

早稲田大学
WASEDA University



Miraikan

THE NATIONAL MUSEUM OF EMERGING
SCIENCE AND INNOVATION



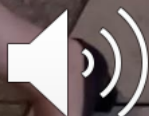
CHI2025

WanderGuide: Indoor Map-less Robotic Guide for Exploration by Blind People

Masaki Kuribayashi^{1,2}, Kohei Uehara², Allan Wang²,
Shigeo Morishima¹, Chieko Asakawa²

1 : Waseda University

2: Miraikan - The National Museum of Emerging Science and Innovation



A person wearing a dark jacket and a blue face mask is walking in a public space, possibly a cafe or a public square. A small, dark robot is visible on the ground near the person's feet. The background is blurred, showing other people and structures.

WanderGuide

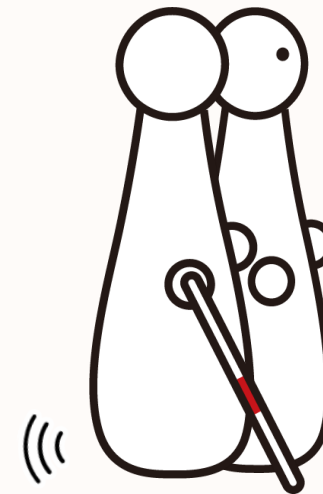
A **Map-less** robot that enables blind people in **exploring** independently

Blind People Have Difficulty in **Exploring** Independently

Ask sighted people for help



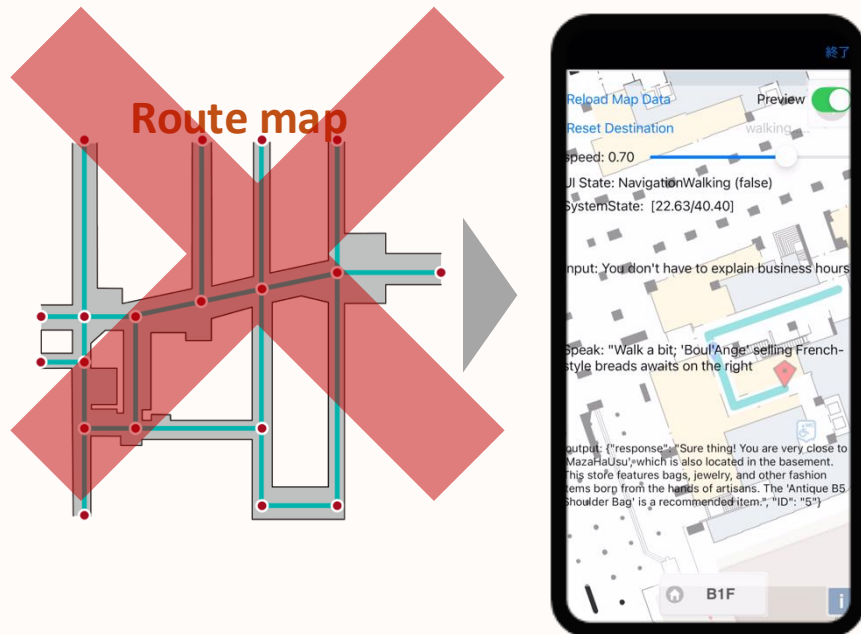
Explore together



Systems with Prebuilt Maps Cannot be Used Anywhere

ChitChatGuide^[1]

