RUNN 2019

ACCESSPACE: une aide portable pour la navigation autonome des déficients visuels

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Scannez-moi

1 Contexte

Navigation autonome des DV

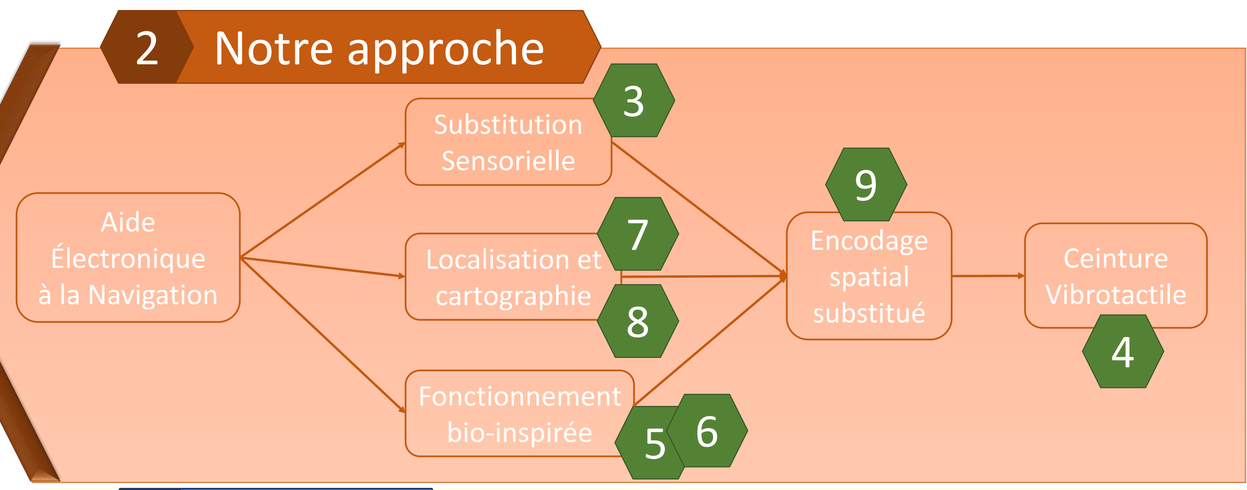
Représentation spatiale
- Information à fournir ?
- Quelle interface ?
- Quel format / code ?

Localisation et guidage
- Quels capteurs ?
- Quels algorithmes ?
- Comment guider l'utilisateur ?

