

Coupled Indoor Navigation for People Who Are Blind

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PROBLEM STATEMENT

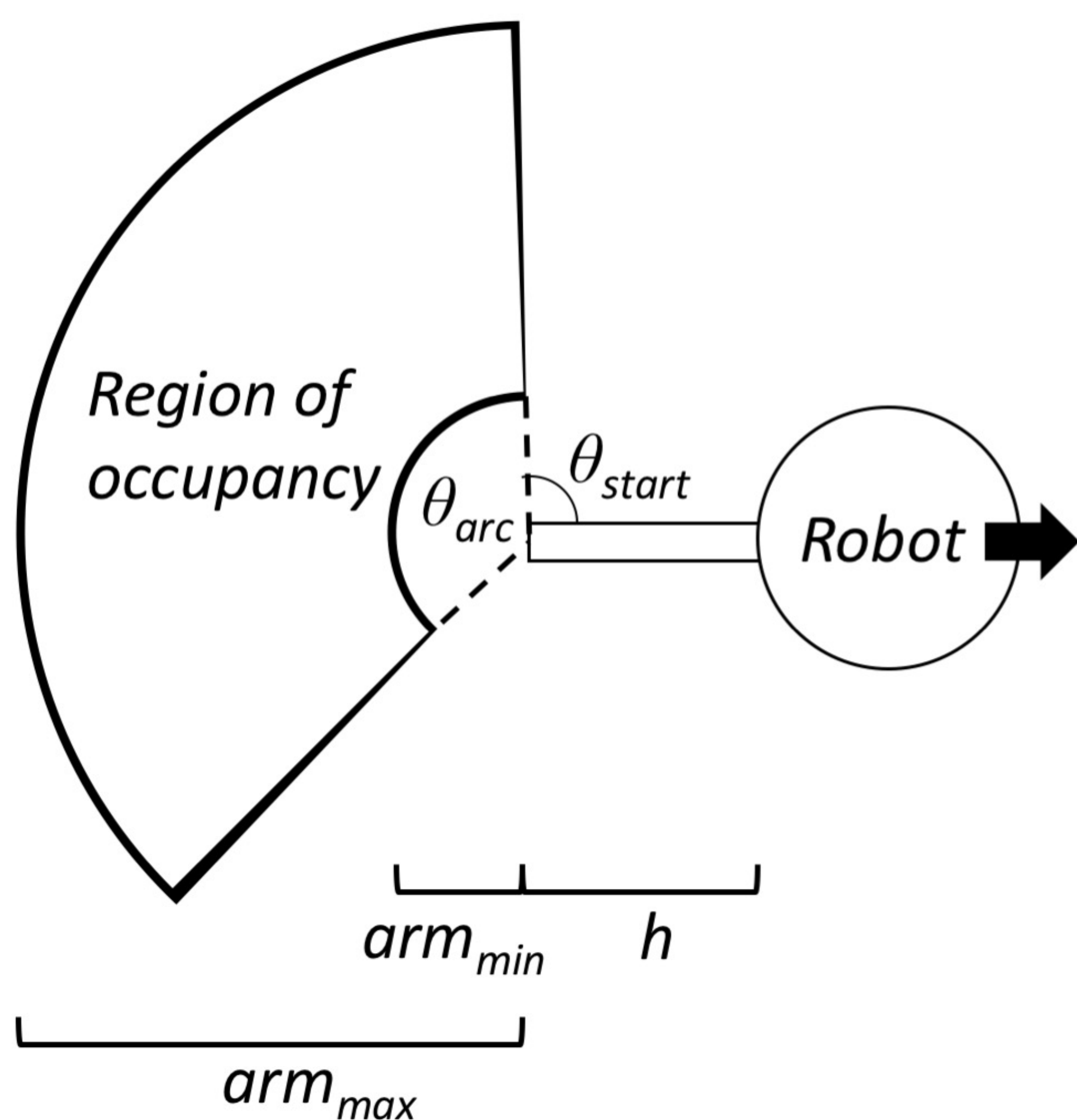
People who are blind and low vision (B/LV) face difficulties navigating complex indoor spaces (i.e. airports or malls). This poster presents our investigation of an autonomous navigation system for a mobile robot that helps guide people who are B/LV in indoor settings.