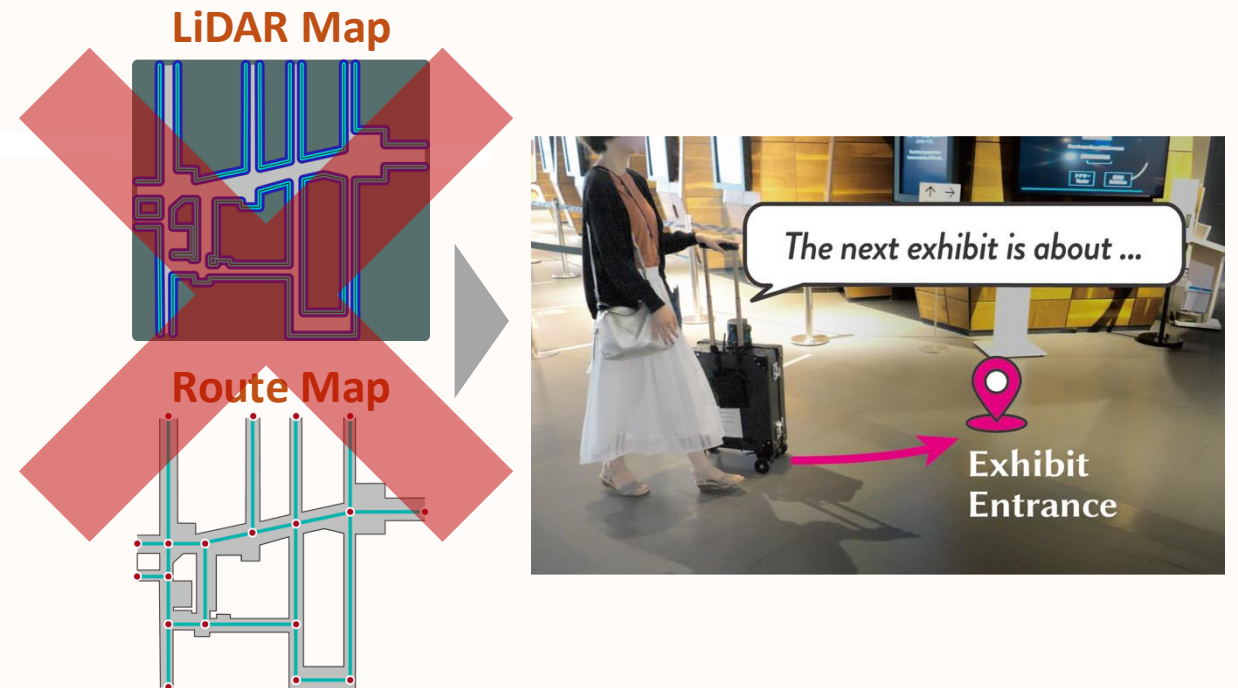
LLM-powered system that uses **Route Map**



[1] Kaniwa et al., "ChitChatGuide: Conversational Interaction Using Large Language Models for Assisting People with Visual Impairments to Explore a Shopping Mall"

Kayukawa *et al.* ^[2]

Robot that uses **Route Map** and **LiDAR Map**



[2] Kayukawa et al., "Enhancing Blind Visitor's Autonomy in a Science Museum Using an Autonomous Navigation Robot"

