HEIG VD
HAUTE ÉCOLE D'INGÉNIERIE ET DE GESTION DU CANTON DE VAUD

Citizen participation & digital tools to improve pedestrian mobility in cities

Romain Sandoz, Olivier Ertz - olivier.ertz@heig-vd.ch
HES-SO // HEIG-VD, ***Media Engineering Institute***

modos

6th International Conference on
Smart Data and Smart Cities (SDSC'21)
September 15–17, 2021 · Stuttgart, Germany

Hochschule für Technik Stuttgart

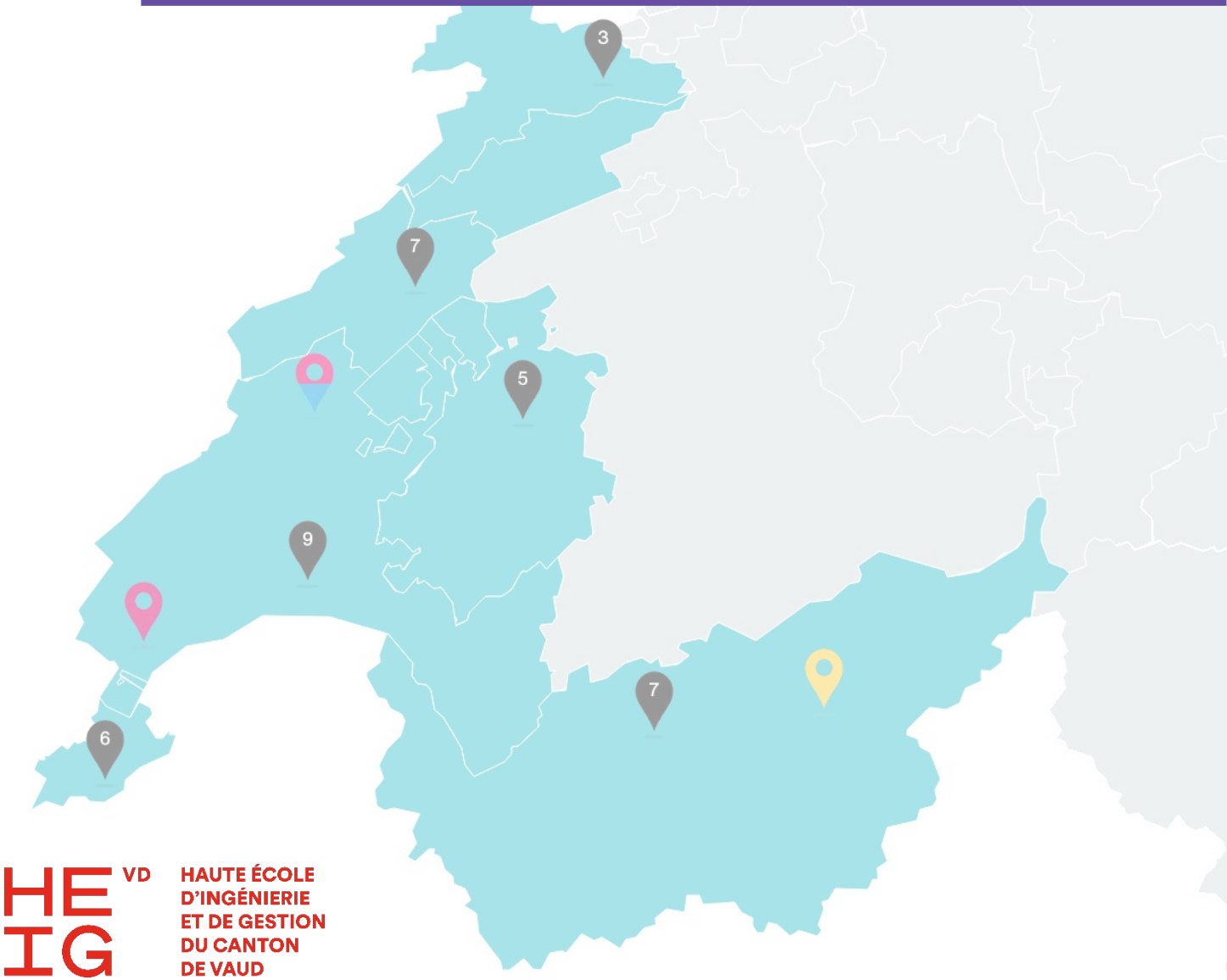
modos

20th EUROPEAN MOBILITY WEEK

Safe and Healthy with Sustainable Mobility

modos

senior – lab ch



Project funded by

Hes·so
Haute Ecole Spécialisée de Suisse occidentale

Interdisciplinary collaboration

HEIA-FR HTA-FR

haute école neuchâtel berne jura arc

HE IG VD HAUTE ÉCOLE D'INGÉNIERIE ET DE GESTION DU CANTON DE VAUD

Ageing and mobility

+80% in 30 years > 2045 with 2.7 millions of **65+ (seniors)**

~69 : average age experiencing **discomfort in moving around**

79-80 : very noticeable increase

Sidewalks slopes, inclines, holes, obstacles : **impediments to walk**

Walking = outdoor activity : **well-being, socialisation, health**

