Queries in the Augmented Town

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Learning Navigation fromVisually Impaired People

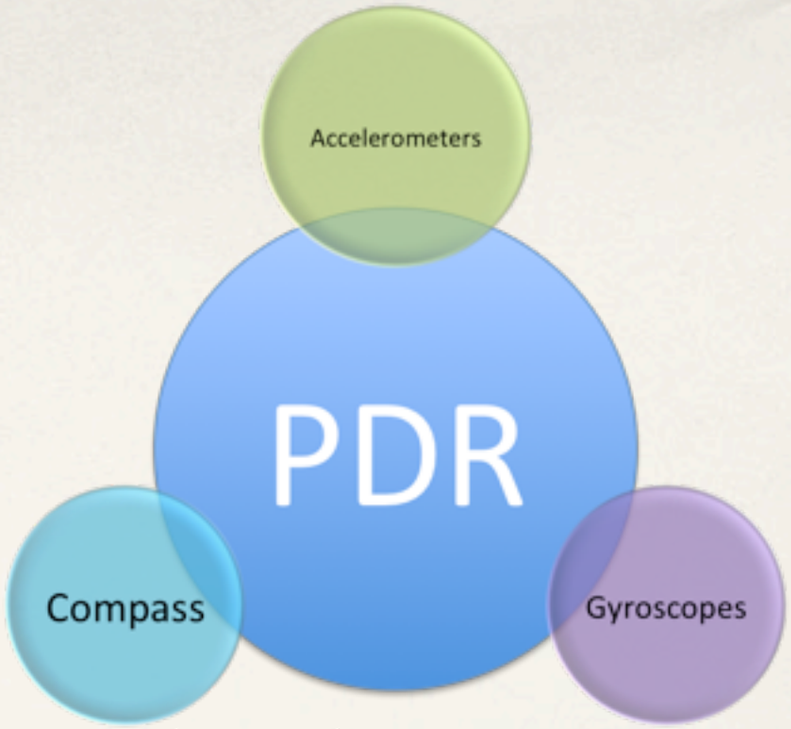
- Difficulties
  - in preplanning routes
  - in recovery from unexpected detours
  - maintaining heading
- But
  - **seek independent travel**
  - **considerable success at it**

Learning fromVisually Impaired People

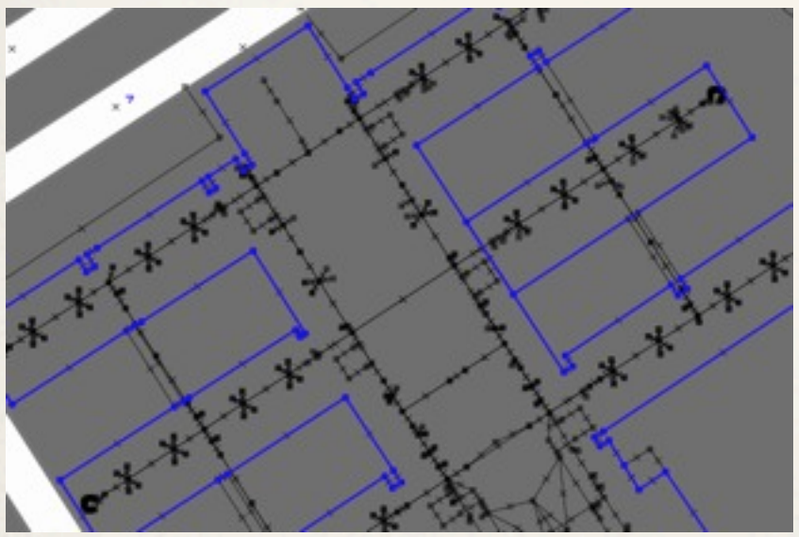
- They may use
  - Path integration ----> Inertial Measurement Unit
  - Auditory cues ----> Synthetic 3D binaural audio

- Regular layout such as a city or building ---> OpenStreetMap (OSM) modeling

Three Main Concepts



- Inertial Measurement Unit ----> Pedestrian Dead Reckoning
- Augmented Reality Audio ---> XML Language for Interactive Audio
- MAP ----> OSM (XML)