Navigation vs **Exploration**

Exploration involves navigation as well as learning

PathFinder^[3]: Map-less **Navigation** System



WanderGuide

A Map-less Exploration
Robot for Blind People



System Overview with MLLM-powered Surrounding Explanation

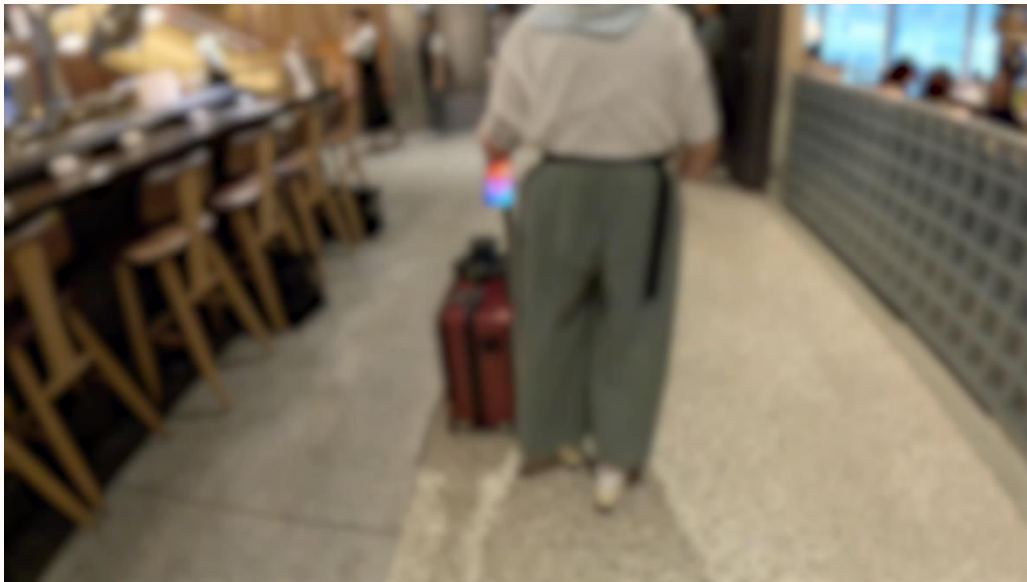


Formative Study with 10 Blind Participants

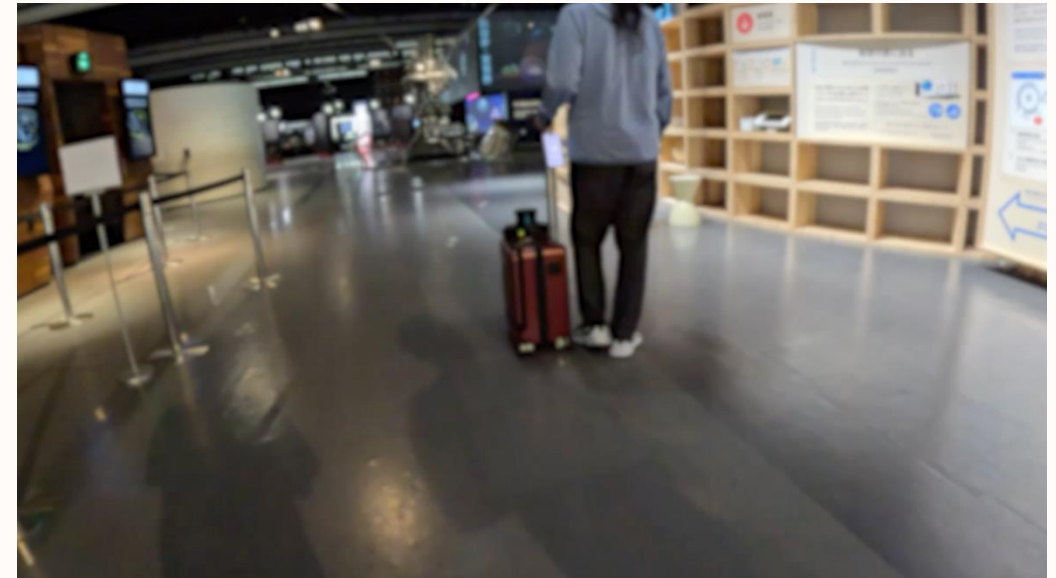
RQ1: How should the MLLM describe environment?

RQ2: What other functionality should WanderGuide have?

Shopping Mall



Science Museum



Design Implications From The Formative Study

Implication 1: Need of Varying Level of Description

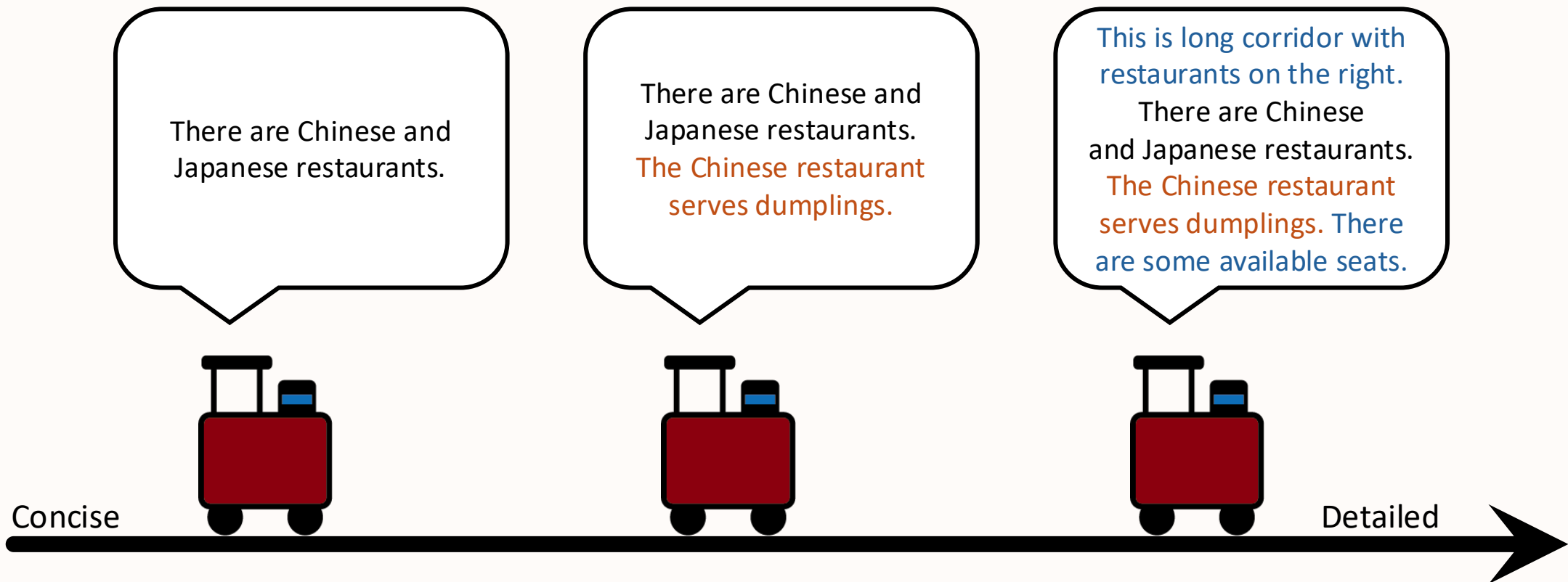
Preferences of the length in described descriptions was observed