travel mode largely predominant from the age of 70

2020: Aarau, Bâle, Bellinzone, Coire and Neuchâtel awarded *« Golden shoe brush »*

Study on **walkability** in Switzerland *« still significant potential for improvement »*

Sidewalks: coveted strategic assets (restaurant terrace, electric scooter park, bike sharing station, amazon locker, ...)

modos

What if...

... **convalescing on crutches** to get to an appointment in a city whose **pedestrian network you don't really know**?

... convinced your grandmother, who became **fearful with age, to walk again** on the sidewalks of her city?

... in a **wheelchair and want to visit Bern**, which you only know before a sad accident?

... lucky enough to be **driving a stroller** to make your child **discover the city** and its inhabitants?

modos

Purpose

How to promote pedestrian mobility for seniors and more ...

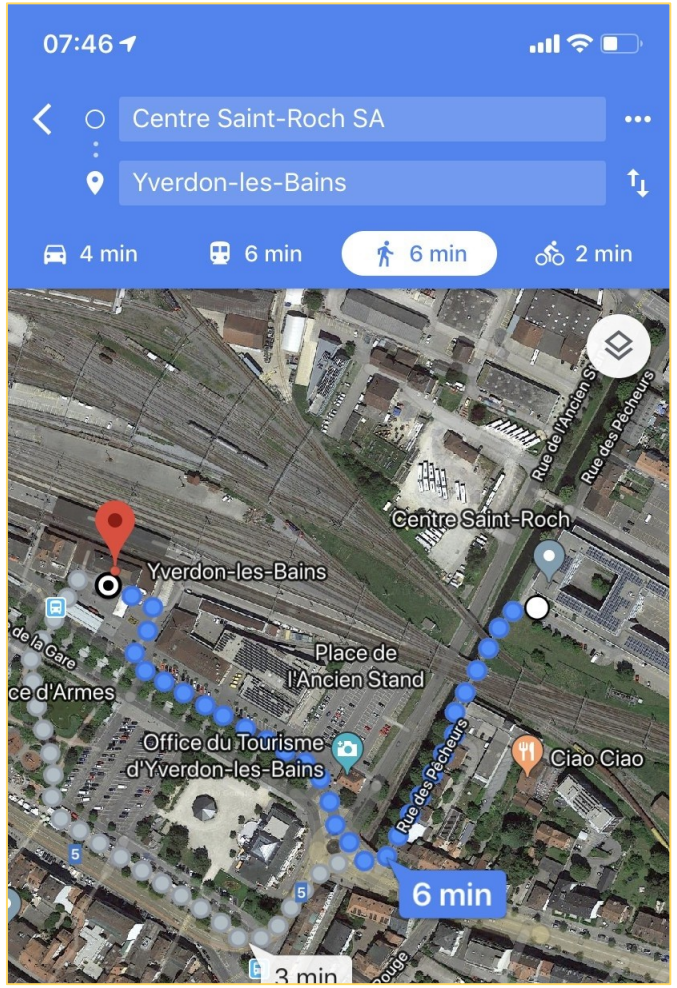
Help navigation in a city by visualizing current impediments on a map and to personalize routes according to user profiles and preferences.

