Université Polytechnique HAUTS-DE-FRANCE

Workshop Entrain, Exploring New Territorial User Interfaces

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AR Glasses as a Navigation Assistance System to Extend Territory by Embracing New Navigation Knowledge & Skills

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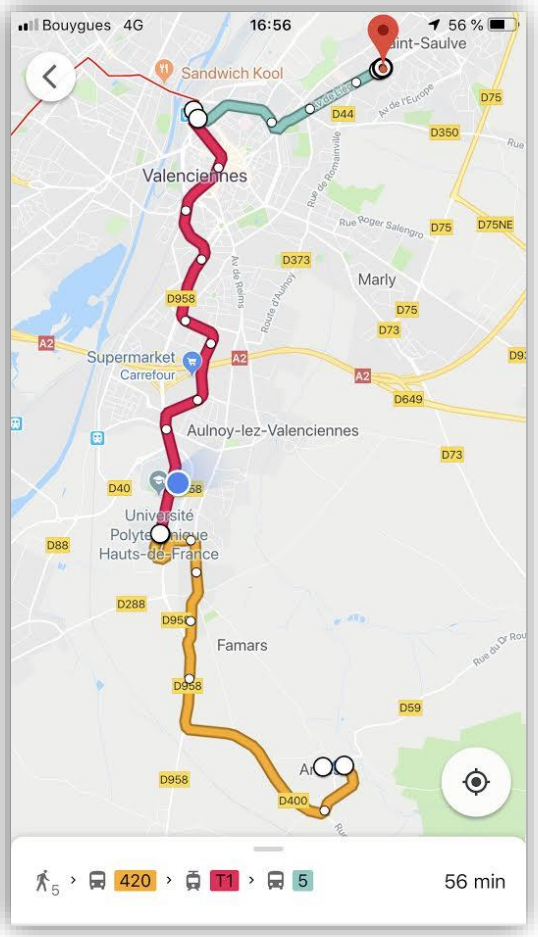
INSTITUT CARNOT ARTS