Implication 2: Need of “Take-Me-There” Functionality

Add function to revisit where users found interesting

Implication 1: Varying Level of Description

Adjust the detail level using the handle buttons



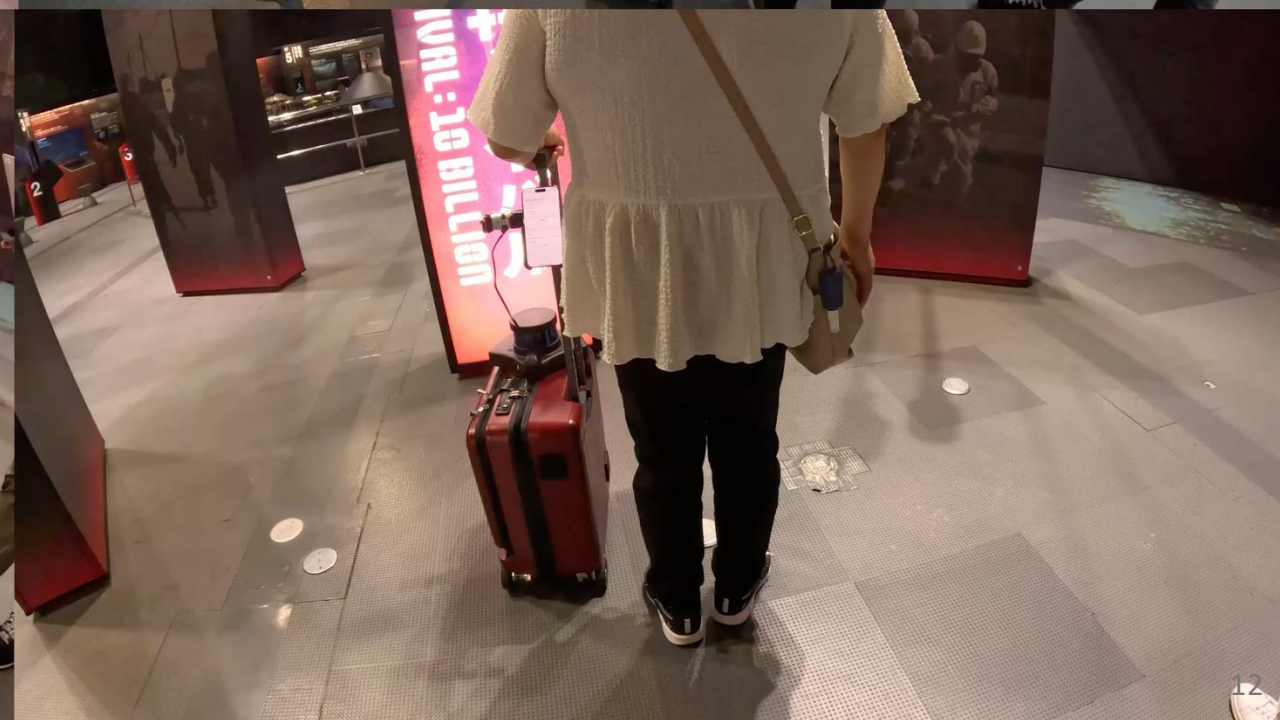
Implication 2: “Take-Me-There” Functionality

Revisit locations they found interesting after walking around the floor.

