# Assessment of Tactile Languages as Navigation Aid in 3D Environments

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Assessment of Tactile Vocabularies

We propose the use of prefixation as an approach to increase the expressiveness of tactile vocabularies. User experiments were conducted to analyze the effects of prefixation on the user's performance.

We designed and evaluated three alternative tactile vocabularies to support navigation in 3D environments. We also designed a vibrotactile display to deliver the tactile information.
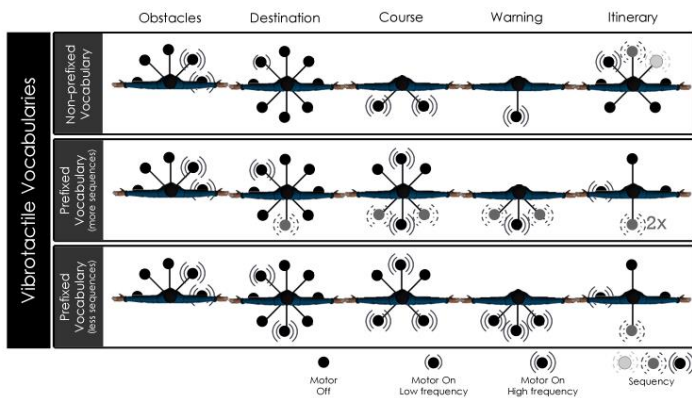
Tactile Belt

The vibrotactile display was constructed with eight electromechanical tactors. They were positioned at equidistant locations, so the user can identify each one when wearing them around the waist as a belt.

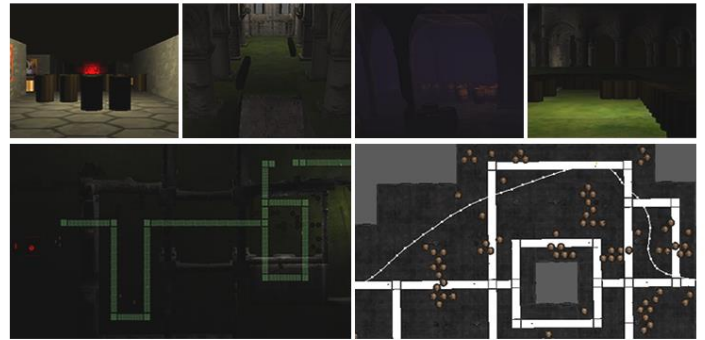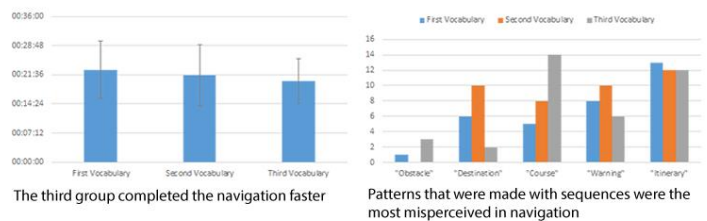| Obstacle | Destination | Course | Warning | Itinerary |

User Study

Perceptual analysis

Interpretation task

After a training section, the user performed a perceptual task and an interpretation task. Then, users navigated in four different scenarios. The lighting was uneven and its intensity decreased along the path to encourage tactile guidance.

The experiment results showed that the group that used the third vocabulary performed better. This vocabulary was the one with prefixation and had only one pattern delivered as a sequence.

The third group completed the navigation faster

Patterns that were made with sequences were the most misperceived in navigation

Conclusion

- We observed how user's performance is influenced by tactile sequences and a large number of stimuli at a time
- The modifier-based vocabularies had the best results
- Even if the processing of multiple stimuli at a time is more difficult, the way that the information was split into prefixation elements and iconic elements seemed to help the memorization