cnrs dépasser les frontières

PRIMOH

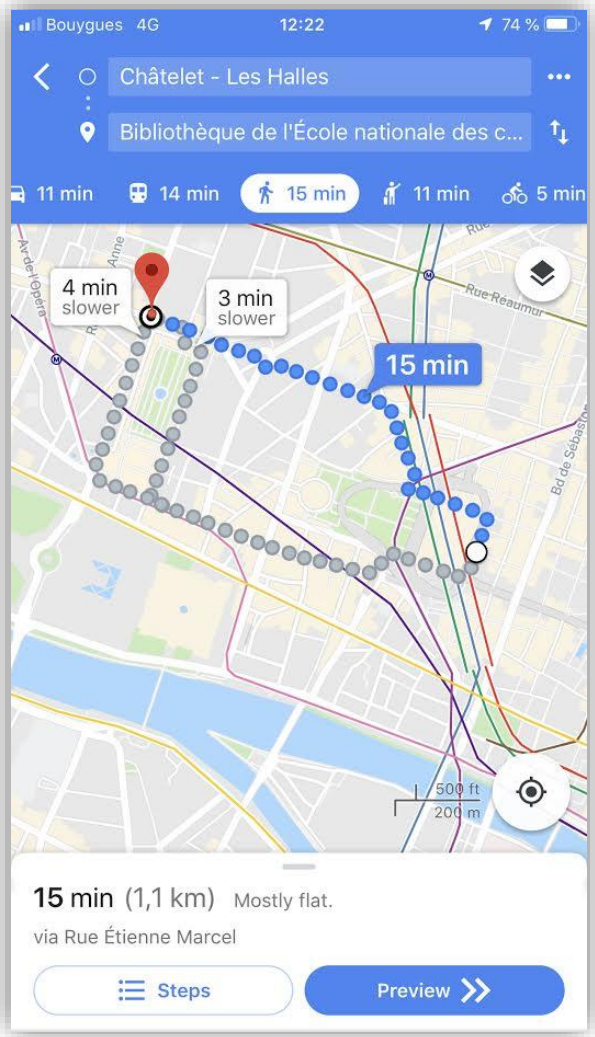
Introduction



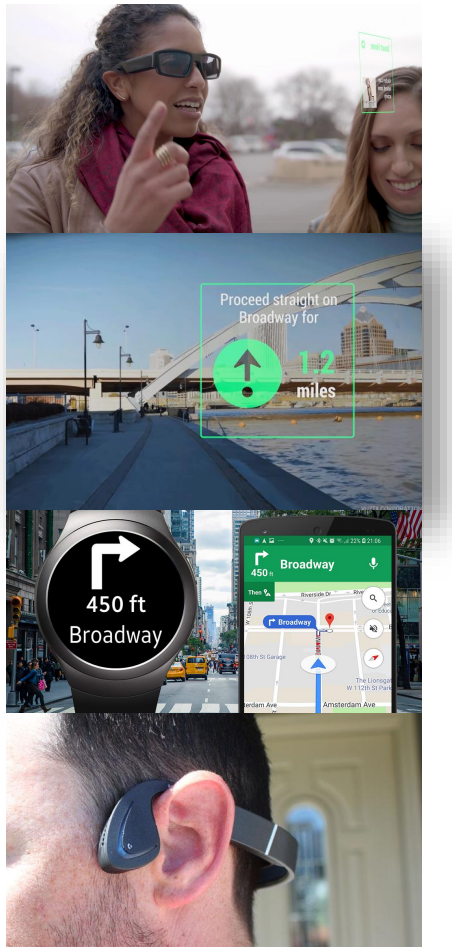
Mobility

- In urban environment
- With different public transport

=> Is often a complicated task!



Introduction



Haptic feedback

Confidentiel Industrie

CAYLAR TECHNOLOGIES PERCEPTIVES

Matrice tactile

Communiquer par le toucher

Un outil de communication innovant

La matrice tactile vous permet de recevoir des informations par la peau, sans utiliser vos yeux, vos oreilles ou vos mains. Grâce à une technologie vibratoire de haute résolution, vous ressentez des formes et des rythmes tactiles sur votre peau. En leur donnant du sens, vous créez votre propre langage tactile.

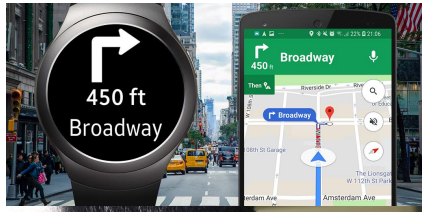
La matrice tactile est connectée

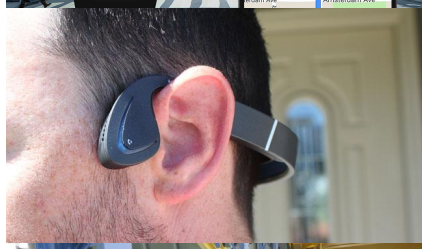