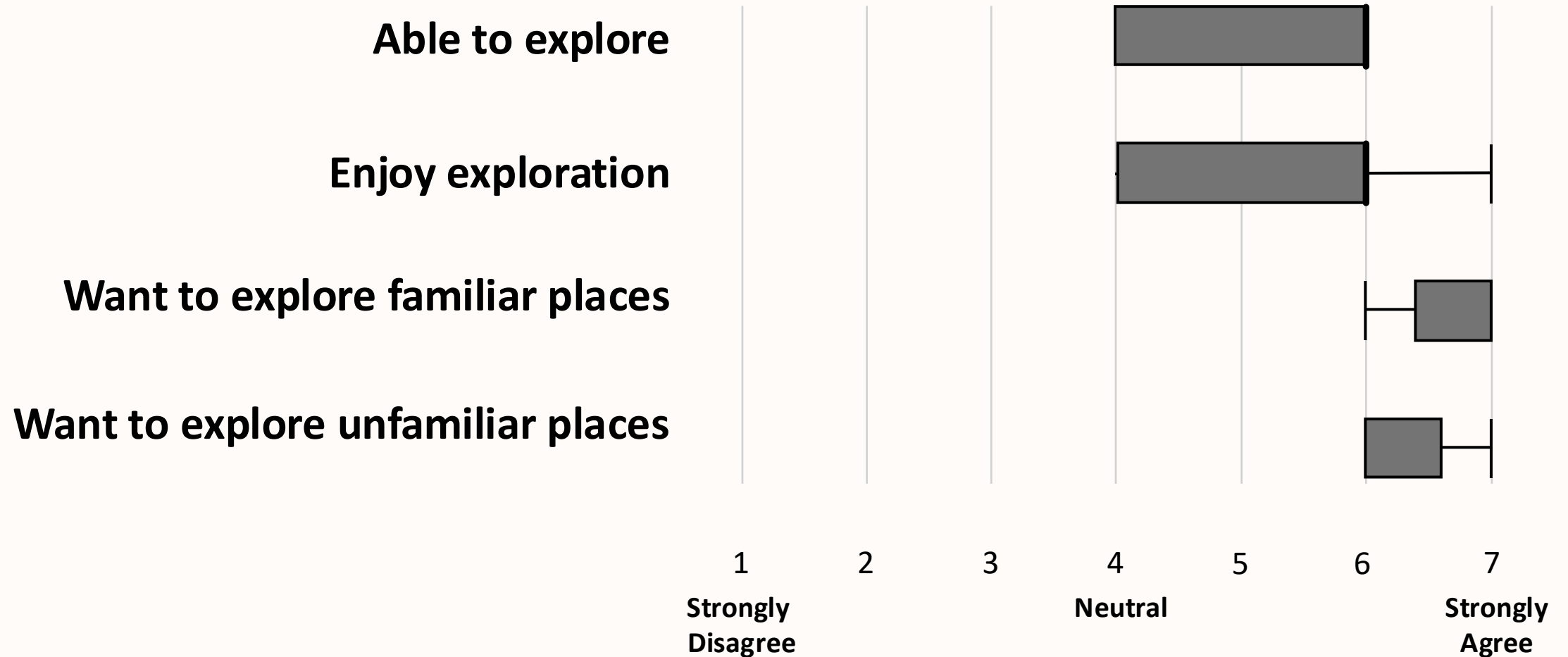


Main User Study with 5 Blind Participants

Task: Use WanderGuide for 20 minutes and explore the Science Museum Freely



Participants Enjoyed Exploration and Expressed a Desire to Use It in Various Locations



Participants Appreciated Experience of Exploring



*“[...] this navigation system that explains various situations, **it's exactly what I need**. It's not just about setting a destination and getting there but feeling the freedom to explore spontaneously. **For example, the ability to roam a large shopping mall freely and explore on a whim feels like true freedom to me.**”*

Design Validation: Participants Varied Description Level

Proportion of time spent using each description level

	Concise	Balanced	Detailed
P11	0.10%	76.46%	23.43%
P12	15.22%	29.88%	54.91%
P13	0.19%	49.14%	50.66%
P14	0.15%	87.94%	11.91%
P15	0.14%	99.86%	0.00%

Varying the Description Level Depending on the Context



*“It might depend on the location, but I know I can get detailed information in Q&A functionality. So, **for familiar places, the Balanced-Length mode might be fine. However, there are parts where I'd want the Detailed Description mode for unfamiliar places.**”*

Future Work: Need of Audio Recognition



“At a place like the exhibition hall we're visiting this time, various sounds are coming from all directions. This prompts questions like, “What's happening at that sound over there?”

