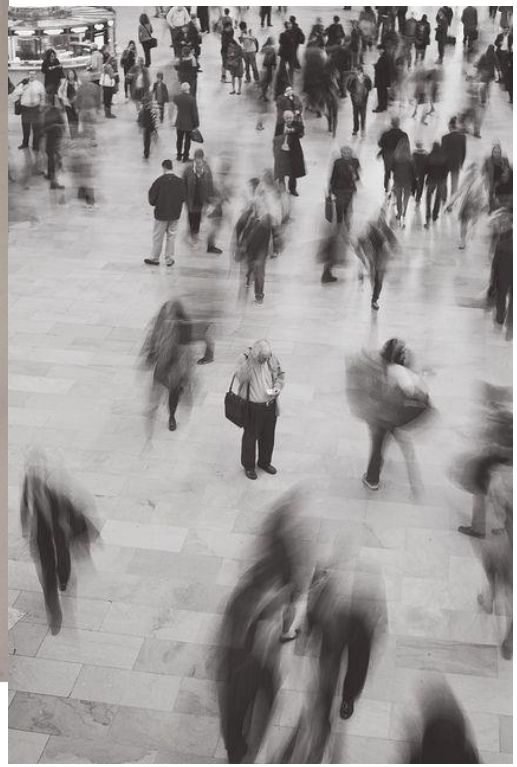
Wayfinding and cognitive maps for pedestrian models



Source: pinterest

Overview

- The problem
- The cognitive map
- Modeling wayfinding
- Examples
- Summary & Outlook