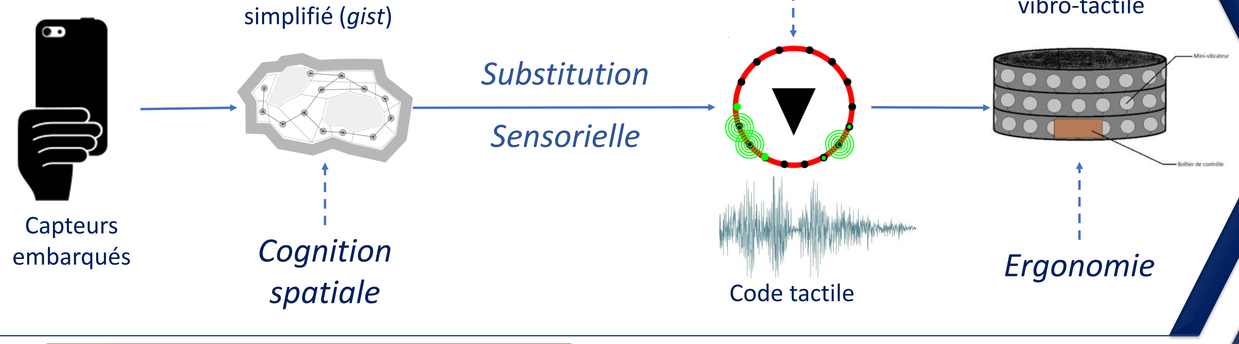
DV : 1 700 000
Av. : 207 000

DV : 26 350 000
Av. : 2 550 000

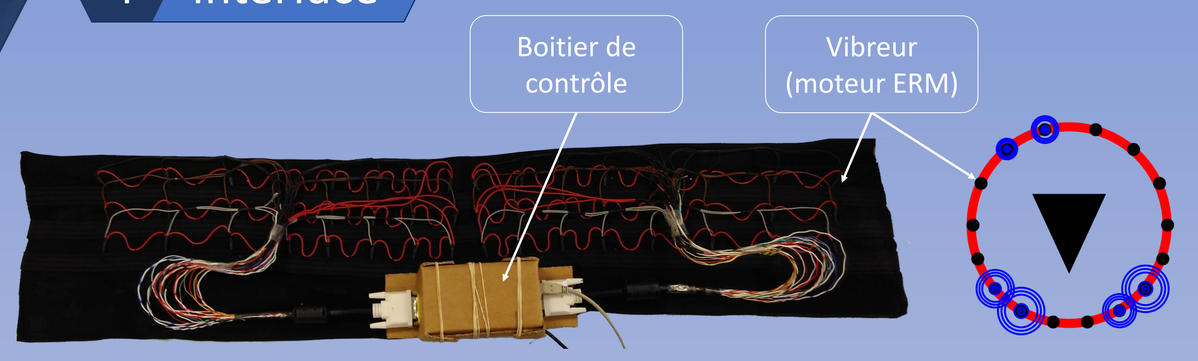
2 Notre approche



3 Notre dispositif



4 Interface



Tactibelt — Egocentré — Spatialisé — Dynamique — Parallèle

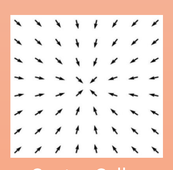
5 Cognition spatiale

Entrées sensorielles
- Vision
- Audition
- Proprioception
- Kinesthésie

Système de Navigation

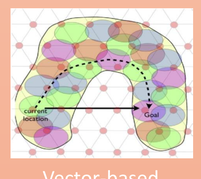

Grid Cells


Place Cells

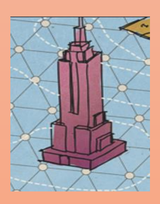

Center Cells

Représentation spatiale parcimonieuse

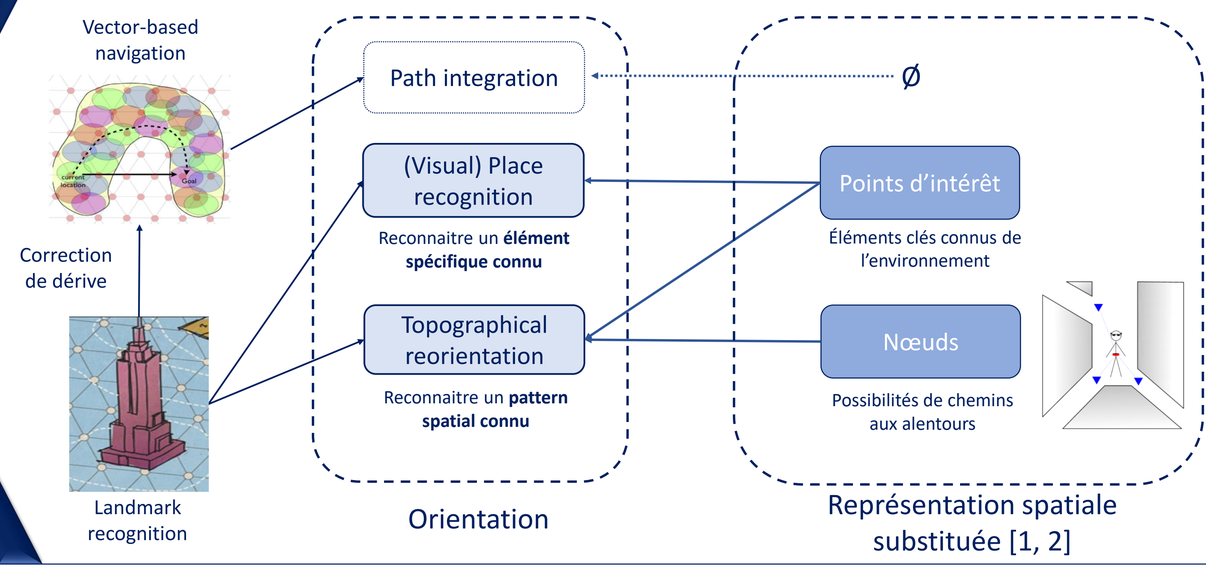
Cognition Spatiale



Vector-based navigation


Landmark recognition

6 Substitution spatiale



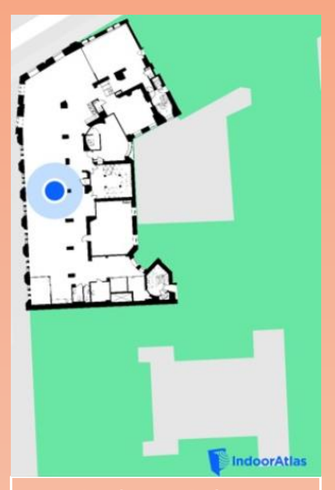
7 Localisation

Déterminer la positon de l'utilisateur + **Caractériser la topographie de l'environnement**