La matrice tactile vous permet de communiquer discrètement et à distance. Dans un groupe d'utilisateur, un message tactile peut être envoyé à une ou plusieurs personnes à la fois. Les messages tactiles peuvent être déclenchés manuellement par un tiers ou de manière automatique, en réponse à des capteurs et instruments de mesure.

La matrice tactile vous alerte et vous guide

La matrice tactile vous permet d'être alerté d'un danger ou d'une panne. Lorsque vous êtes immergé dans un environnement visuel et sonore riche, la matrice tactile vous aider à diriger votre attention vers une information prioritaire. La matrice vous aide à vous déplacer en vous guidant et vous orientant lorsque la vision et l'audition sont perturbées ou surchargées.

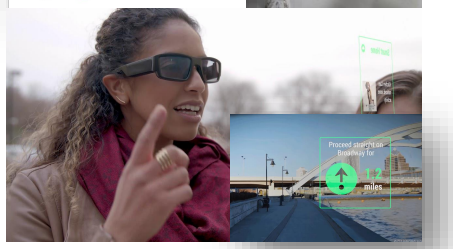
Introduction





AR Glasses

Introduction



Smart Watch & Smartphone

Introduction

Bone conduction Head phones

Introduction

How could we design an adapted and adaptive mobility assistance for people with ID?

