

3D visual perception

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topics

- visual shape of objects
- visual structure of space
- visual navigation

3D

- do we need two eyes?

No

not a necessary condition for seeing in 3D

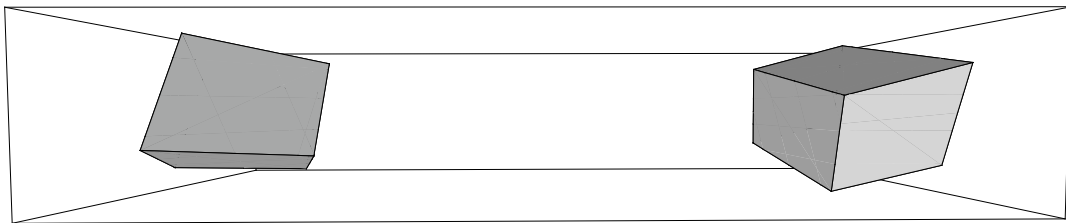
visual shape

Jan Koenderink

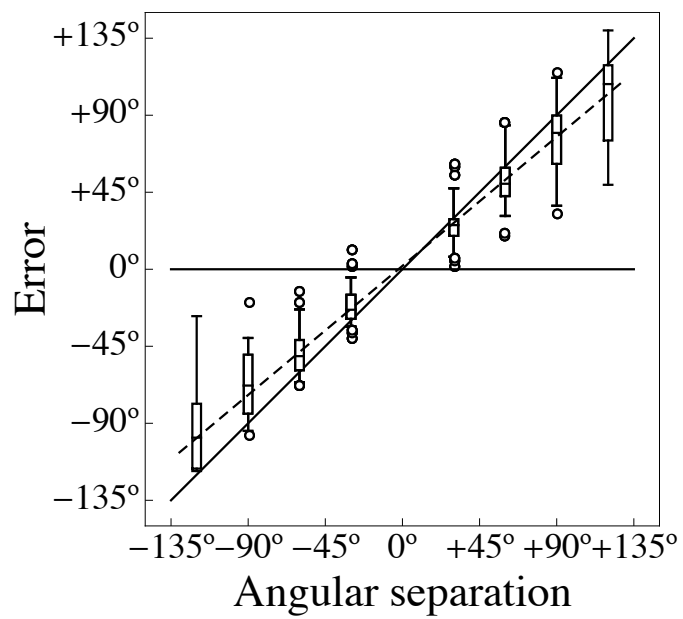
Ans van Doorn

Huib de Ridder

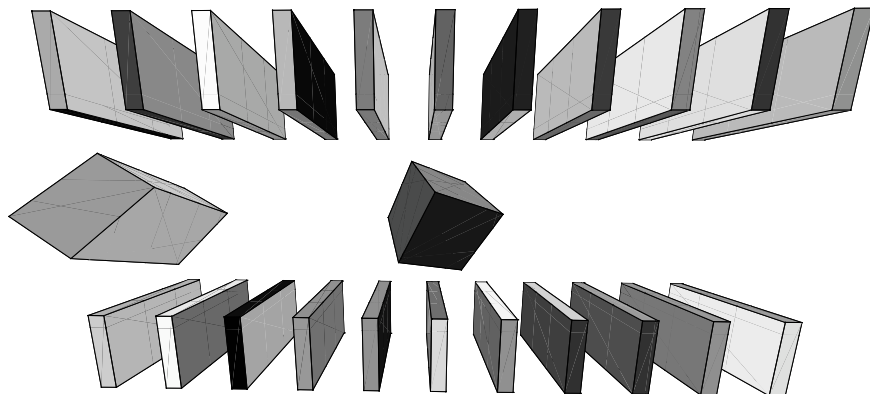
two cubes



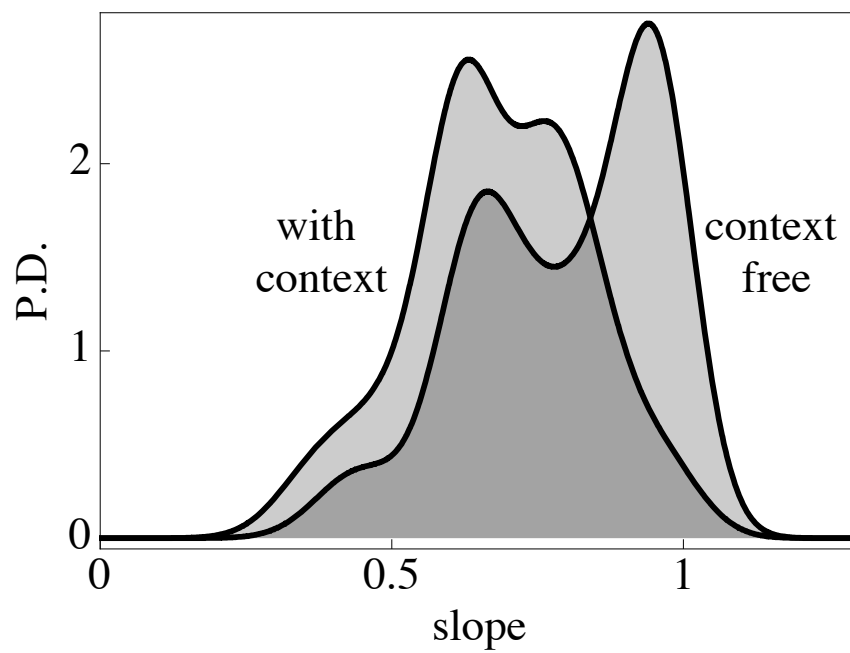
parallel cubes



context

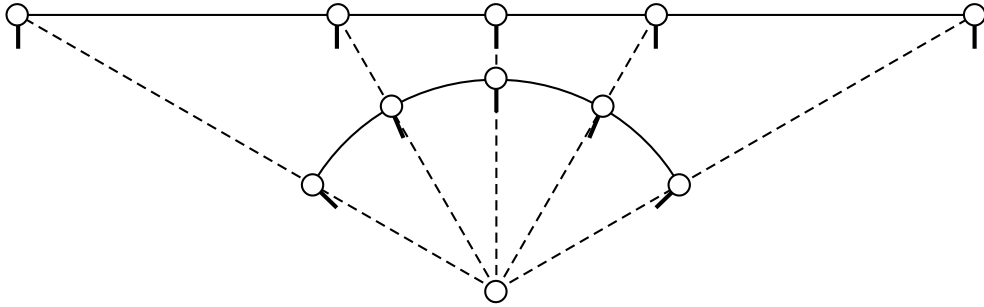


influence of context





Parallel - Equidistant



visual space

Jim Todd (OSU)