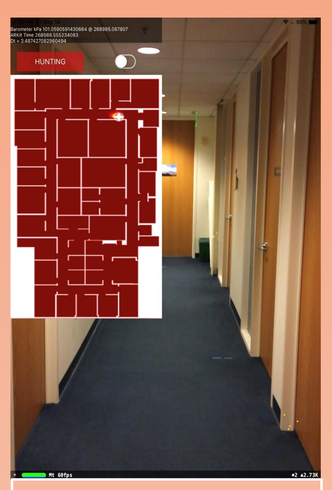
1. **Indoor Atlas** [3]:
   - IMU, Magnétique, WiFi, Pression
   - Faible précision, rapide
2. **iLocalize** [4]:
   - Vidéo , IMU, Pression
   - Bonne précision, intensif

1. **ORB-SLAM 2 :**
   - Reconstitution 3D
   - Très précis et très lourd

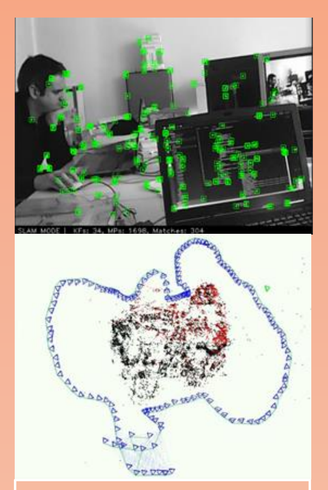
8 Localisation



Indoor Atlas

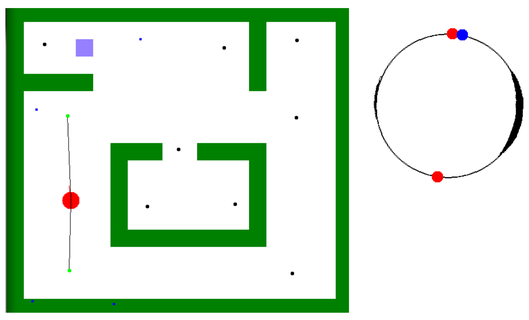


iLocalize


ORB-SLAM 2

9 Evaluation

Environnement virtuel



Encodage tactile

Motion tracking

Raisonnement spatial

10 On en parle

Récompenses
- CCAH 2017

Lauréats de la recherche appliquée

Presse spécialisée
- Oxytude
- Acuité
- Guide Néret

Vulgarisation
- Science Action & URN
- PhDTalent
- Expérimentarium

Presse générale
- Podcast RTL
- Site web

11 Références

[1] M.-A. Riviere, S. Gay, and E. Pissaloux, "TactiBelt: Integrating Spatial Cognition and Mobility Theories into the Design of a Novel Orientation and Mobility Assistive Device for the Blind," in *Computers Helping People with Special Needs*, vol. 10897, K. Miesenberger and G. Kouroupetroglou, Eds. Cham: Springer International Publishing, 2018, pp. 110–113.

[2] E. E. Pissaloux, R. Velazquez, and F. Maingreaud, "A New Framework for Cognitive Mobility of Visually Impaired Users in Using Tactile Device," *IEEE Transactions on Human-Machine Systems*, vol. 47, no. 6, pp. 1040–1051, Dec. 2017.

[3] Haverinen, J., & Kemppainen, A. (2009). Global indoor self-localization based on the ambient magnetic field. Robotics and Autonomous Systems, 57(10), 1028–1035.

[4] Fusco, G., & Coughlan, J. M. (2018). Indoor Localization Using Computer Vision and Visual-Inertial Odometry. In K. Miesenberger & G. Kouroupetroglou (Eds.), Computers Helping People with Special Needs (pp. 86–93). Springer International Publishing.