modos

Looking for a route with a usual digital tool, I can choose to do so:
on foot, by car, public transport, bike …

5 min | 8 min | 9 min

What about without walking impediments and suited to me, my pedestrian mobility profile?

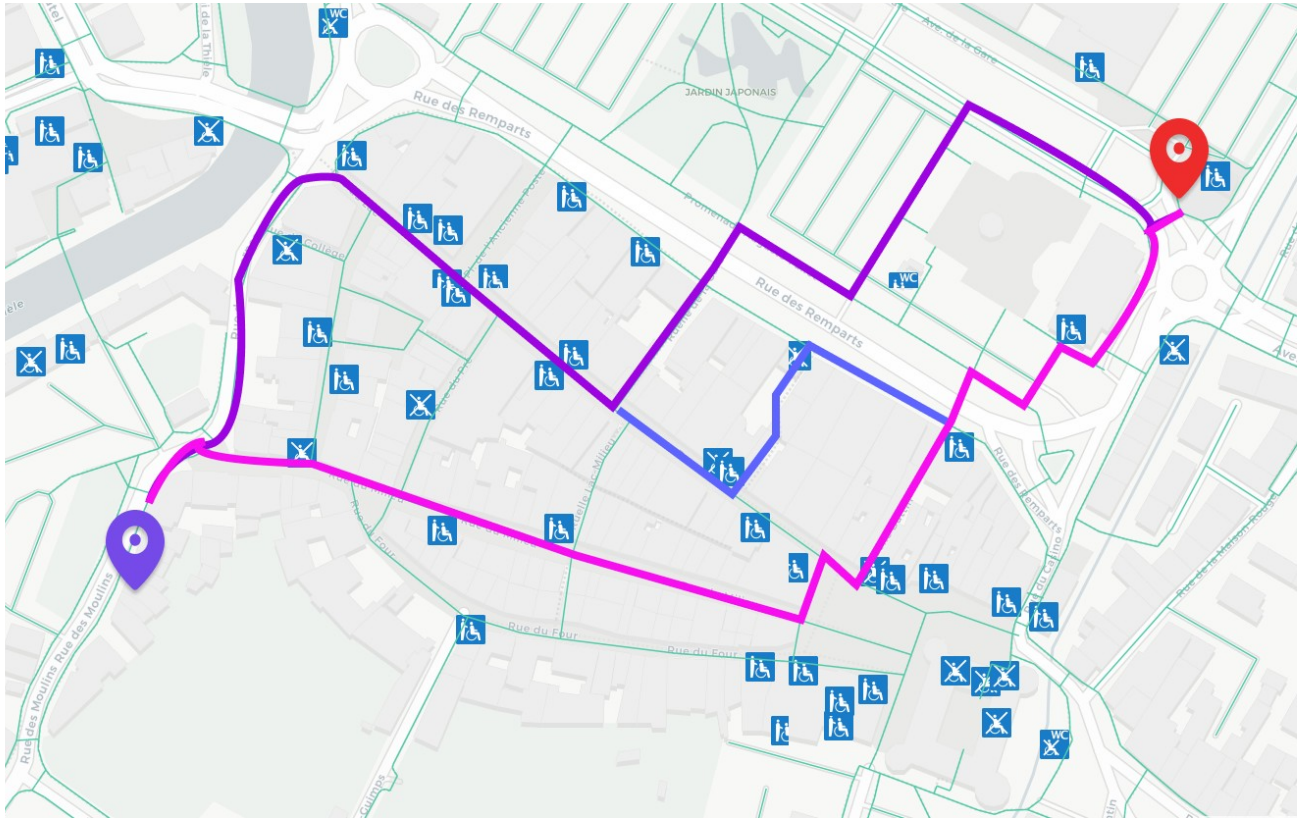


modos

Starting point

Destination point

For different profiles



Digital tools to help in bypassing the walking impediments while waiting for them to be solved by city planners.