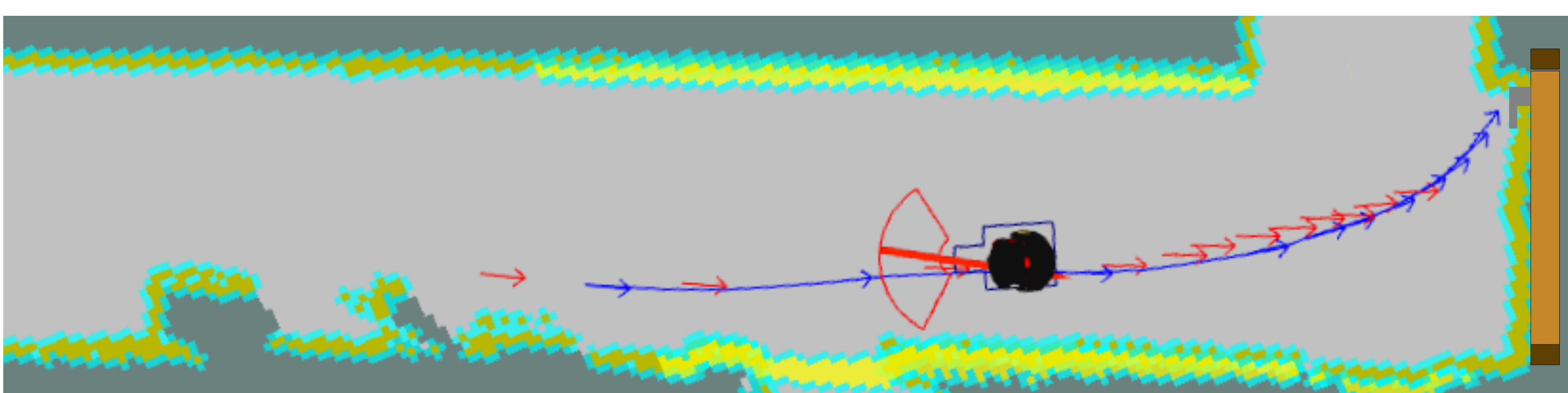
Podi, the indoor guide robot for B/LV users.

HUMAN-ROBOT COUPLING MODEL

This coupling model enables the planner and controller to operate in the human space. It accounts for latency as the human follows the robot and human arm compliance during turns.



Top: The coupling model, parameterized by: θ_{start} , θ_{arc} , arm_{min} , arm_{max} , and h . Bottom: The coupling model simulates how the human (red) follows the robot (blue).