Source: pinterest

The problem

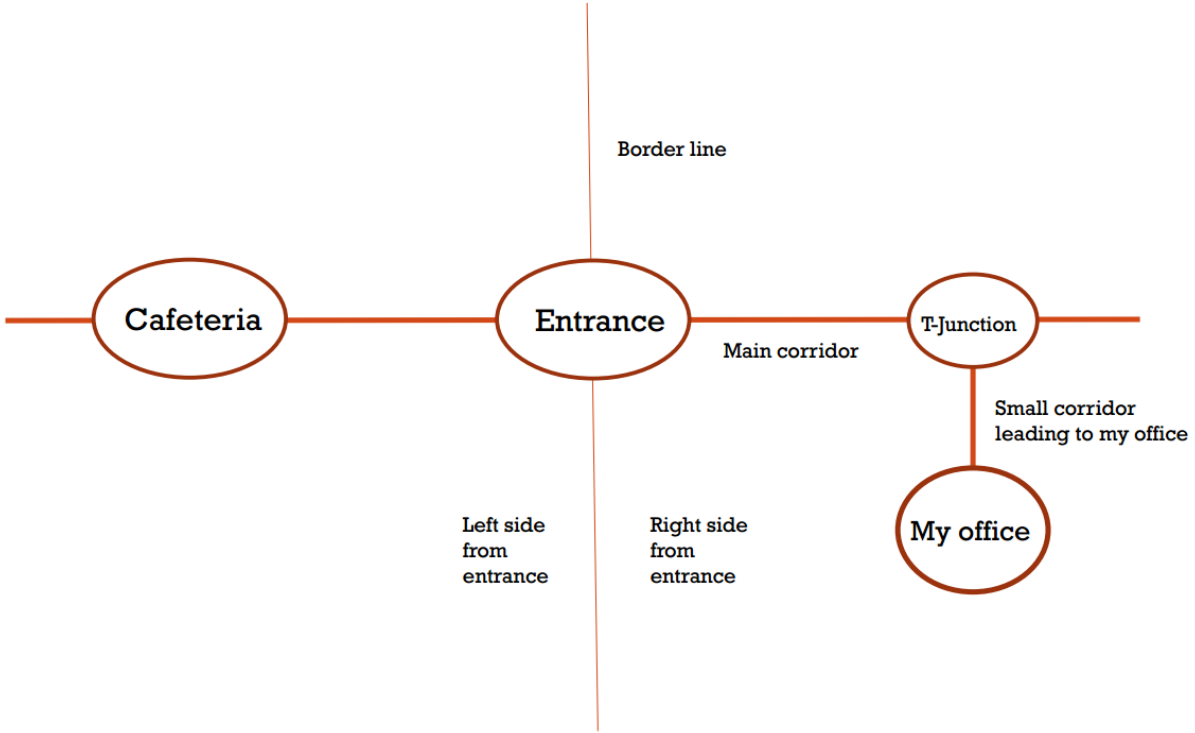
Routing algorithms in literature

- Shortest path algorithms
  - Assume complete knowledge
  - Overstraining of doors
  - Local shortest path algorithms not necessarily expedient
- Travel time optimizations
  - Agents avoid jams
  - Still assume complete knowledge

Looking for a sophisticated routing algorithm containing a model representing the human navigation process