*Therefore, **it would be nice if we could ask specific questions like, “What's that sound coming from the right?”** ”*

AI Suitcase Field Study at OSAKA EXPO2025

AI Suitcase Field Study at OSAKA EXPO2025

IBM Newsroom ニュースリリース お知らせ 受賞歴 リーダーシップ

Reservation now open for Autonomous Navigation Robot "AI Suitcase" Demonstration Experiment at the Osaka-Kansai Expo

Alps Alpine Co., Ltd.
OMRON Corporation
Shimizu Corporation
IBM Japan, Ltd.

AI Suitcase, an autonomous navigation robot

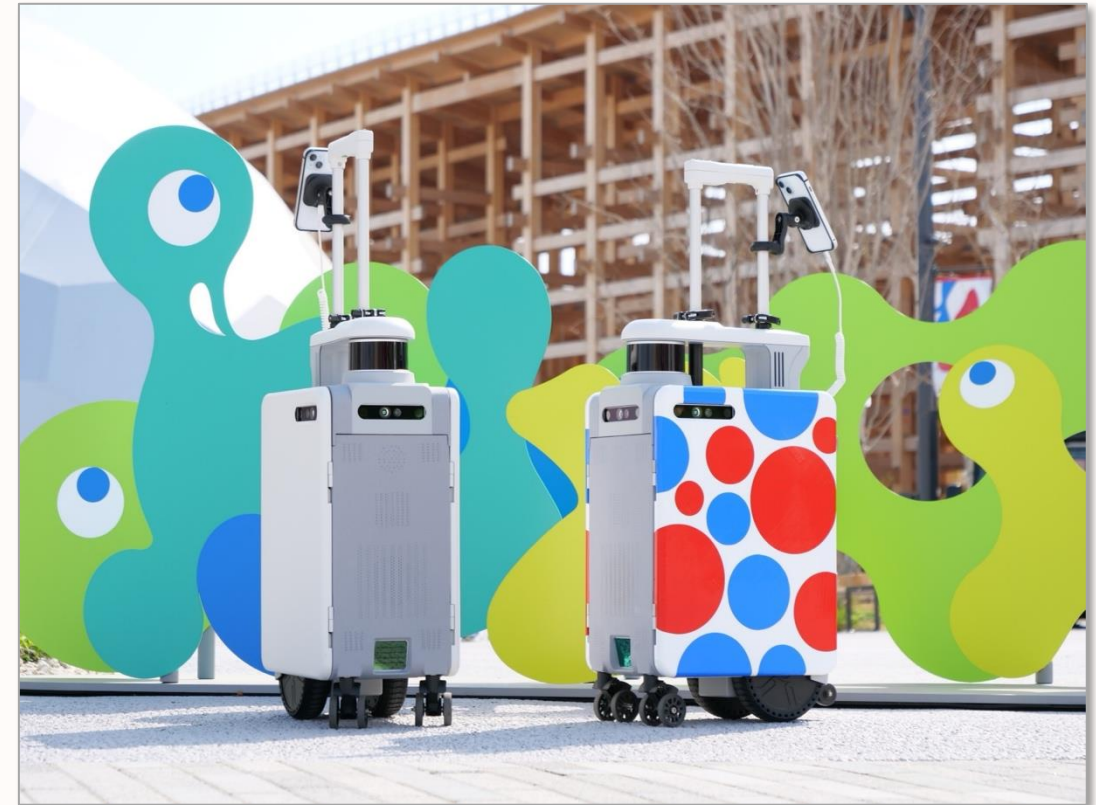
Robot & Mobility Station
April 13 (Sun) – October 13 (Mon, Holiday), 2025

The Consortium for Advanced Assistive Mobility Platform
March 2025

ALPSALPINE OMRON 清水建設 IBM
Miraikan

Smart Mobility Expo: Robot Experience | EXPO2026 EXPO2026 street outdoor ai
navigation communication sightseeing sharing cubio barrier free

The "AI Suitcase" is an autonomous navigation robot designed to assist visually impaired individuals. Equipped with a computer, sensors, and motors, it safely guides users while avoiding obstacles. Demonstration experiments have been conducted.