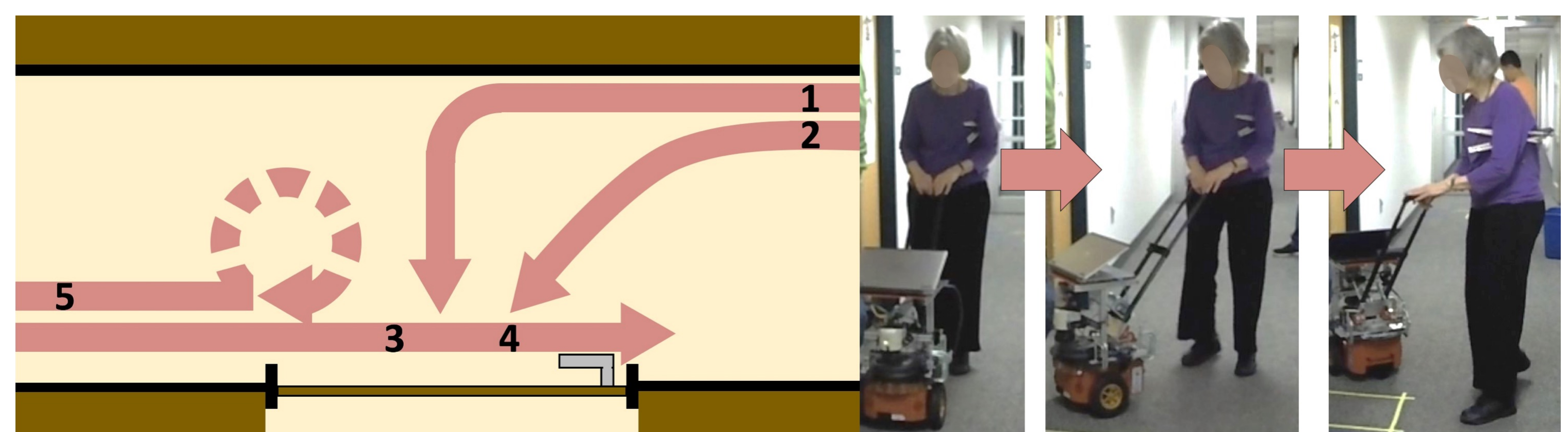
PARTICIPATORY DESIGN SESSION

DOOR APPROACHES

- **PASS**: same side of the hall
- **DIP**: opposite side of the hall, turn towards door

