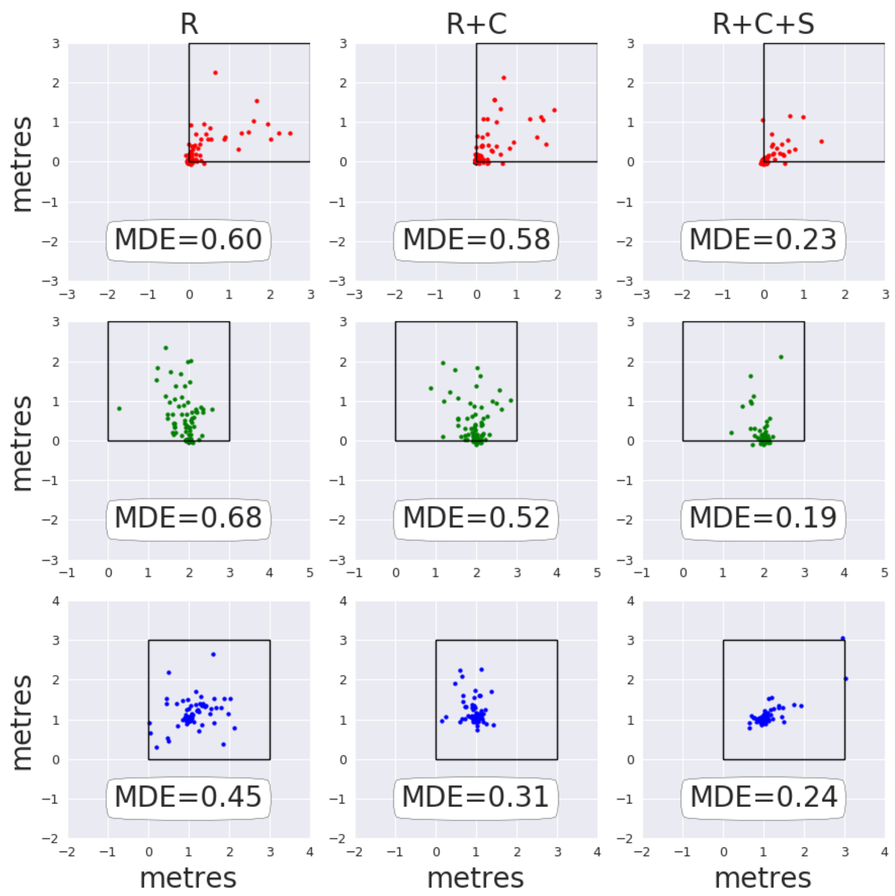
Trajectory based approach:

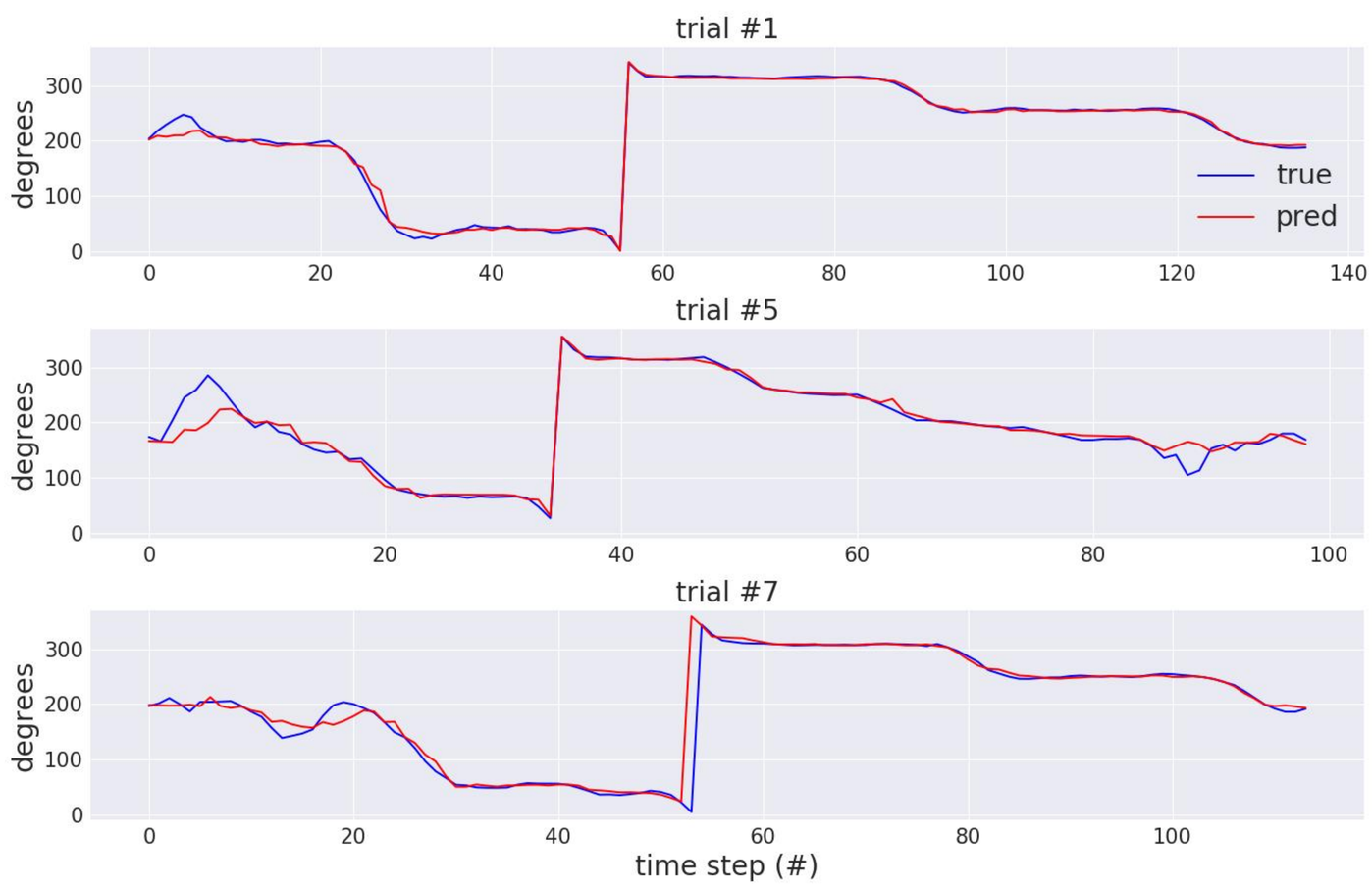
- Collect data from sensors by walking through maze (multiple times)
- Smooth data on micro:bit using running average

- Replace missing values
- Apply gaussian filter for smoothing
- Label samples with future compass bearing

- Train random forest regression to **predict desired direction**
- Features are augmented with the output of the position based approach

Results





- Position estimates for corner (top row), side (middle row), and center point (lower row)
- Accuracy increases with use of compass (C) and ultrasonic data (S) compared to radio strength (R)

- Approach can predict direction accurately for a maze trajectory that it has been trained on
- **In the future** training automation and advanced signal processing could be used to accelerate model building and improve accuracy