OSM model of a building

HRTF Measurement
at IRCAM, Paris

Regular Layout in Outdoor

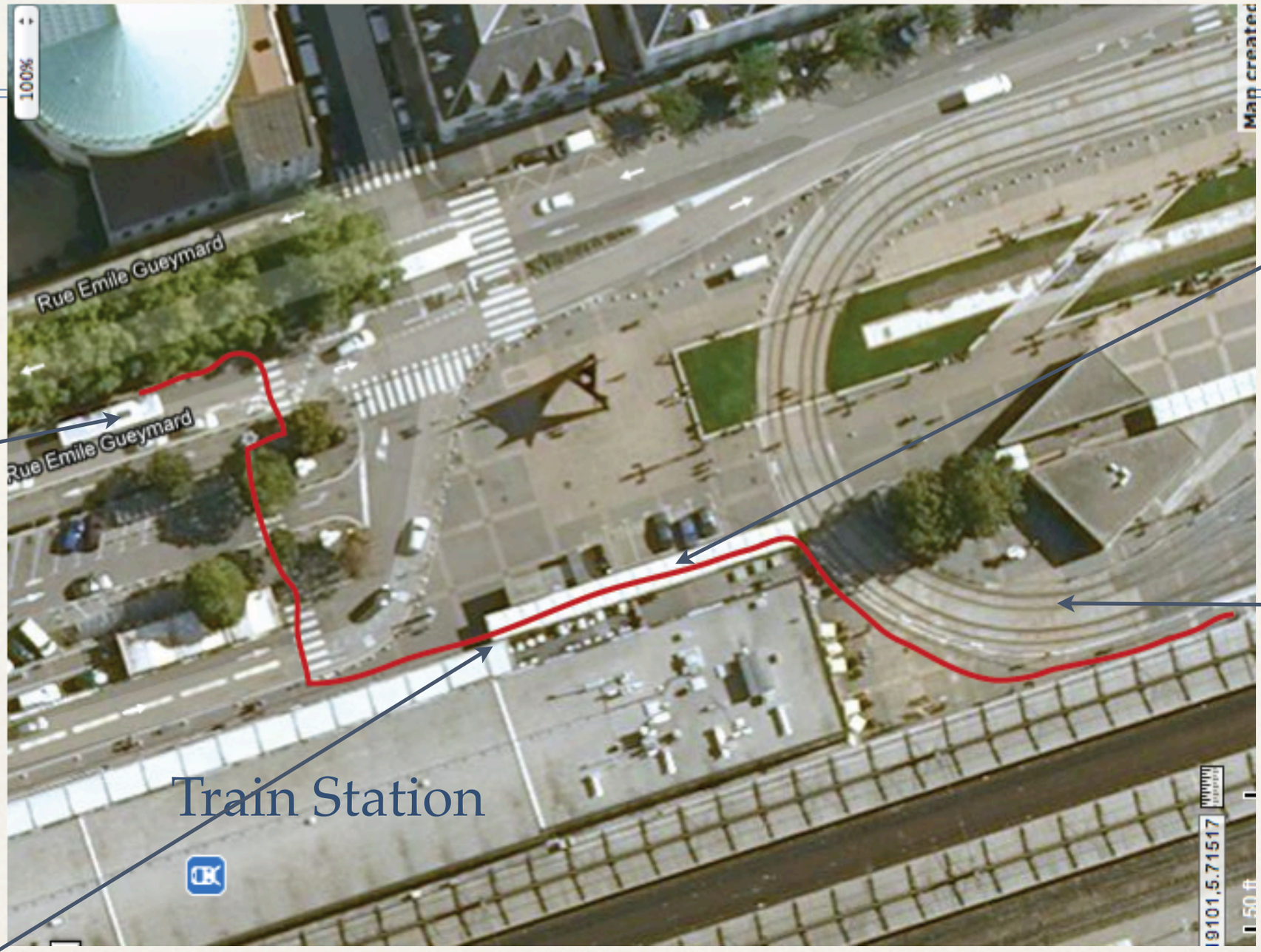
Pedestrian navigation is structured by

- Pedestrian crossings
- Sidewalks
- Pedestrian streets
- Tactile paving
- Poles
- Urban furnitures

Next Generation Accessible Pedestrian Navigation Systems

- One step precision, running indoor & outdoor on mobile phones
- Interactive Queries on :
  - the environment
  - Urban information systems
- Mix of vocal & 3D audio instructions
- Remote assistance
- Energy efficient