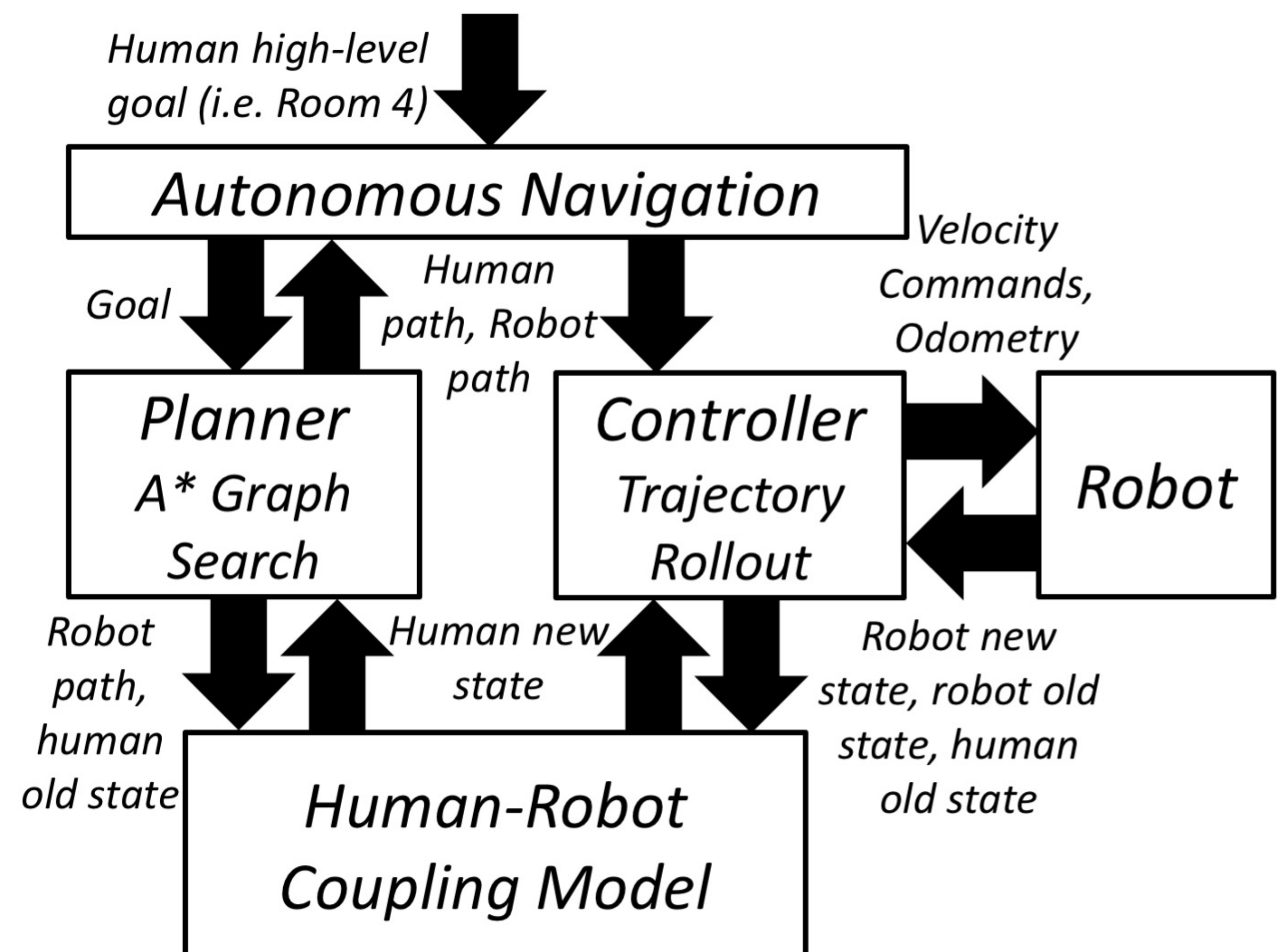
IMPARTING INFORMATION

- **FACE**: drop the user off facing the door
- **TAP**: after dropping the user off, tap the door
- **ROTATE**: rotate the user towards the door

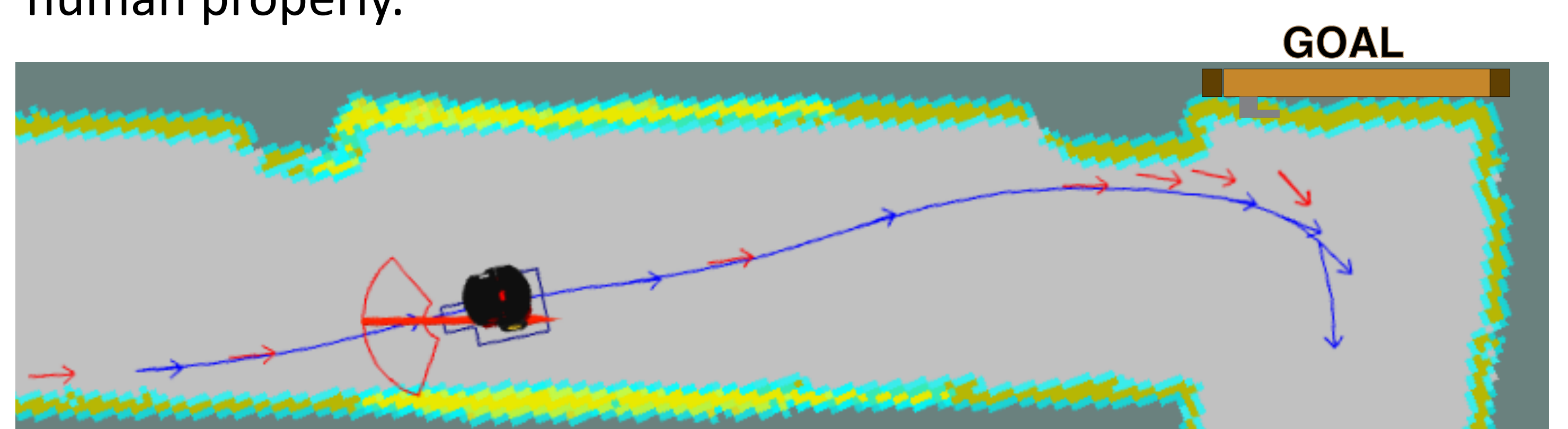


Left: The trajectories we tested. 1) DIP + FACE, 2) DIP + TAP, 3) PASS + TAP, 4) PASS + ROTATE, 5) PASS + ROTATE. Right: In trajectory 5, the robot rotates the user 180 degrees towards the door.

AUTONOMOUS COUPLED NAVIGATION



Top: A diagram of the autonomous navigation system. Bottom: The robot performs ending rotations to position the human properly.



ACKNOWLEDGEMENTS

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