modos

mobile & web apps, known tools/algorithms/methods sustainable and reusable

Framework

pedestrian-centric: define adequate typology of pedestrian mobility impediments

citizen participation: in situ and remote crowdsourcing to collect geolocated points of obstacle documented with walkability information

evaluation by citizens per type of mobility impairments

validation by **senior referents**

creation of a database layer of collected/documented **points of impediments**

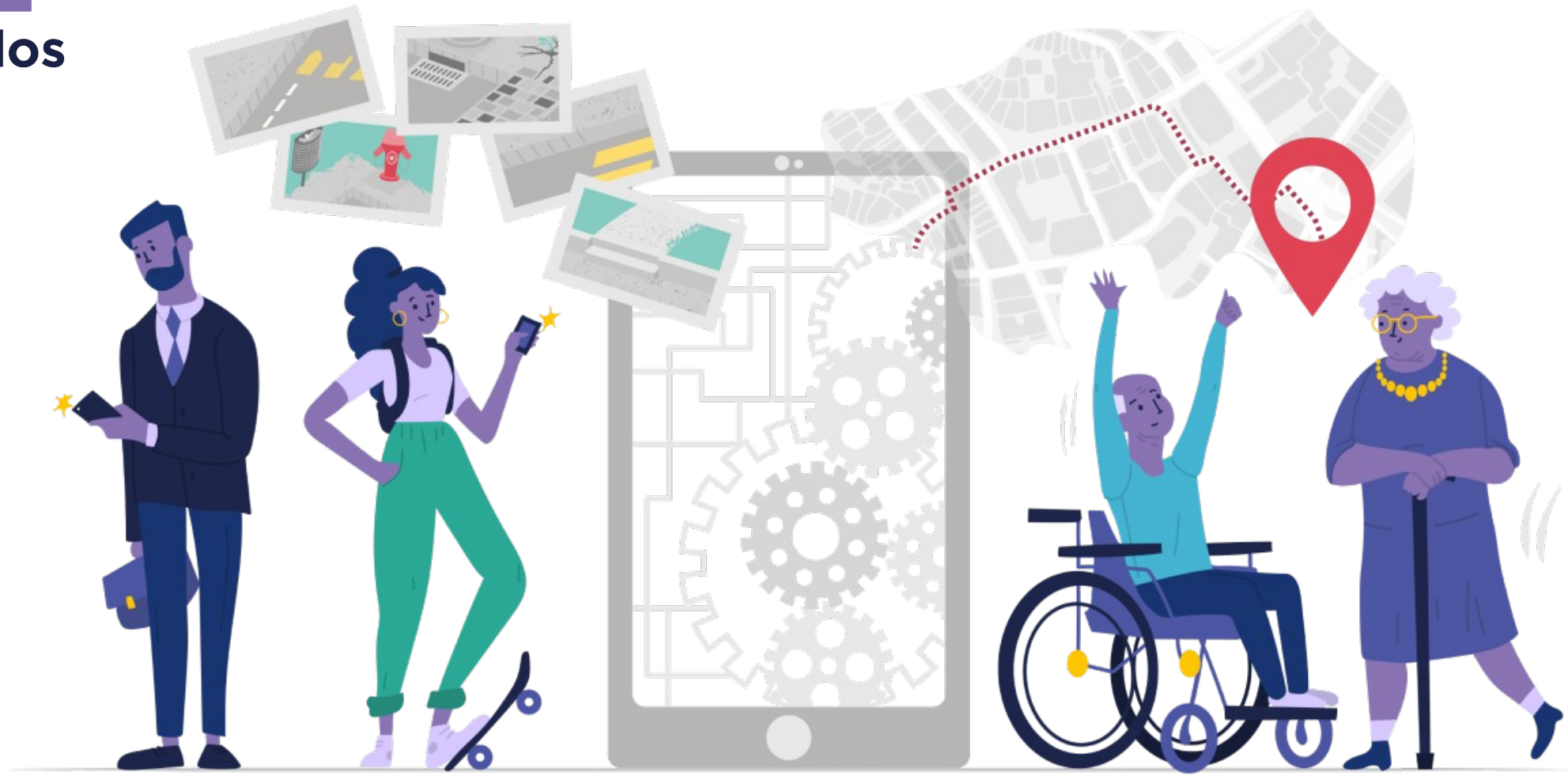
creation of a **routing db** with a pedestrian network based on **OpenStreetMap**