A Pedestrianway in Grenoble



Bus Stop

Audio Queries

Covered Passageway

GPS

Tramway

IXE : Pedestrian Navigation Software running on Mobile Phones

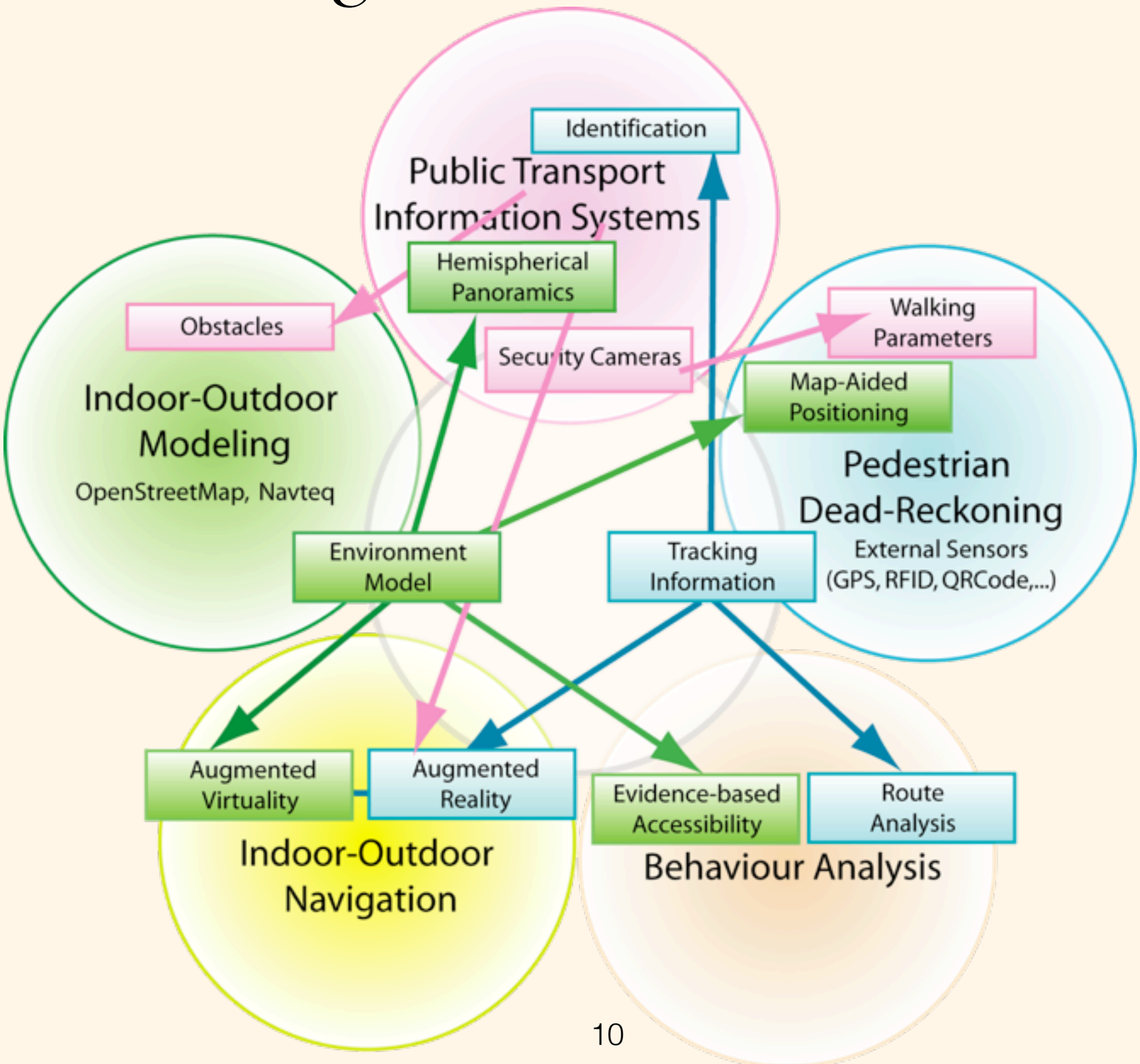
Accessible Navigation using IXE

Accessible Pedestrianway Networks

A city pedestrian plan:

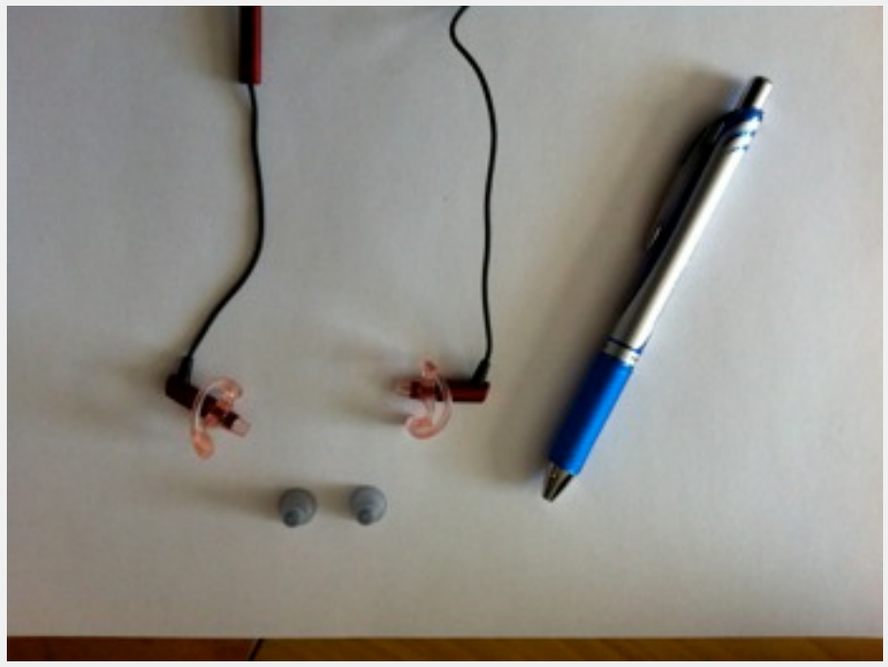
- Complete the pedestrianway network in 3 years
- Ensure the safe and confortable year round operation of pedestrainways through design, signage (NFC), enforcement and maintenance
- Connect network to public transport system

System for Urban Navigation in the Augmented Town



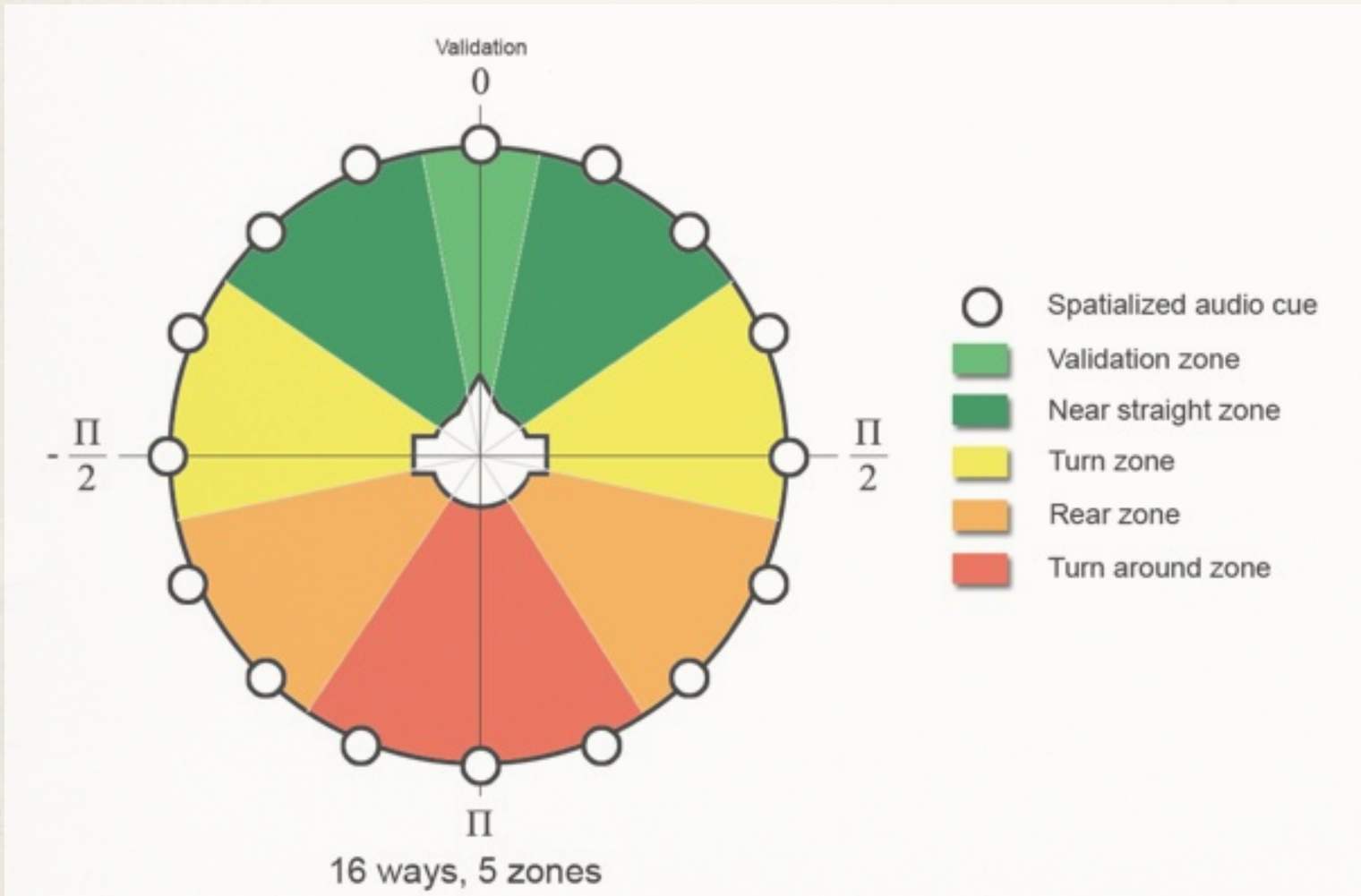
Accessibility for Visually Impaired People