Function to adjust of description level (implication 1) is already integrated

WanderGuide: Indoor Map-less Robotic Guide for Exploration by Blind People

We tackled the situation where blind people explore in unfamiliar buildings where the navigation system has no prebuilt maps.

We designed a map-less system called WanderGuide with blind people and verified that they could enjoy exploring unfamiliar building.

For future work, we aim to integrate audio recognition to enable blind people to better understand the environment.

Supplementary Slides

Navigation vs **Exploration**

Exploration involves navigation as well as learning the environment

PathFinder^[3]

Map-less Navigation System

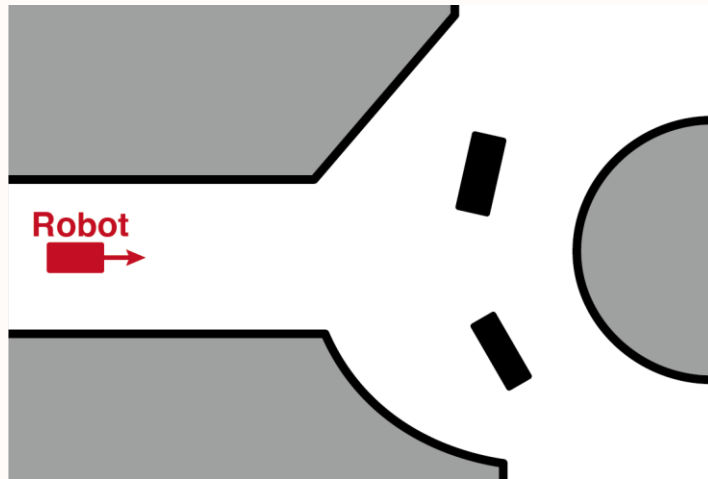


Blind People Have Difficulty in Exploring Independently

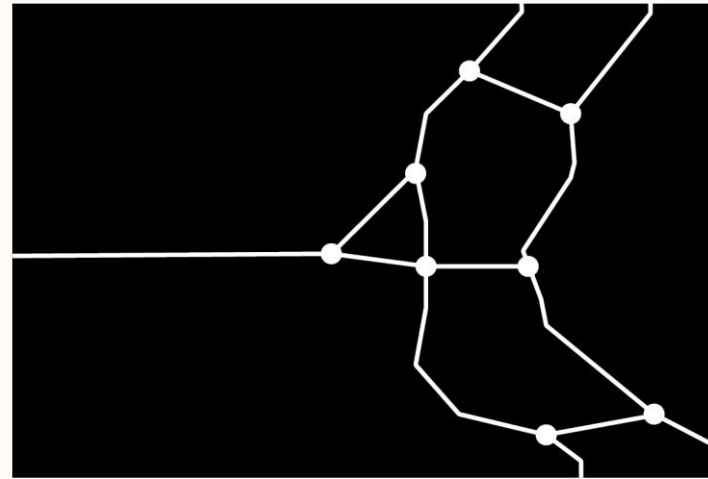
*“ It's not that I didn't care about exploring at all,
but perhaps I've been raised this way by society, to live without exploring ”.*