weighting of each street segments by **merging these points with the network**

use segment weights for **route personalization** considering **user preferences**

Without the words ...

modos



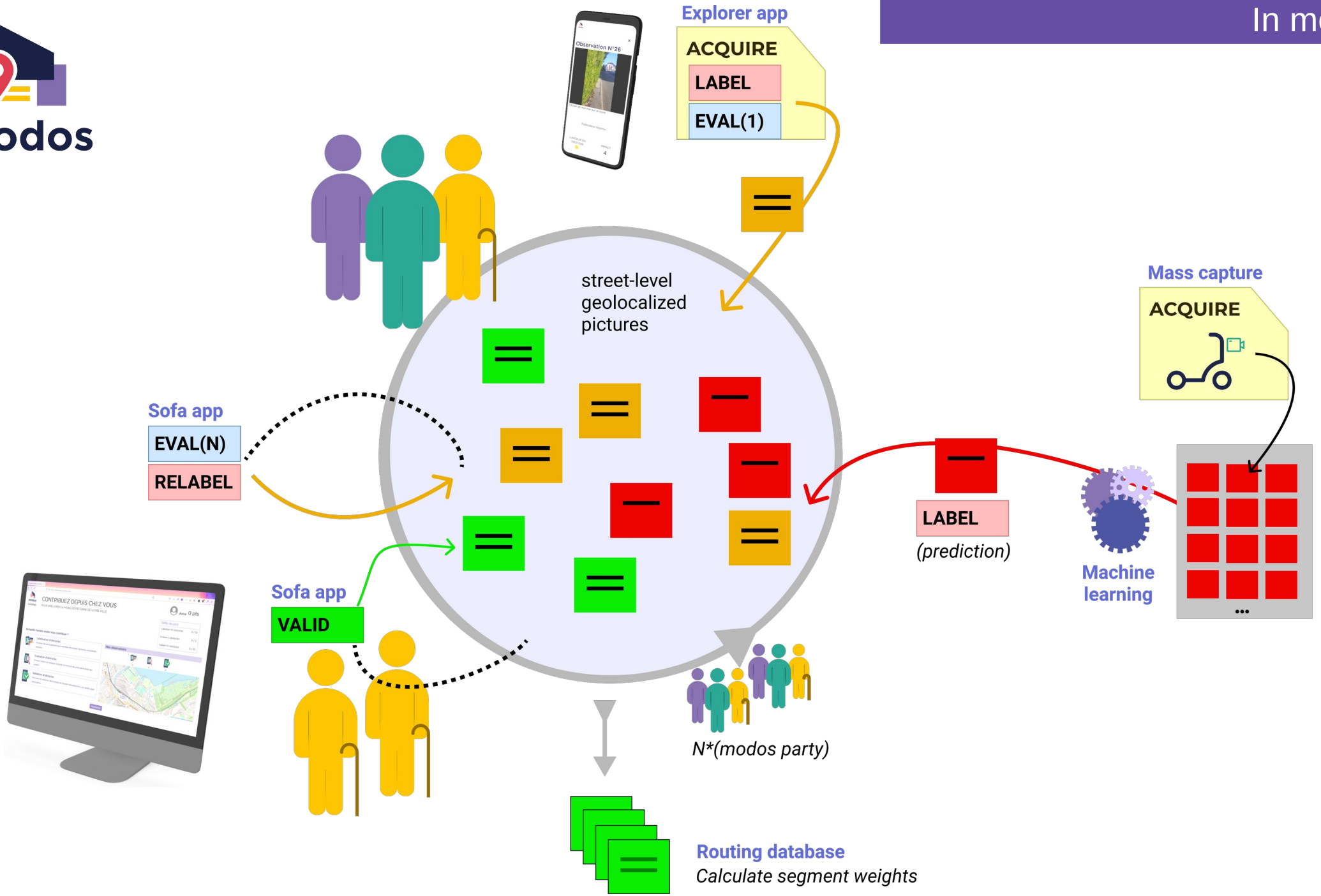
CONTRIBUTIONS FAITES PAR DES CITOYENS, SUR LE TERRAIN OU DEPUIS LA MAISON

MÉCANISME DE MACHINE LEARNING ET DE NAVIGATION POUR PONDÉRER L'ACCESSIBILITÉ DE TRONÇONS PIÉTONS

APPLICATION DE CALCUL D'ITINÉRAIRE ADAPTÉ AU PROFIL DE MOBILITÉ DE L'UTILISATEUR

In more details ...

modos



modos