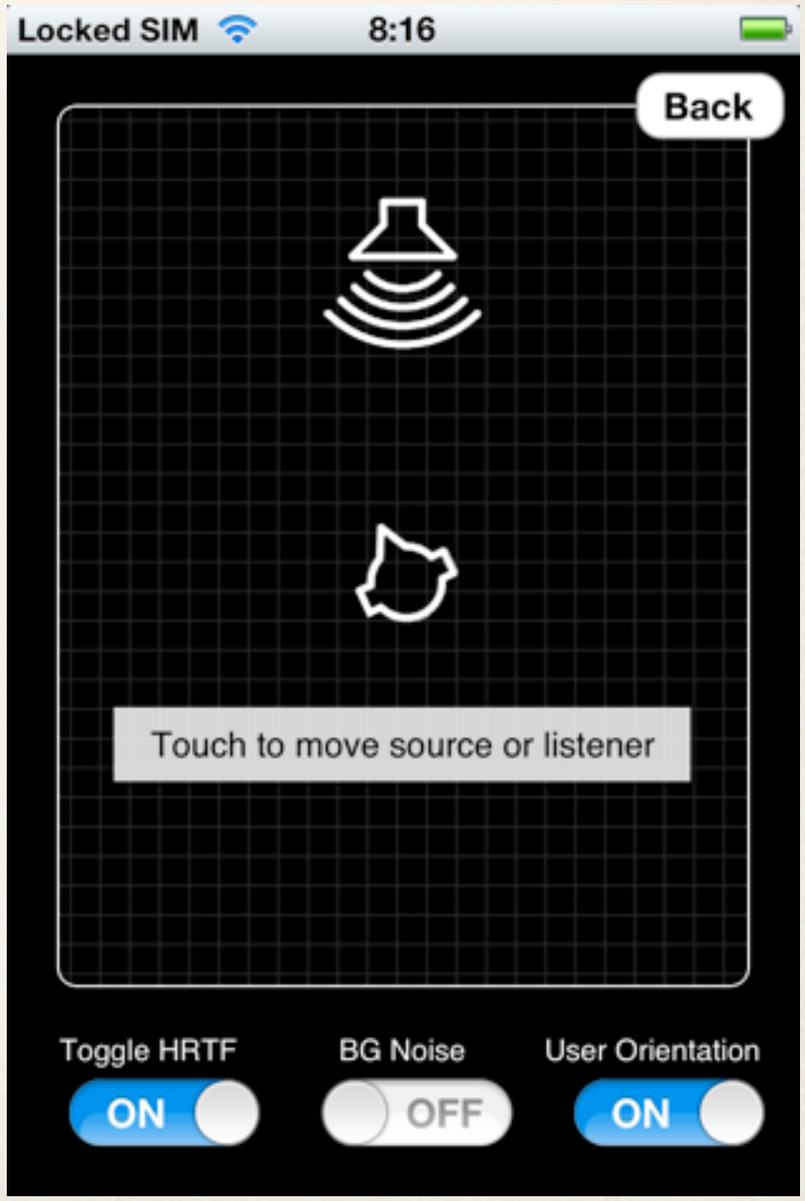
- Queries through gestures
- Guidance by mixing of real & synthetic sounds
- Personal remote assistance to reassure
- Voice Over for phone's user interface
- Usable all the day (energy efficient)