Waypoint Detection and Map-less Navigation Algorithm

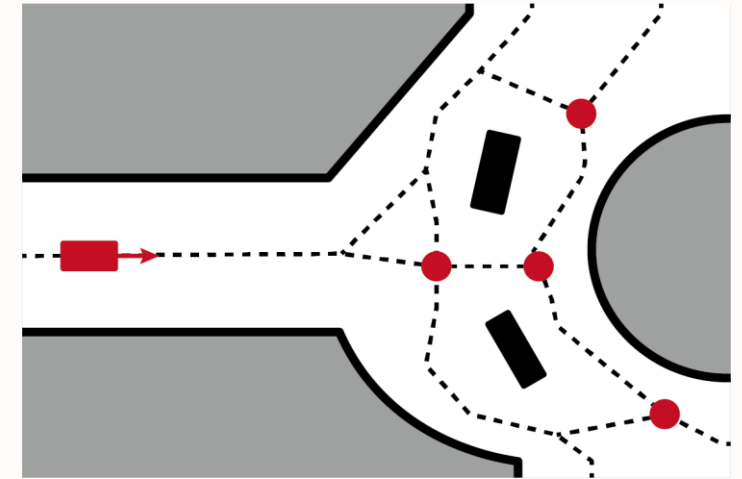
1. Obtain cost map from LiDAR sensor



2. Skeletonize Cost Map and obtain destination candidates

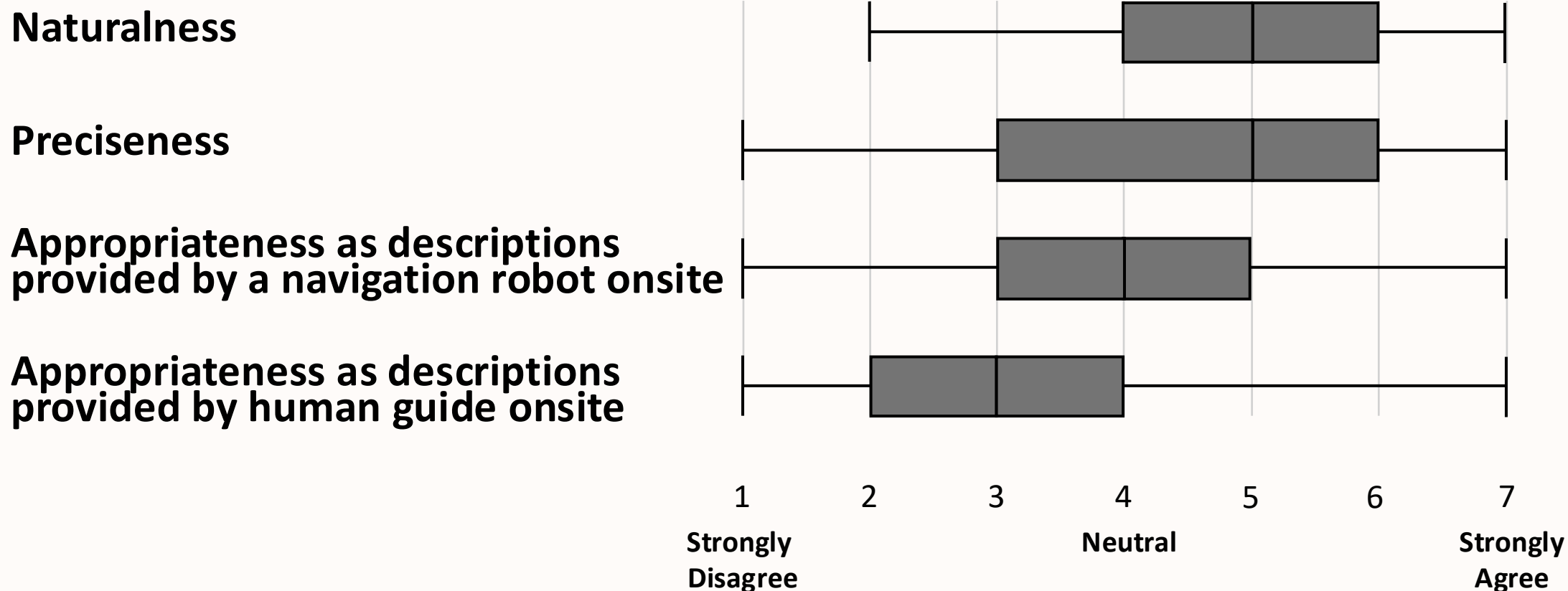


3. Filter out candidates and plans a path to the nearest candidate



Scene Description Evaluation with 56 Human Experts

Although blind participants appreciated the descriptions, human experts found them natural and precise but not suitable for onsite use.



Participants Appreciated The Sense of Independence



*“When walking with other people, I often find myself feeling a sense of obligation. I worry that they’re putting in extra effort to describe things because I can’t see. [...] **But with this system, I feel I can go strolling by myself**”*

Implication: More Concrete Information

MLLM often lacked concrete information, such as names of stores.

→ Equipped high-res fisheye camera in the higher position.

Before



After Update