Urban safari

Workshop

With volunteers of the senior citizens' council of the city of Yverdon-les-Bains (COSY)

- Identify impediments situations in the city.
- Document them with a picture and elements of description (with the help of a research team member)
- Making concrete experiences as perceived in the field by seniors citizens

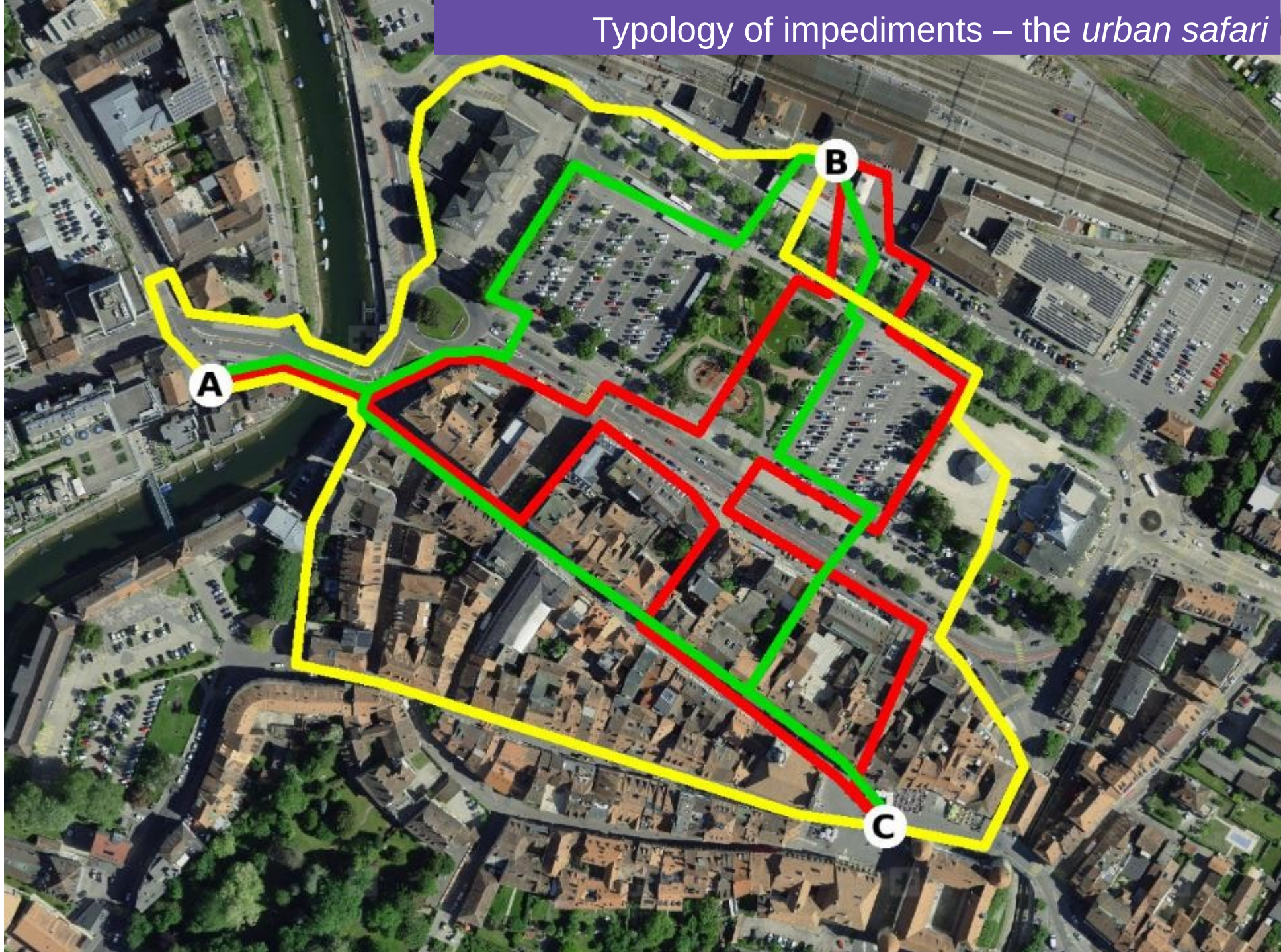
- Group obstacles into homogeneous families
- Evaluate the obstacles in terms of difficulties
- Define their typology matching their perspective