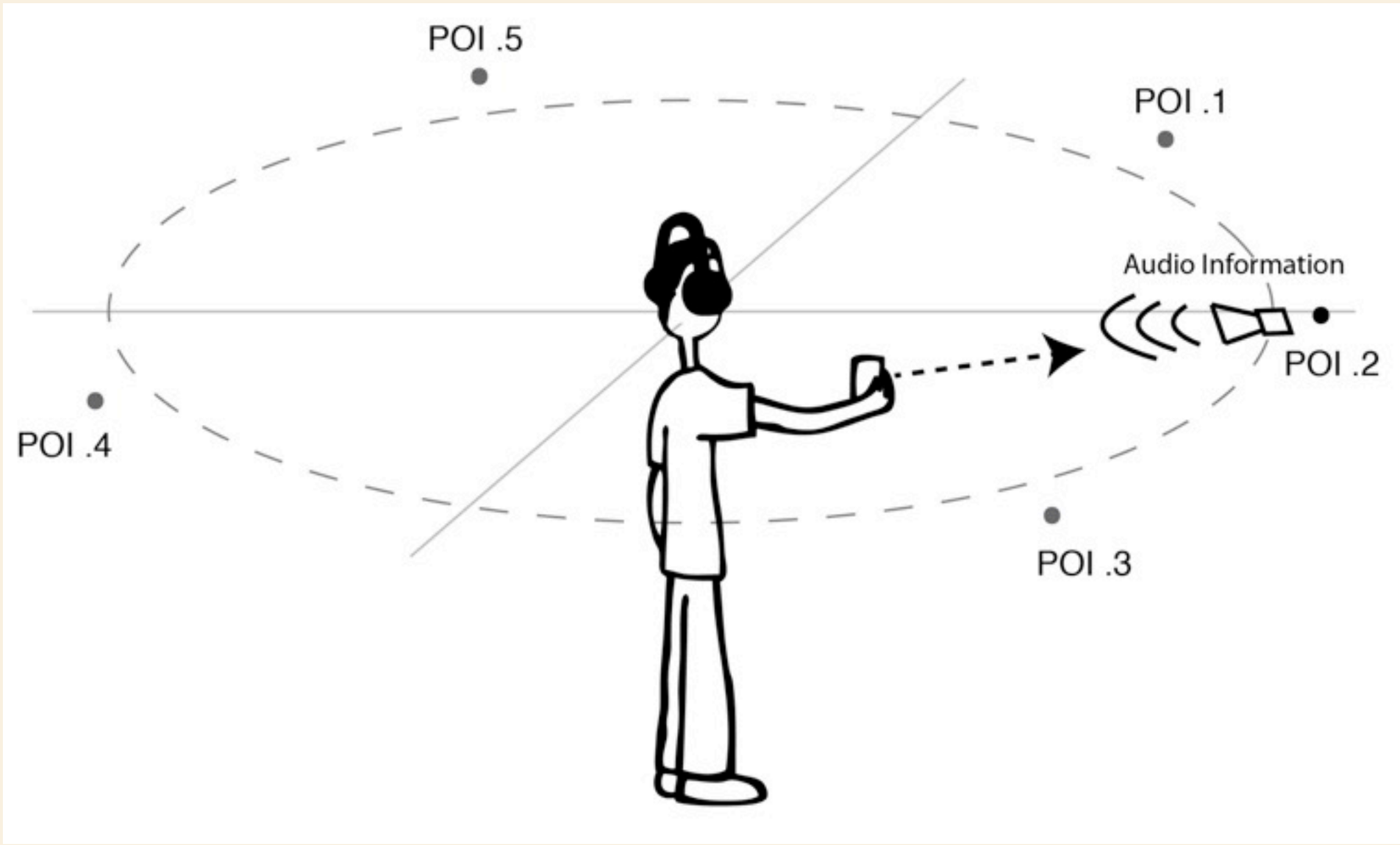
Airtube earphones

Queries: 3D Audio Pointer





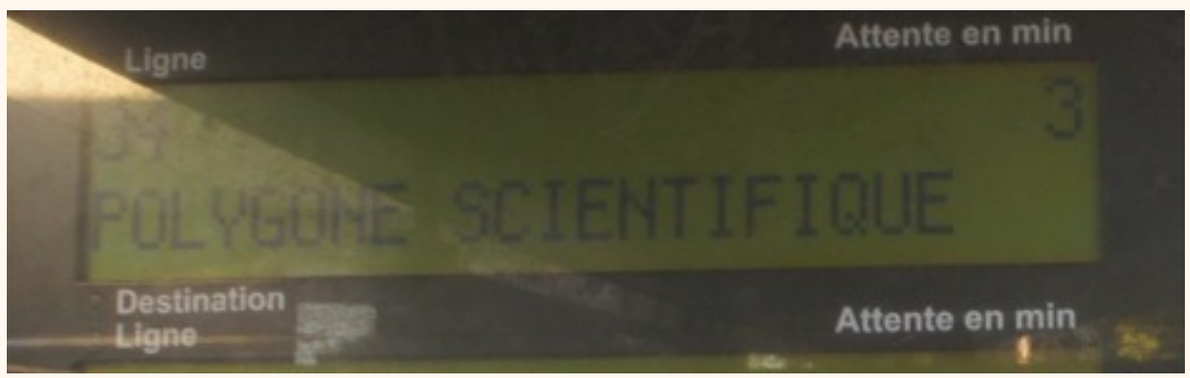
Querying Audio POIs



Real Time Data from Transport System

- Already done or in test for urban transport like buses or tramways

- To be done for railways station and airports by using information embedded in electronic tickets



Outdoors Queries

[Environmental Queries using IXE]