How could we contribute to improve their **spatial navigation skills**?

How to avoid an aid giving **strict** instructions?

↓

In order to encourage **spatial knowledge acquisition**

Spatial Navigation

[Montello. 2005]

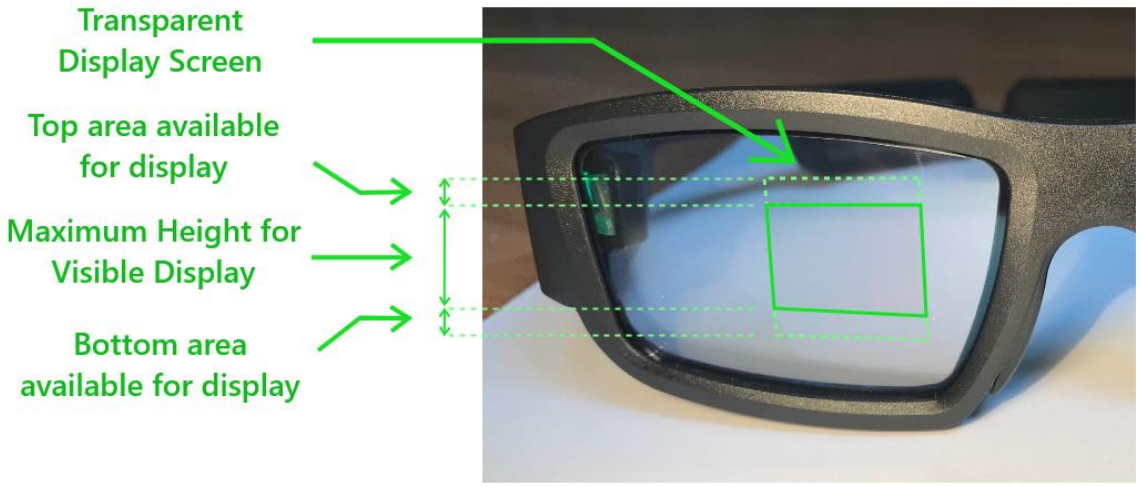
Wayfinding

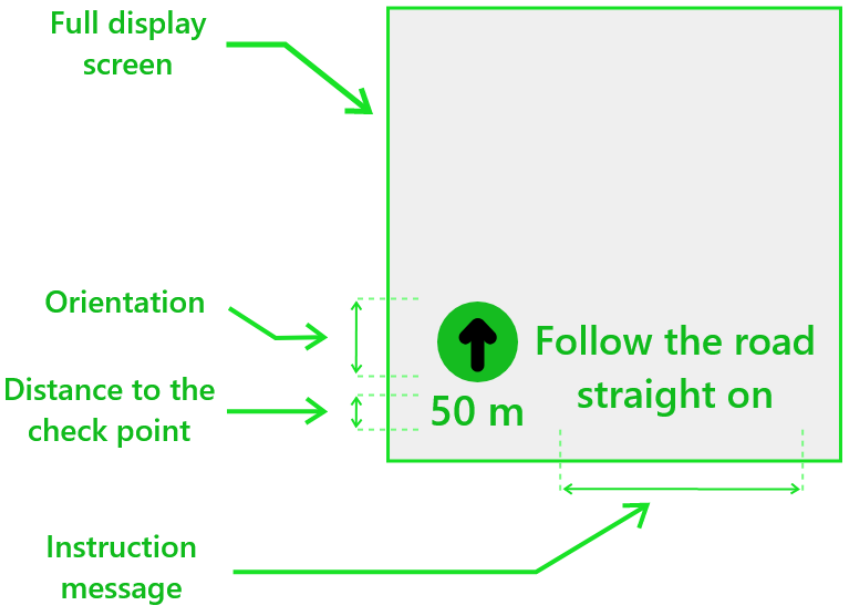
Cognitive process of determining and following a path or route between an origin and a destination [Golledge, 1999] [Letalle, 2017].