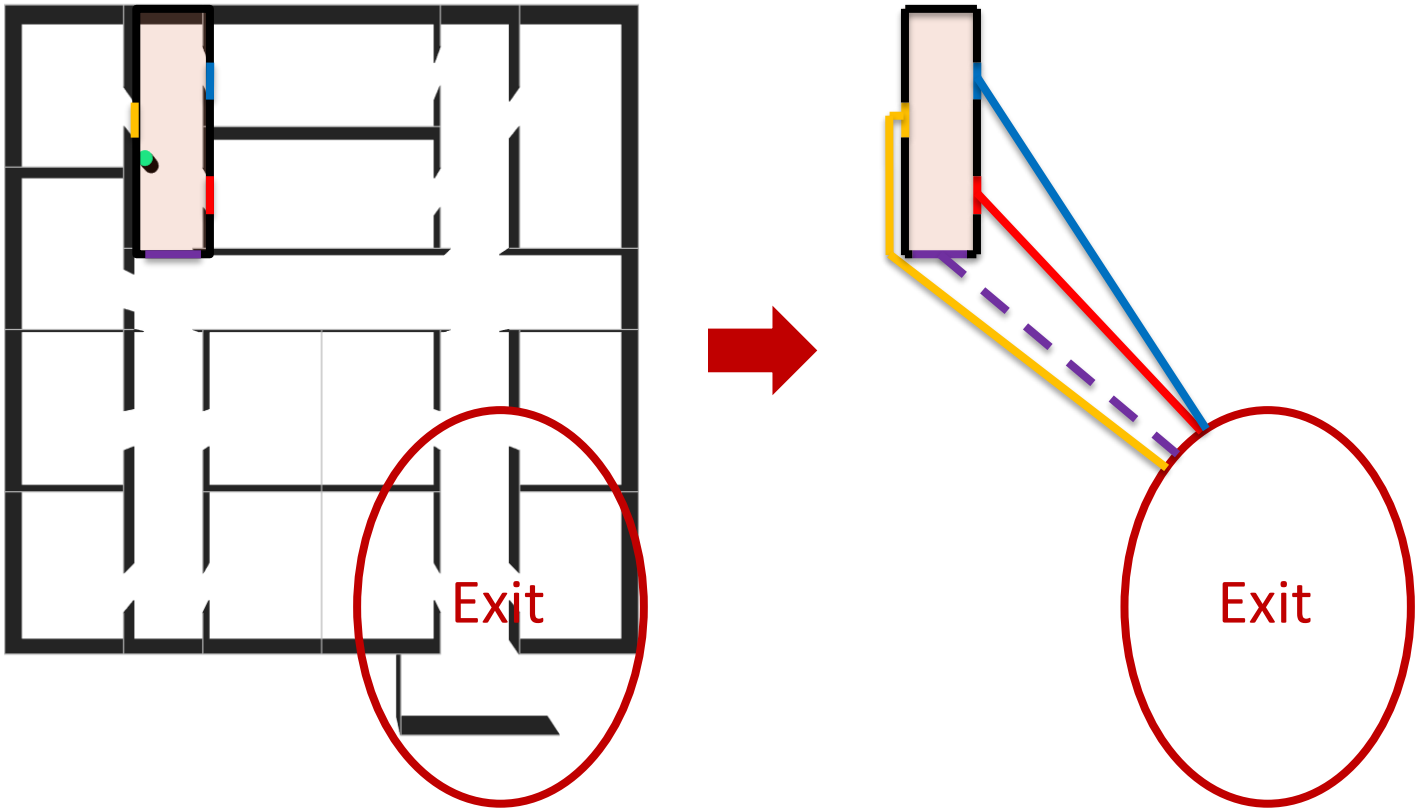
The cognitive map

- Initially introduced by Tolman (1948)
- Mental representation of the spatial relations
- Important objects (landmarks)
- Inaccurate (fuzzy) especially concerning metric relations



