

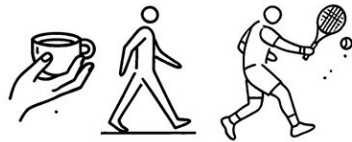
## Abstract

What if you could be guided not just by words or maps, but by the sensation of being pulled in the right direction? We are exploring a new form of multi-sensory communication that helps people with visual impairments - or those unfamiliar with their surroundings - to navigate intuitively through somatosensation. By combining the **Buru-Navi 4** compact haptic device with **Eye Navi** AI-powered environmental recognition via smartphone camera, we have developed a **real-world pedestrian navigation system that guides users to their destination with a tactile pull**. This breakthrough is a major step towards a more inclusive future where the world's 45 million visually impaired people - and anyone who needs navigation assistance - can move freely around the city. Through the fusion of traction force sensation and camera AI, we aim to **break down the barriers to mobility** and **pave the way for a society where everyone can walk with independence and ease**.

## Multisensory Communication



we perceive the external world and our own state through a variety of sensory information in everyday life.



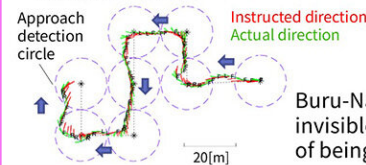
These sensory inputs allow us to interact with the world—enabling various actions.

While recent advances in ICT and AI have significantly improved text- and voice-based user interfaces, interactive communication involving haptic and force feedback remains underdeveloped.

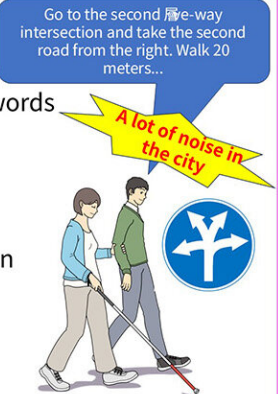


## Guided by a pulling force

- Explaining walking directions with words can be difficult in complex areas.
- In noisy urban environments, voice instructions can be hard to hear.
- For visually impaired people, being guided by hand by a companion is an effective way to navigate unfamiliar environments.



Buru-Navi can guide users along invisible paths by creating a sensation of being pulled.[1, 2]



## Haptic Force Gadget: Buru-Navi 4

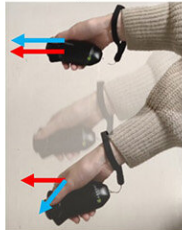
## ■ Buru-Navi :

A handheld gadget that uses asymmetric vibrations to present a traction force sensation to the hand.



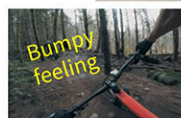
BuruNavi4 Finger Force

- Buru-Navi 4 can rapidly and continuously change the direction and intensity of the sensation of being pulled, allowing it to present consistent directional forces regardless of hand orientation. **Dir of traction force sensation** **Hand direction**



- It can also present various type of vibration sensation.

The rugged, bumpy feel of mountain biking on a rough trail.



## Collaboration between Buru-Navi and Eye Navi

- Buru-Navi 4 collaborates with Eye Navi [3], which detects obstacles and signals via smartphone camera AI.
- Smartphone app detects turns, obstacles, signals, and misalignment, and intuitively guide users by directional force cues and distinct vibration patterns—toward intuitive, stress-free navigation.

Eye Navi



Red pedestrian signal triggers a 'stop' vibration; green restarts directional haptic guidance.

Smartphone camera checks ahead

Haptic pattern changes when approaching a turn.



## References

- [1] H. Gomi, S. Ito, R. Tanase, "Innovative mobile force display: Buru-Navi," in *Proc. The 26th International Display Workshops*, pp. 962–965, 2019.
- [2] Sight World, <https://www.sight-world.com/>
- [3] Eye Navi, Computer Science Institute Co., Ltd., <https://www.eyenavi.jp/>

## Contact

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