Jan Koenderink

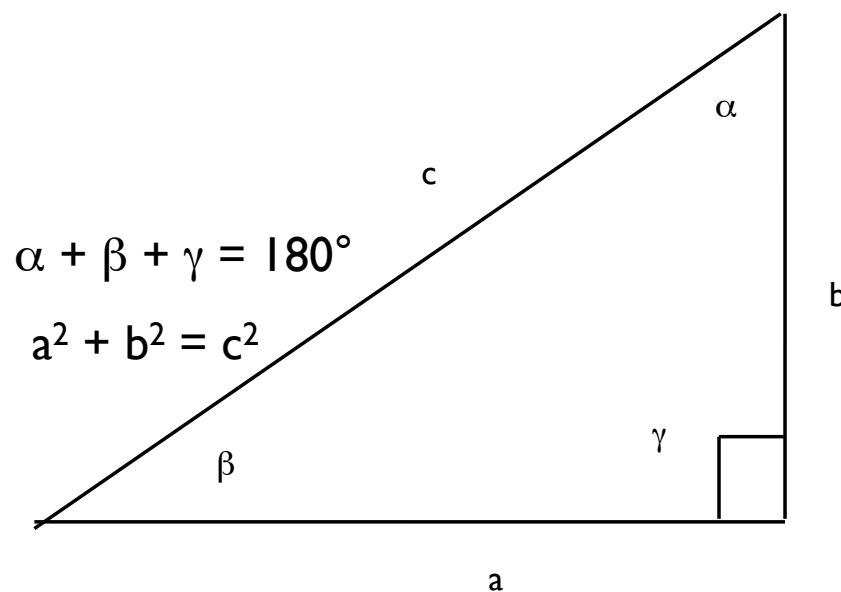
Ans van Doorn

Astrid Kappers

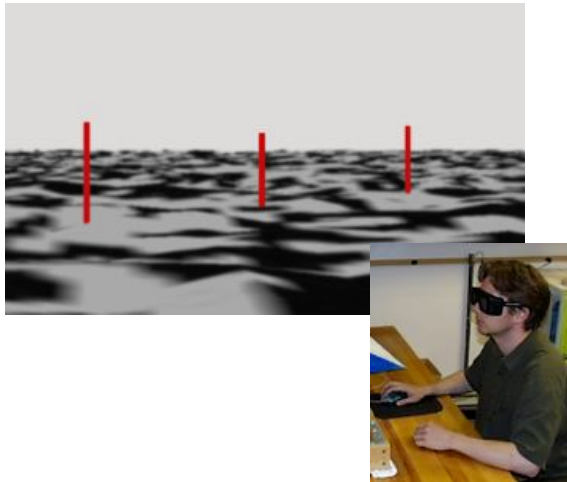
natural space



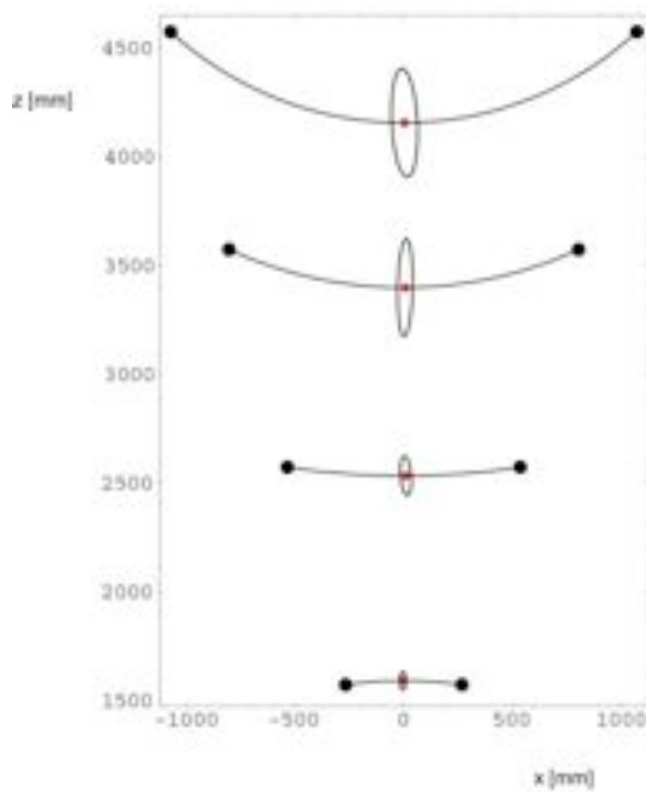
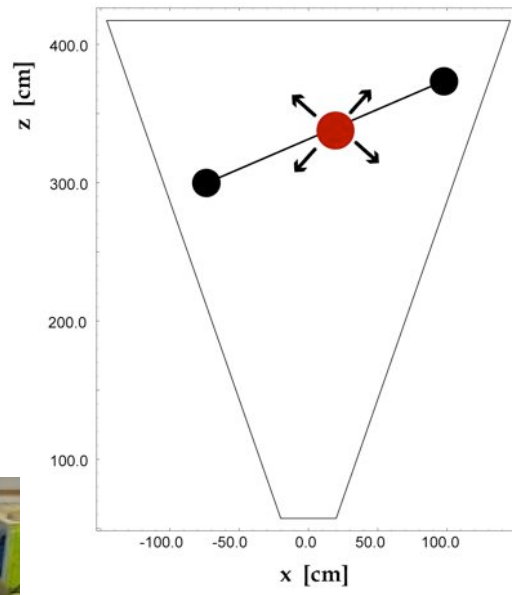
Pythagorean Theorem