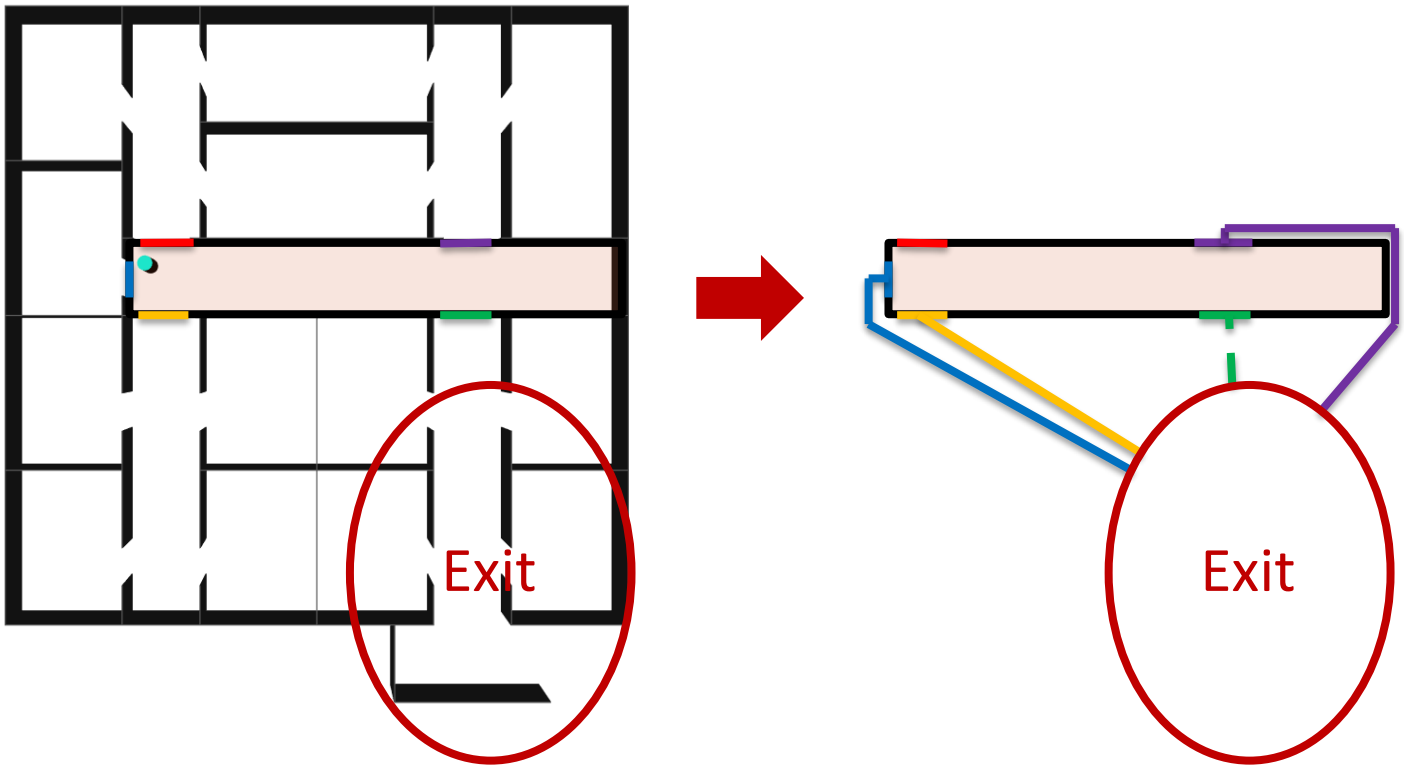
Cognitive map knowledge

- Ellipses representing inaccurate idea of the destination‘s position
- Isolation of current room
- Comparison of paths from doors to ellipse



Cognitive map knowledge

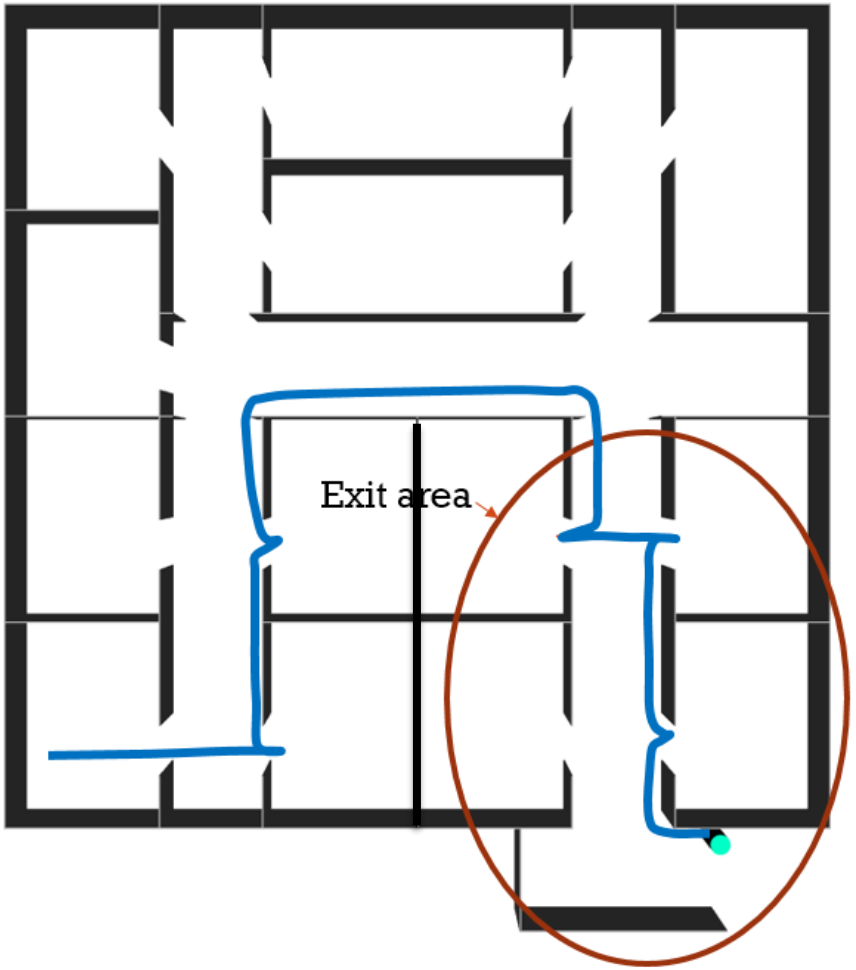
- Dashed line represents shortest path
- Green door is evaluated as the most expedient one