Locomotion

Movement of one's body around an environment, coordinated specifically to the local or proximal surrounds [Montello, 2005]

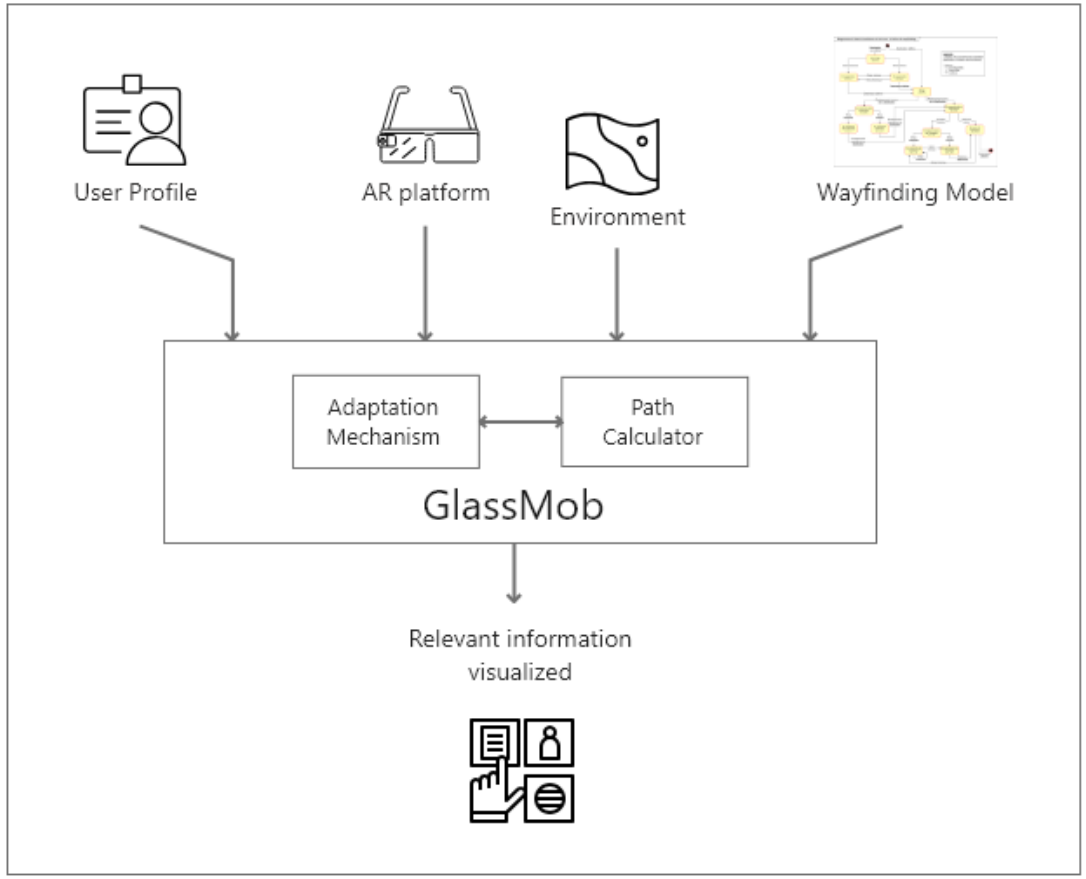
AR Glasses Design





Example of Landmarks

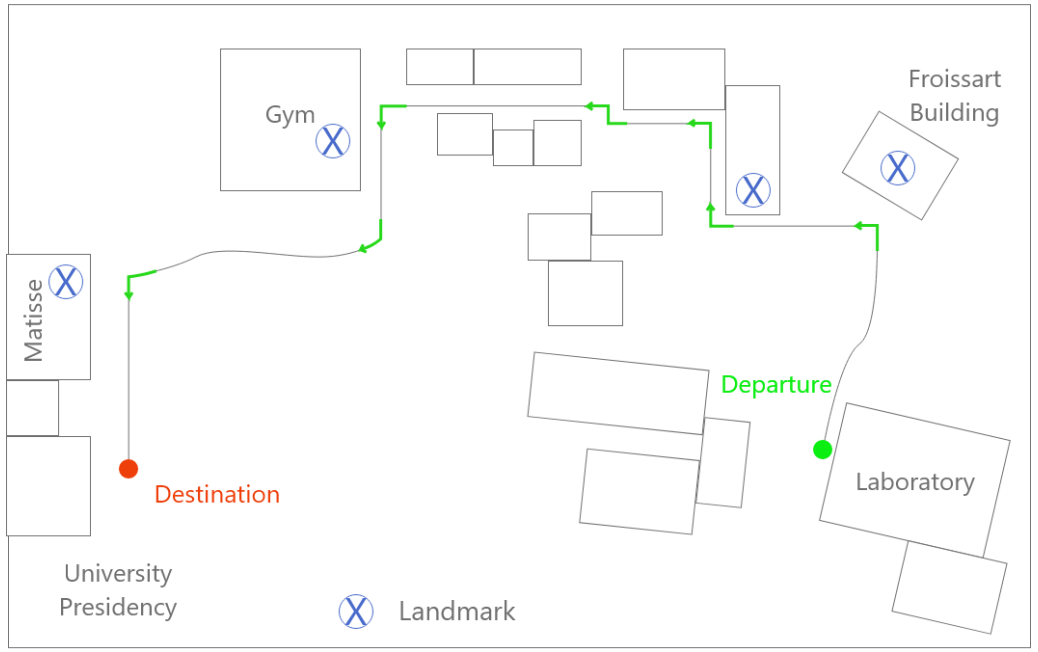
Mobility Assistance using AR Glasses: preliminary study