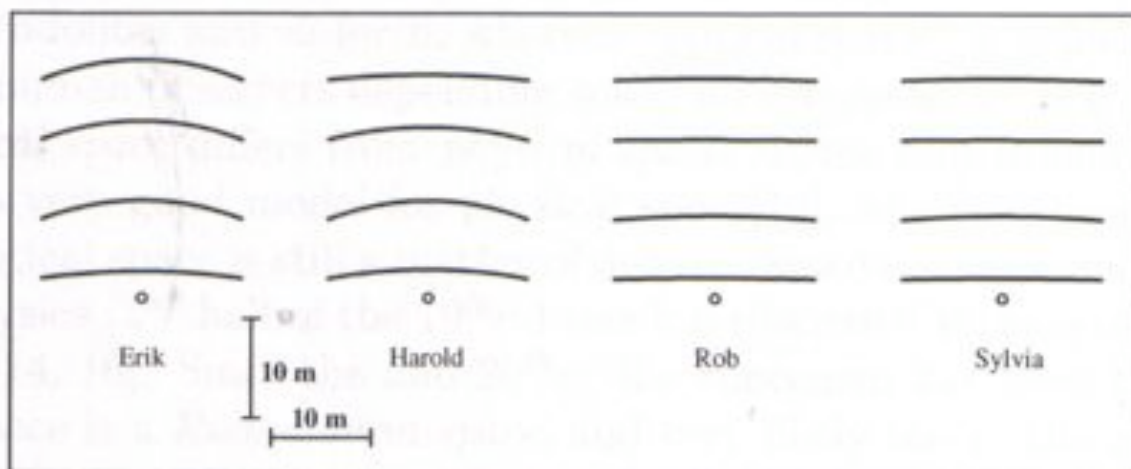


Scene view



Top view



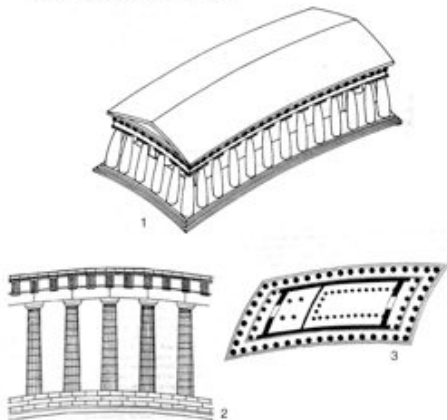


architectural space



architectural objects

Exaggerated refinements in the Parthenon



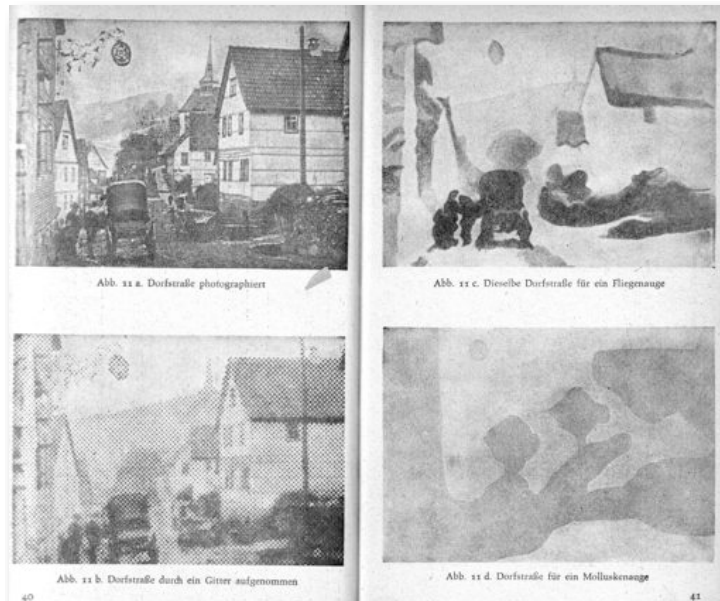
St. Peter's square



Piranesi's spaces



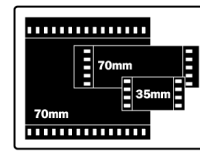
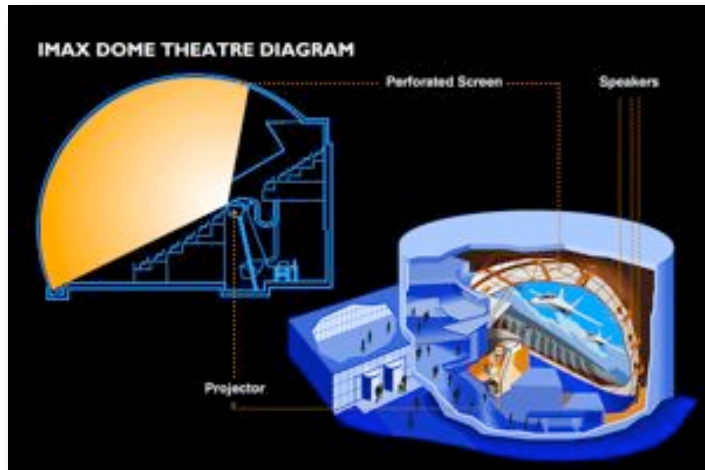
Uexküll's spaces ("Umwelts")



Second Life



IMAX Dome



Elumens Vision Station



visual navigation

Miroslav Bojic

Mark Neerincx

Gideon Bazen
(Logica)

visual navigation

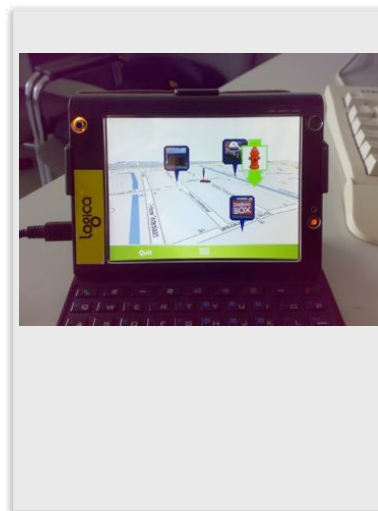
- humans do not have a “mental map”
- humans use “cognitive collage” (Tversky)
 - path integration
 - landmarks
 - spaces (“re-orientation”)