Examples

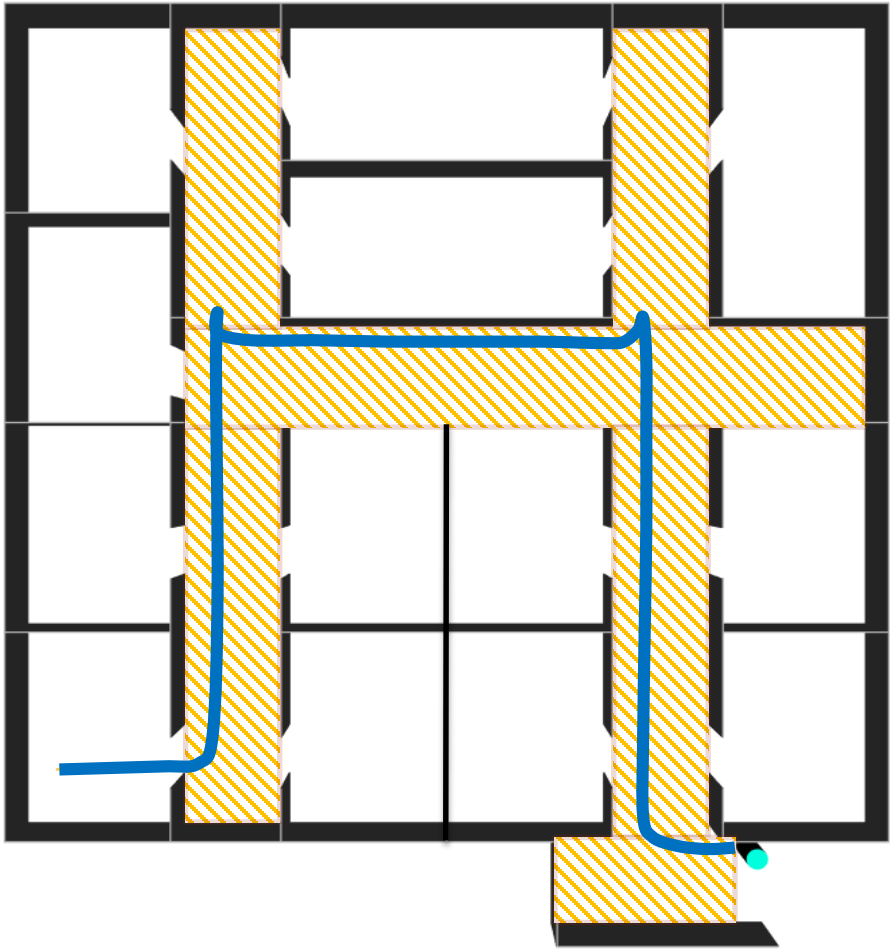
Cognitive map knowledge

- Agent prefers crossings taking him closer to the exit area
- Chooses nearest crossing inside the exit area