System Architecture

Mobility Assistance using AR Glasses: preliminary study

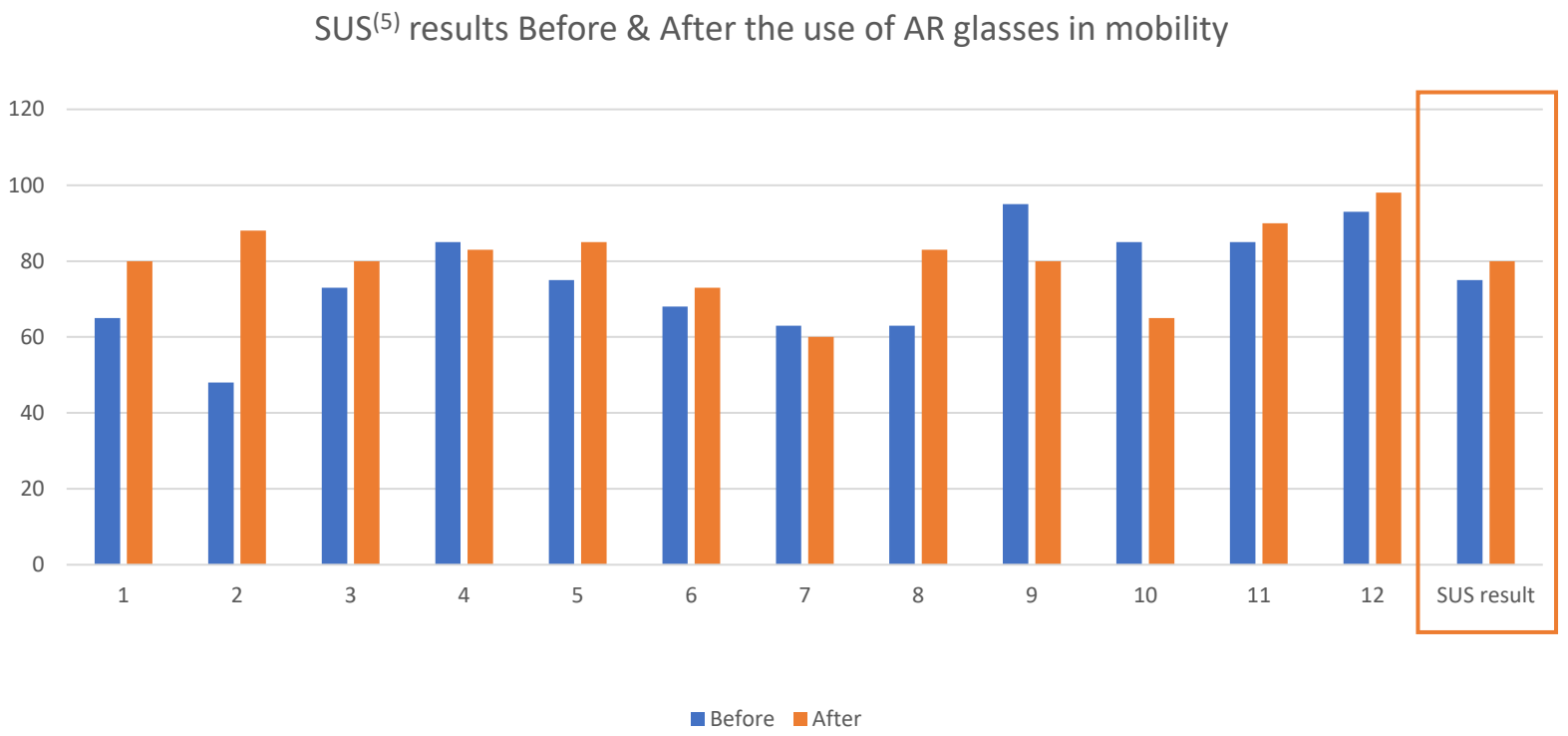
Vuzix Smartblade



- Continue for 150 m
- In 20 m, turn left in front of Froissart Building
- Continue for 50 m
- In 20 m, turn right behind the building
- Continue for 50 m
- In 15 m, turn left
- Continue for 40 m
- Turn slightly to the right and then continue to the left
- Continue for 140 m
- In 30 m, turn left in front of the Gym
- Continue for 40 m
- In 20 m, turn right
- Continue for 70 m
- In 20 m, turn left in front of Matisse Building
- Continue for 50 m
- In 20 m, your destination is on the right

Mobility Assistance using AR Glasses: preliminary study

Mobility Assistance using AR Glasses: preliminary study



5: System Usability Scale (SUS)

Comparative Study for Mobility Assistance using AR Glasses vs Smartphone

Learn the path using one device and just for one time

I-SITE
UNIVERSITÉ
LILLE NORD-EUROPE

University of Kent

EWAID GO-SMART

Lakehal A., Lepreux S., Efstratiou C., Kolski C., Nicolau P. (2020). Investigating Smartphones and AR Glasses for Pedestrian Navigation and their Effects in Spatial Knowledge Acquisition. *MobileHCI, 22nd International Conference on Human-Computer Interaction with mobile Devices and Services*, ACM, Oldenburg, Germany, october

Walking Path

Guidance Instructions:

