Active Vision with Human-in-the-Loop for the Visually Impaired

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Introduction

- Visually impaired (VI) people struggle to independently navigate in unfamiliar environments.
- A system that will allow such navigation will help the VI to, for example, better use existing facilities, use public transport and navigate unfamiliar places.
- In this project we endeavour to create a multi-modal navigation system, with co-adaptation capabilities and human in the control loop, that caters to the needs of the VI.
- The system will be based on the Google Project Tango platform as an Android app.

Motivation

- There are approx. 30 million VI people living in the EU and UK and this number is rising with an ageing population costing approx £30 billion per annum [1].
- Currently no widely-used navigation substitute for traditional white cane and guide dog.
- Guide dogs are often used, but are expensive to raise and train and have other shortcomings, like not being able to read signs, contextualising their environment and not allowed in some public places.
- System based on Google Project Tango platform, giving access to powerful localisation features and Android's mature development platform.

Project Objectives

1. Build **adaptive human-machine interface** with multi-modal feedback into a basic navigation system for a VI user.
2. Create efficient human control system for **place recognition** to enable a VI user to navigate an unknown environment.
3. Test, evaluate and validate the system with **real VI people** in an unfamiliar testing environment.

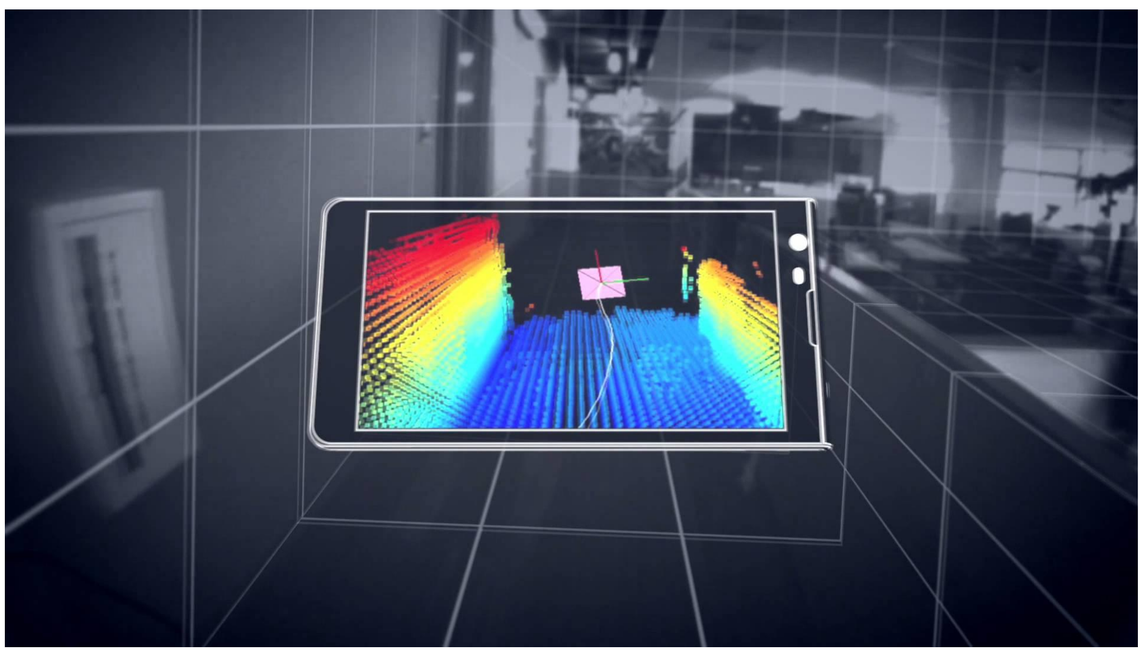
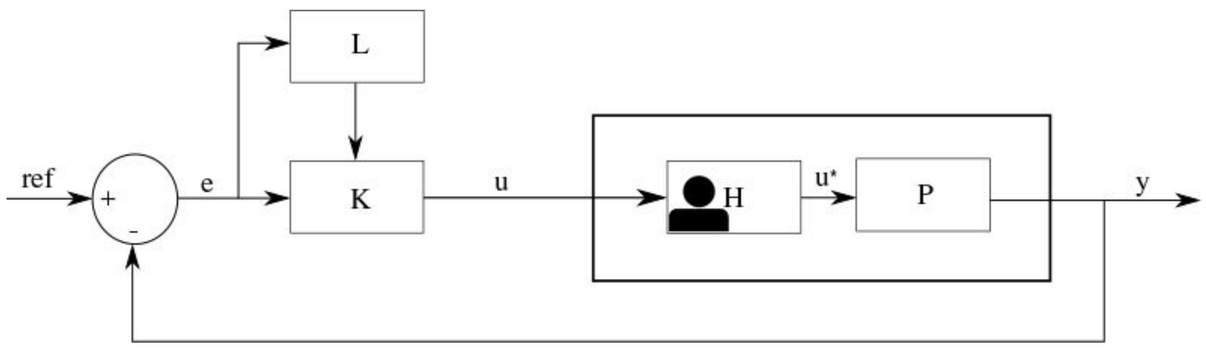