pedestrian assistant

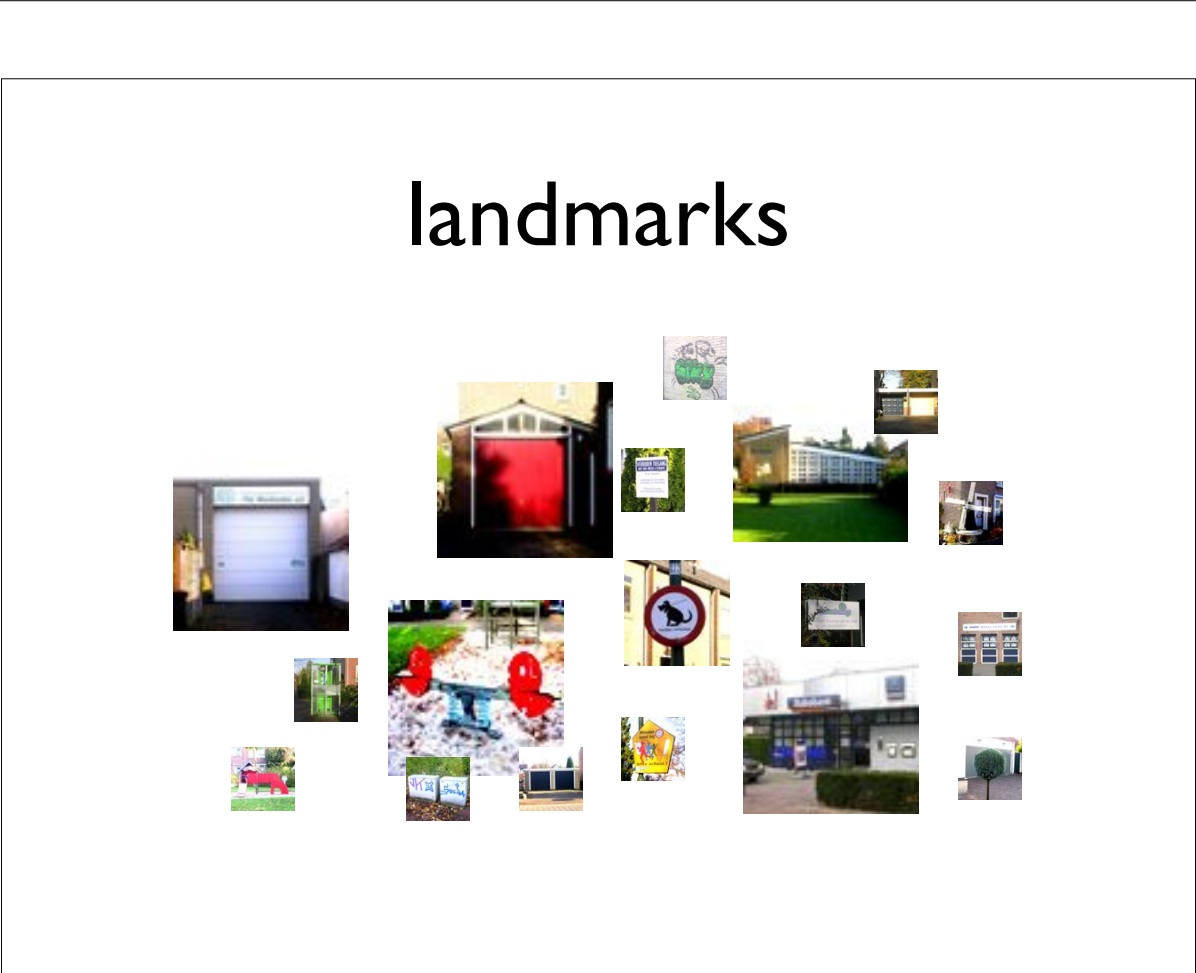


pedestrian assistant

- kaart: in perspectief
- locatie: poppetje op kaart
- orientatie: kaart draait mee
- waypoints: kleine objecten op de route
- landmarks: grote objecten die zichtbaar zijn vanaf de route



waypoints

[illegible]

experiment

- 10 ouderen wandelen in Soesterberg
- 2 condities
 - landmarks *versus* zonder landmarks
- procedure
 - volg een route van A naar B met aanwijzing van de wandel assistent
 - loop *zonder hulp* terug van B naar A



10 proefpersonen



60 - 73
jaar



A hand-drawn map of a village with the following features:

- Top Left:** A small square labeled "Post Office".
- Top Center:** A small square labeled "Rama".
- Top Right:** A small square labeled "Hana".
- Bottom Left:** A small square labeled "School".
- Bottom Center:** A small square labeled "Banyan Tree".
- Bottom Right:** A small square labeled "Shop".
- Connections:**
 - A dashed line runs horizontally across the top, connecting the Post Office, Rama, and Hana.
 - A dashed line runs vertically on the right side, connecting Hana and the Shop.
 - A dashed line runs horizontally across the bottom, connecting the School, Banyan Tree, and Shop.
 - A dashed line runs vertically on the left side, connecting the Post Office and the School.
 - A solid line connects Rama and the Shop.
 - A solid line connects the Shop and Hana.
- Other Labels:**
 - "Ganga" is written near the Shop.
 - "Ganga" is written near the Banyan Tree.
 - "Ganga" is written near the School.
 - "Ganga" is written near the Post Office.