Generalized knowlegde

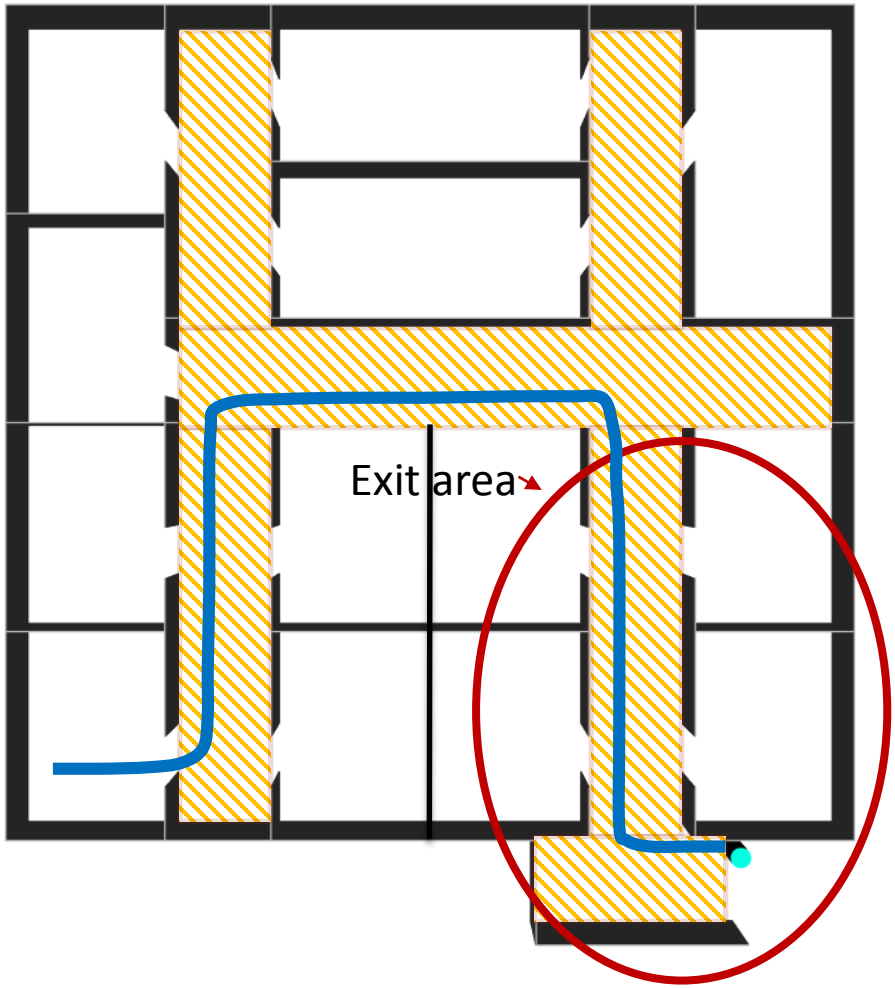
- Knowledge about a type of building
- Example: Room to corridor strategy (sensory input)
  - Doors leading to a corridor will be assessed as more favourable



Examples

Combination of generalized and cognitive map knowledge

- Agent prefers doors leading to corridors
- Agent prefers corridors heading to the exit area



Summary

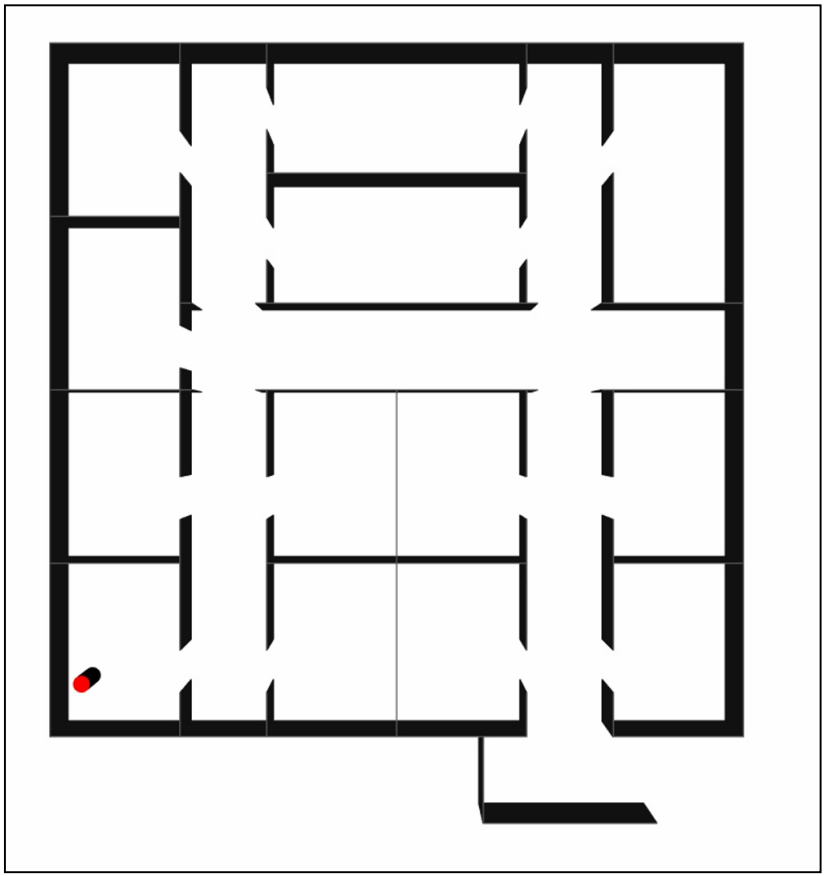
- Avoid global, comprehensive knowledge
- Model approach to provide incomplete, inaccurate information
- Ellipses depict inaccuracies
- Generalized knowledge
- Cognitive map like knowledge
- Combination of both