Image courtesy of Google

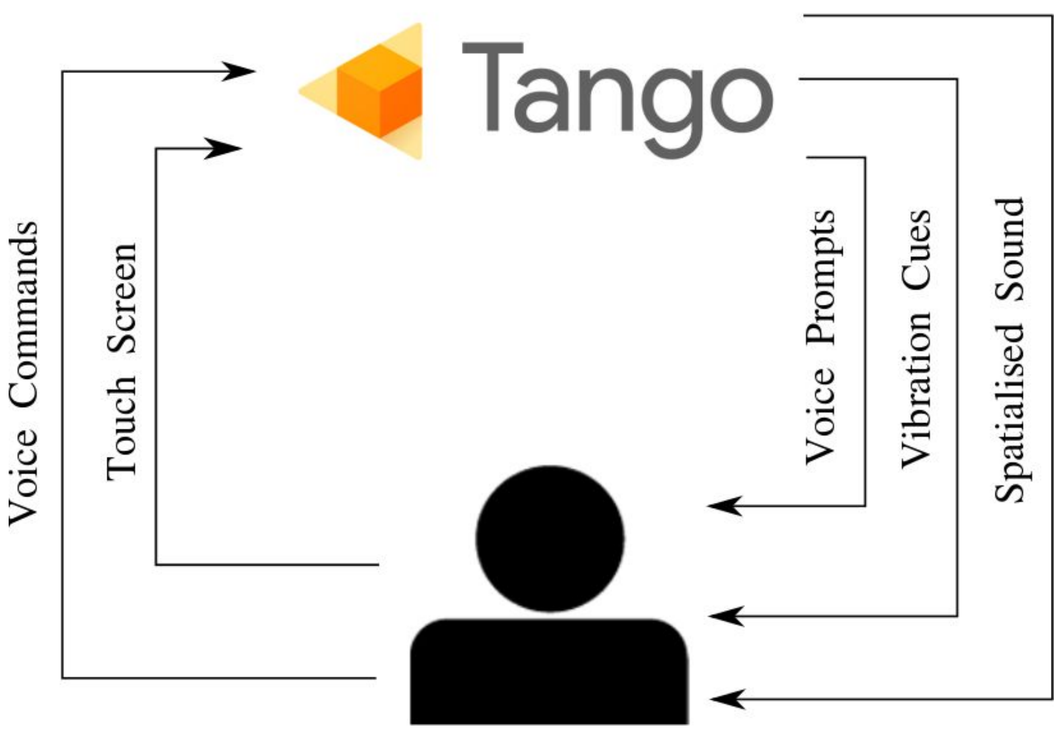
Concept

- We are making an interface for a VI user with multi-modal feedback. These modes include vibration, spatial audio and voice cues.
- We are also incorporating an adaptive module (L) which will adapt the interface parameters to the user's usage, improving navigation performance.



Project Progress

- Started building an adaptive, multi-modal interface.
- Also started testing different experimental setups and configurations to see how interface parameters affect navigation performance.



References

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2. *N. Bellotto*. A Multimodal Smartphone Interface for Active Perception by Visually Impaired. In IEEE SMC International Workshop on Human Machine Systems, Cyborgs and Enhancing Devices (HUMASCEND), *2013*.
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