teknis

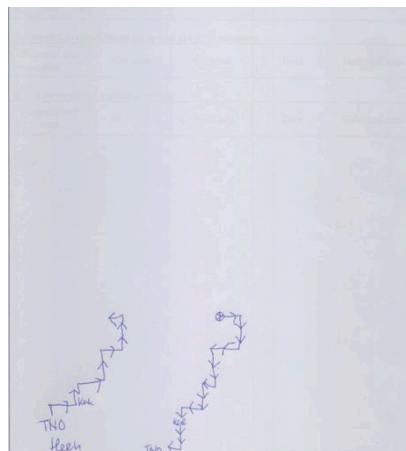
A hand-drawn floor plan of a house with the following labeled rooms and features:

- Living Room (Ruang Tamu):** Located in the center, containing a sofa and a coffee table.
- Bedroom (Kamar Tidur):** Located at the top left, containing a bed and a nightstand.
- Bedroom (Kamar Tidur):** Located at the bottom right, containing a bed and a nightstand.
- Bathroom (Kamar Mandi):** Located at the bottom left, containing a toilet and a sink.
- Kitchen (Dapur):** Located at the top right, containing a stove and a sink.
- Hallway (Koridor):** A central hallway connecting the rooms.
- Door (Pintu):** Indicated by an arrow pointing towards the living room.

verdwaalde proefpersoon



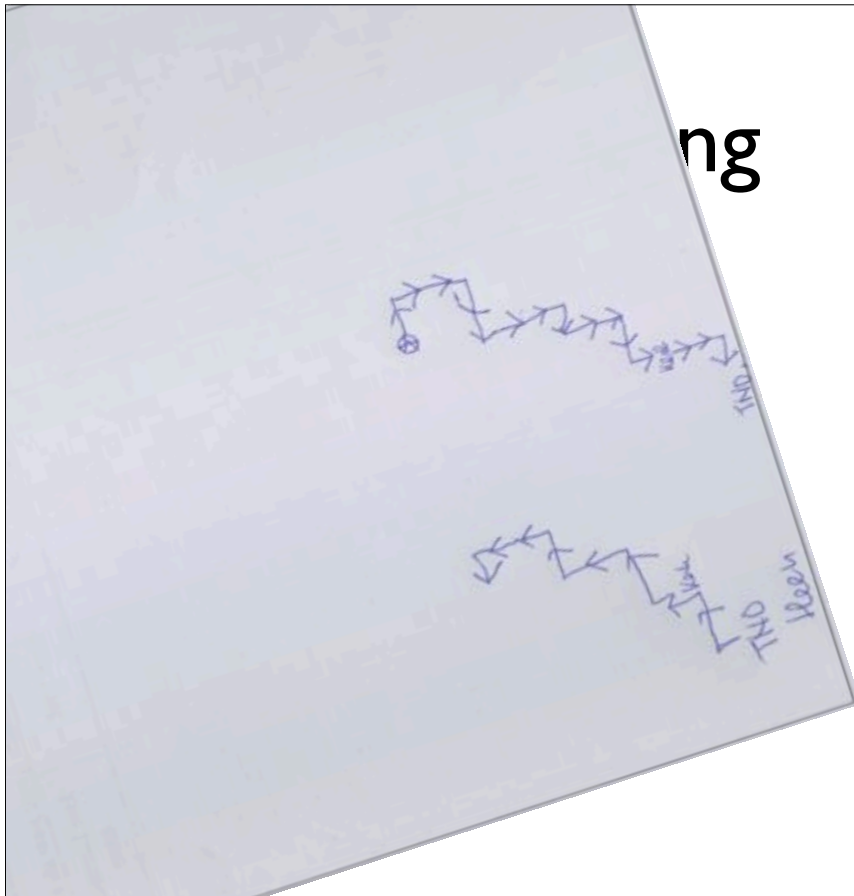
tekening



teknologi



ng



resultaten

- alle 10 proefpersonen bereikten B, en vonden A terug
- verschillen
 - proefpersonen met landmarks namen ongeveer dezelfde route terug (5 uit 5)
 - proefpersonen zonder landmarks gingen vaker dwalen (3 uit 5)

conclusie

- oudere wandelaars kunnen met een wandel assistent een omgeving leren kennen
- een rijkere representatie resulteert in sneller leren van de omgeving en minder dwalen