Outlook

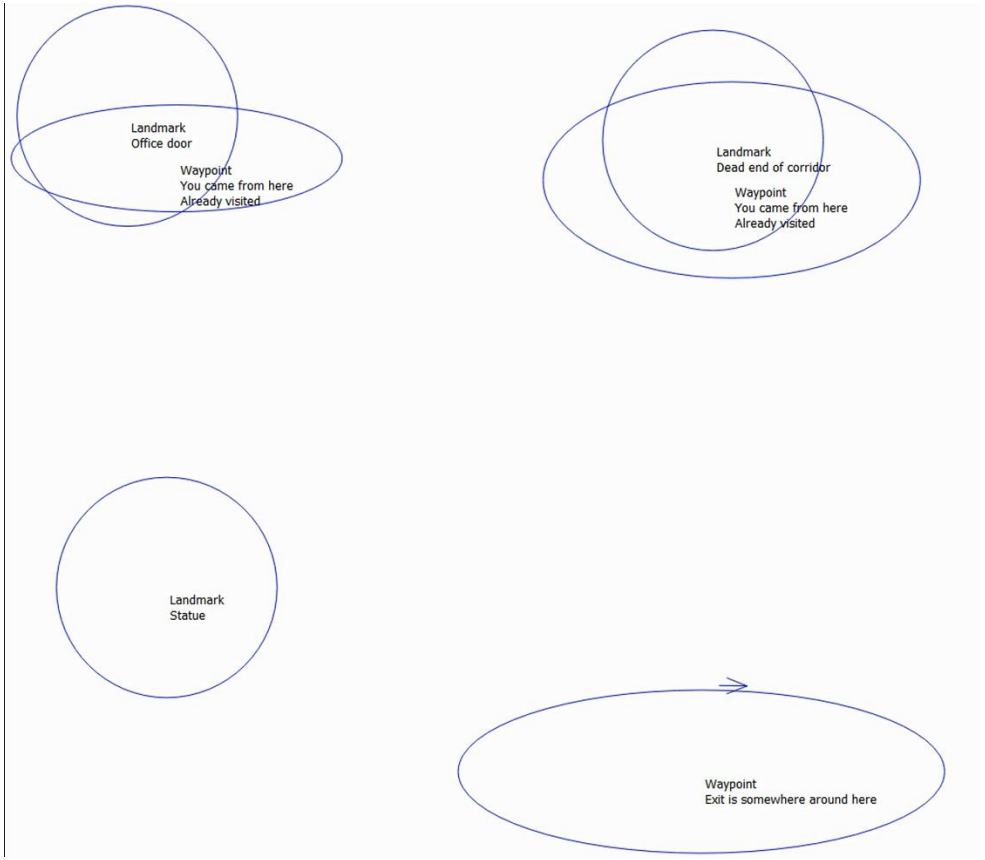
- Extending the cognitive map approach
- Implementing additional sensory input
- Landmarks / Connections
- Visibility graphs
- Maps / Signs
- Herding
- Comprehensive framework for human wayfinding