1- Turn Left and follow the Footpath

2- Cross the road on the Zebra Crossing

3- Turn Left after the Phone Booth

4- Turn Right when you see the bus stop

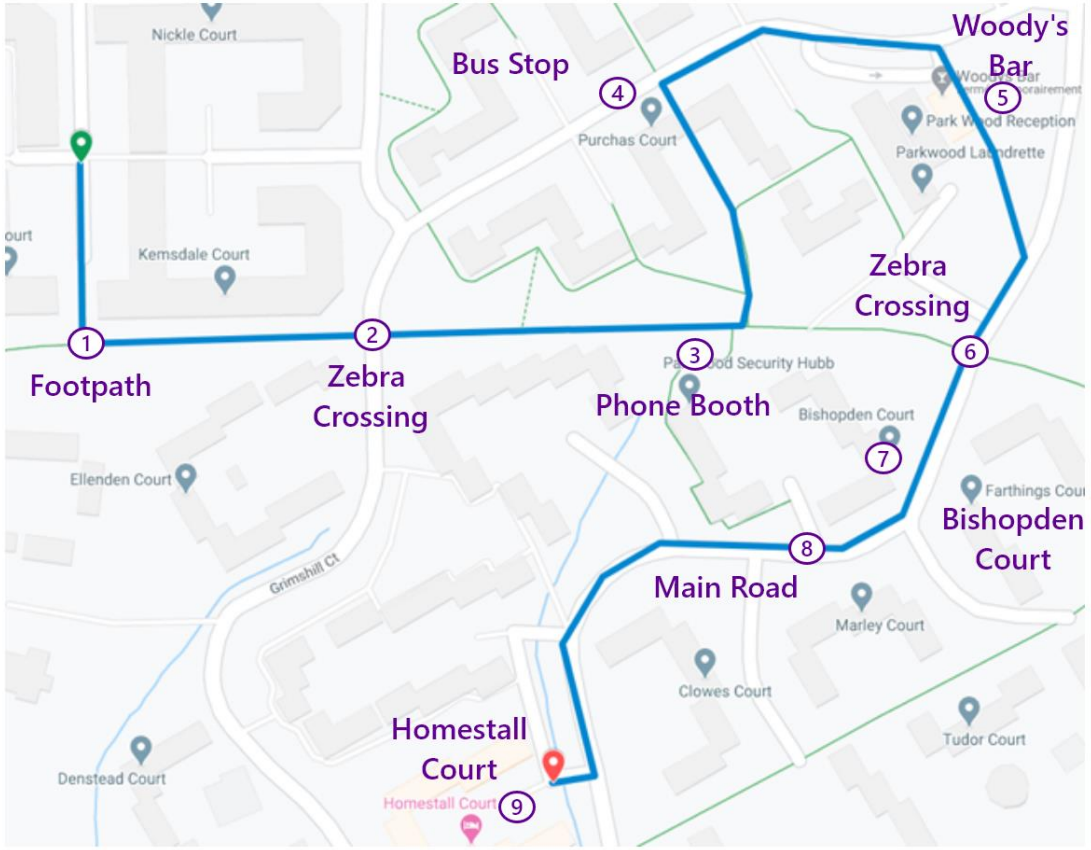
5- Slide Right in front of Woody's Bar

6- Continue Straight over the Zebra Crossing

7- Turn Right after Bishopden Court

8- Follow the main road

9- Your Destination is on the Right



- Location: Park wood in the campus of the University of Kent
- Distance: approx. 830m
- Average walking time (1): 10mns
- Number of decision points: 8 (9 landmarks highlighted)
- Two walks: the **1st walk** using one device (AR Glasses or Smartphone). The **2nd walk** is performed after aprox. 7 days without any support.

1: https://www.healthline.com/health/exercise-fitness/average-walking-speed#average-speed-by-age

Participants

- Total: 23 participants
- Completed walks by: 20 participants
- Gender: 5/10 males & 5/10 females for each device (AR Glasses or Smartphone)

Memory Tests

Example of landmarks:

- Court
- Bar
- Zebra Crossing
- Laundry
- Bus Stop
- Sports field
- Footpath
- Nursery
- Stream/river
- Reception building

Road
Footpath
Departure point
Start orientation

Instructions

- Draw the path you were navigating through.
- Mark the landmarks you remember from the list above (the list may contain odd elements).
- Feel free to add any comments on the other face.

For more details on the study, please refer to: https://arexperiment.wordpress.com/

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Thank you ☺

Any Questions ?

Lakehal A., Lepreux S., Efstratiou C., Kolski C., Nicolau P. (2020). Investigating Smartphones and AR Glasses for Pedestrian Navigation and their Effects in Spatial Knowledge Acquisition. *MobileHCI, 22nd International Conference on Human-Computer Interaction with mobile Devices and Services*, ACM, Oldenburg, Germany, October

Lakehal A., Lepreux S., Letalle L., Kolski C. (2020). From wayfinding model to future context-based adaptation of HCI in Urban Mobility for pedestrians with active navigation needs. International Journal of Human-Computer Interaction (accepted, 19 August 2020)

Letalle, L., Lakehal, A., Mengue-Topio, H., Saint-Mars, J., Kolski, C., Lepreux, S., & Anceaux, F. (2020a). Ontology for Mobility of People with Intellectual Disability: Building a Basis of Definitions for the Development of Navigation Aid Systems. HCI in Mobility, Transport, and Automotive Systems. Automated Driving and In-Vehicle Experience Design. HCII, vol. 12212, Springer, Copenhagen, Denmark, 322–334.

Montello, D.R. (2005). Navigation. In P. Shah & A. Miyake (Eds.), The Cambridge handbook of visuospatial thinking (pp. 257-294). New York: Cambridge University Press.

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