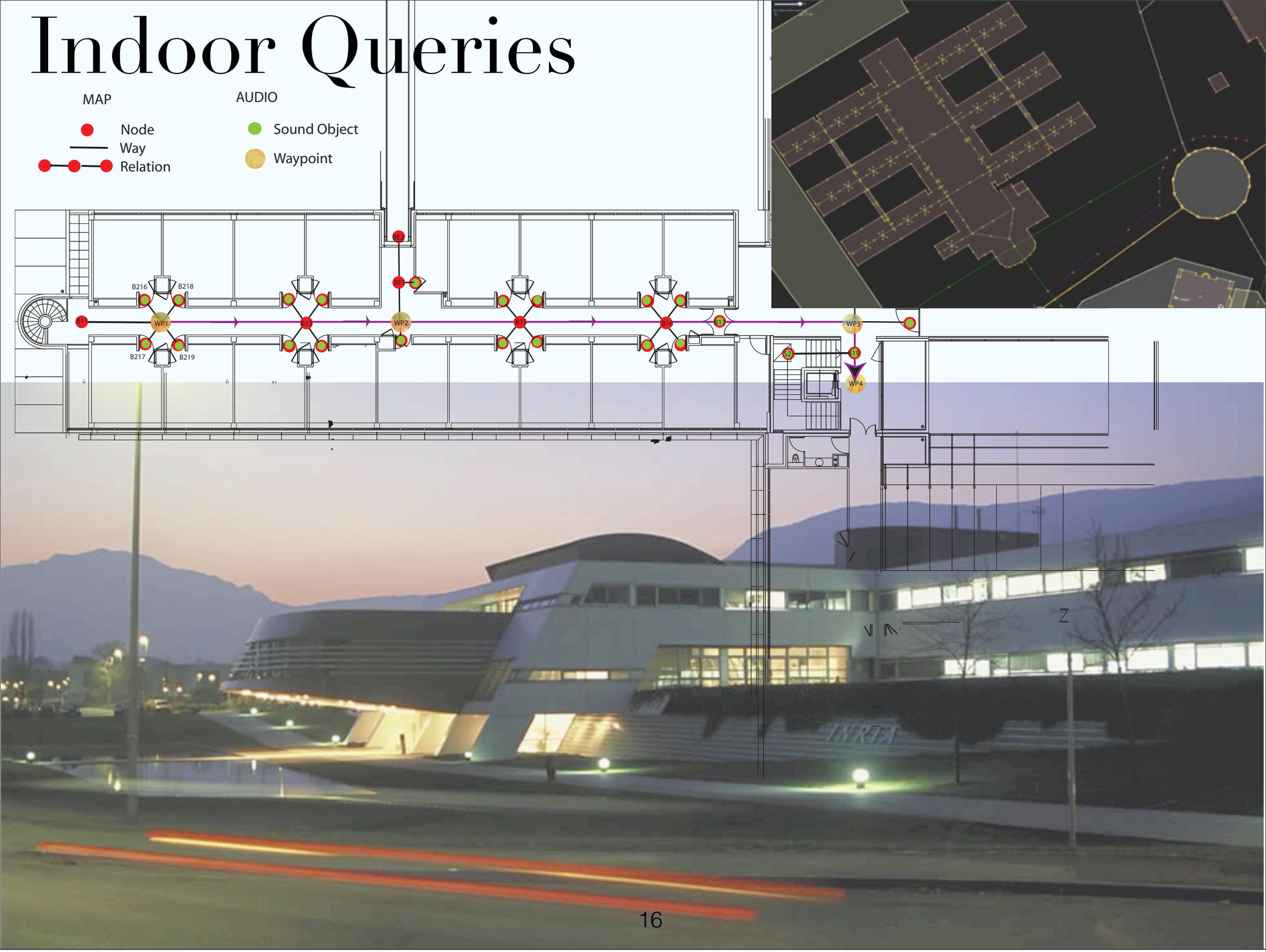
Indoor Queries

MAP

- Node
- Way
- Relation

AUDIO

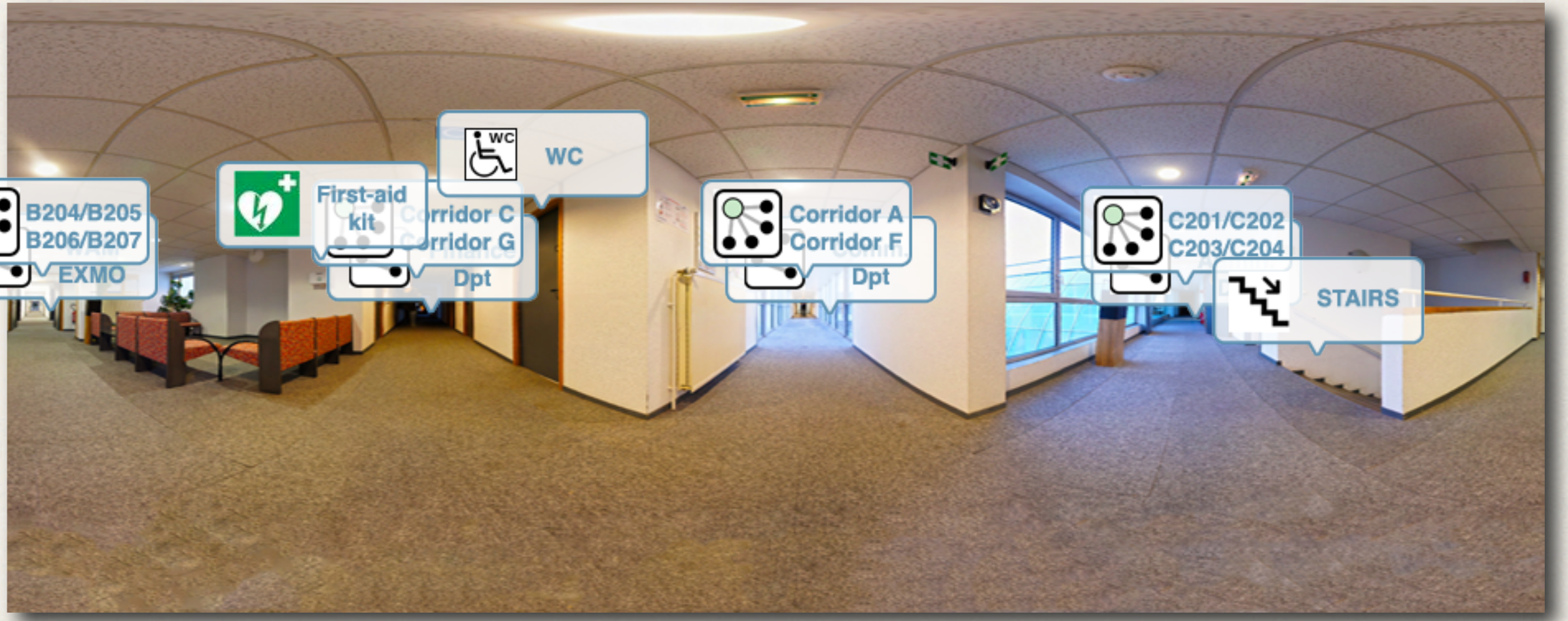
- Sound Object
- Waypoint



Indoor Queries

Gestures

- «Push» to select query level



Level 1 : Nearest Point Of Interests	*Level 2 : OSM Ways*	*Level 3 : OSM Relations*