Outlook

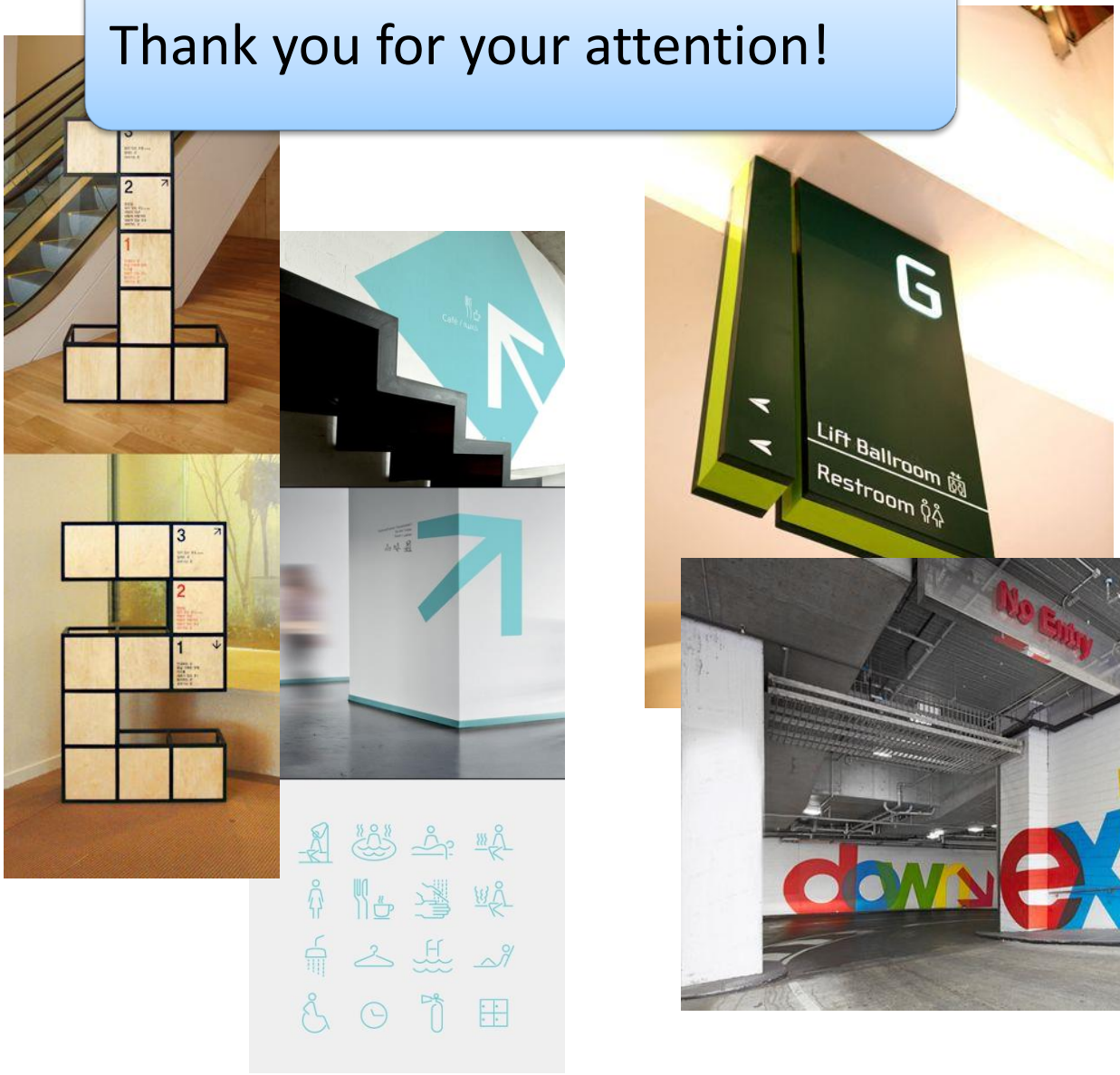
Simulation



The cognitive map



Thank you for your attention!



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