Indoor Queries

[Indoor Queries using IXE]

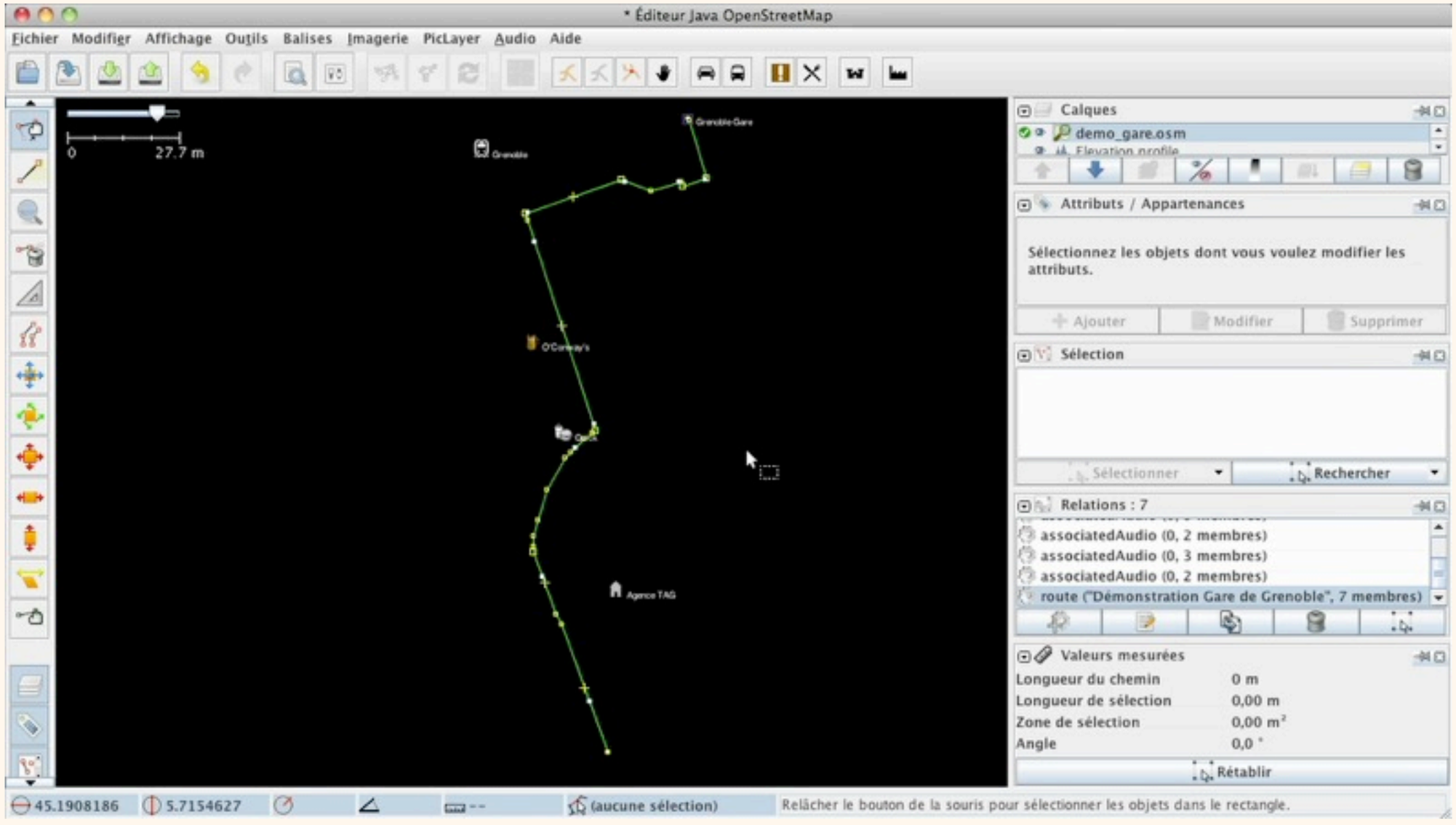
OpenStreetMap (OSM)

- Free map of the world
- Not only tiles like with google maps
- Semantic data
- wiki based

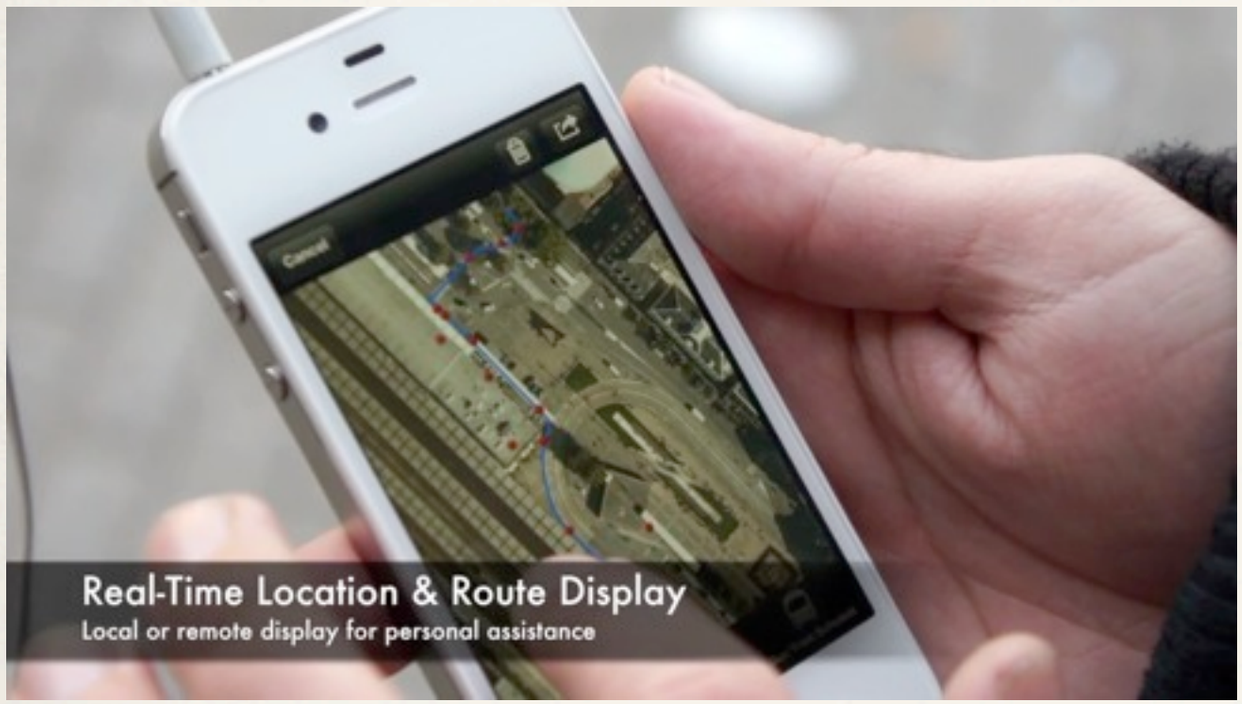
OSM for the blind

Tactile_paving= incorrect

Pedestrianways authoring using JOSM



Remote sighted guidance



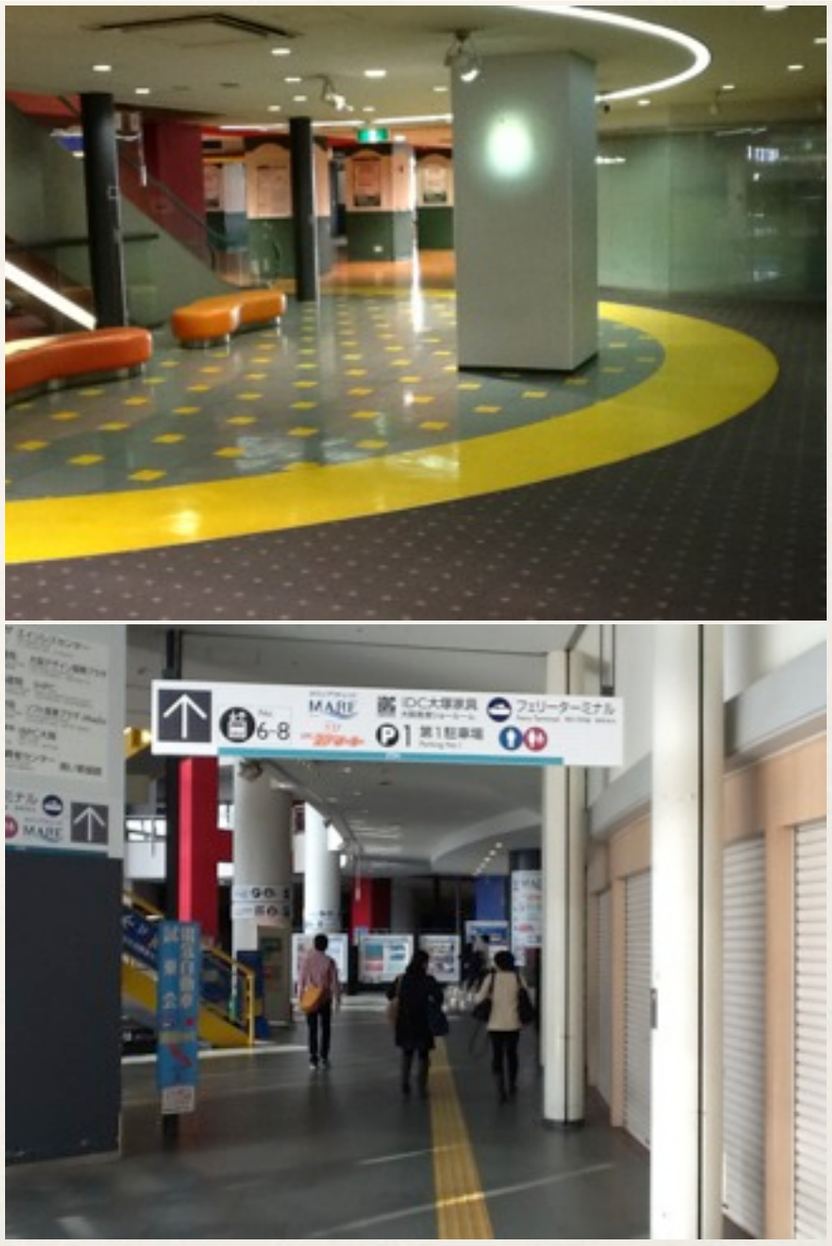
Private help

Call-center

- Remote sighted guidance can replace IMU-based guidance when integrity tests show that something is wrong with path integration due to unexpected obstacle, magnetic disturbance, ...

IXE V2 (2013)

- IXE will be enhanced by :
  - Micro-navigation using computer vision
  - Look-around mode using GPS
  - Obstacle detection
  - Support for external MEMS sensors



IXE V2 : Obstacle Detection

IXE V2 : Obstacle Detection

IXE V2 : External Module

Wheelchairs Caddies Bikes

IXE application in progress: Guidance on tactile paving (Japan)

WAM Project Team

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ventuRi

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