Typology of impediments – the *urban safari*

OSM-based pedestrian network

We completed it for our area of study around the city center of Yverdon-les-Bains

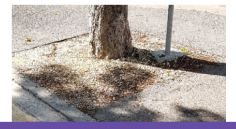
We used the workflow from OpenSideWalks project



modos



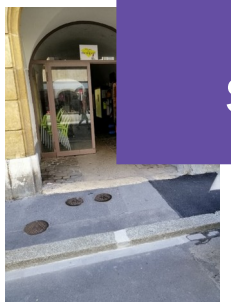
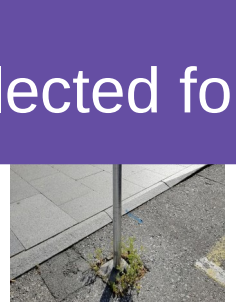
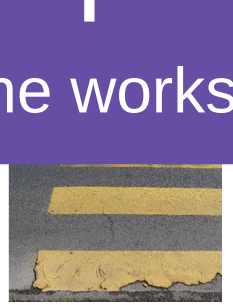


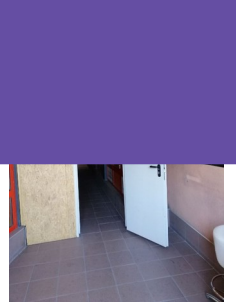


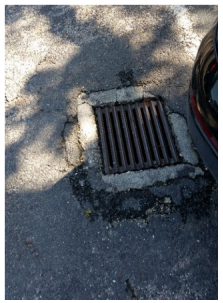

59 impediments

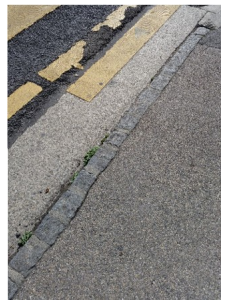
selected for the workshop

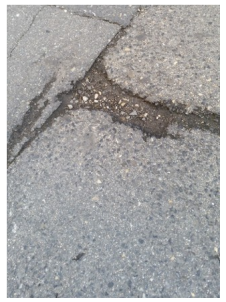


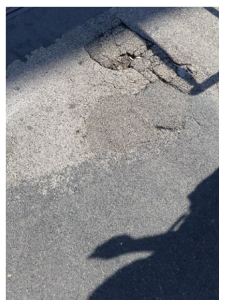













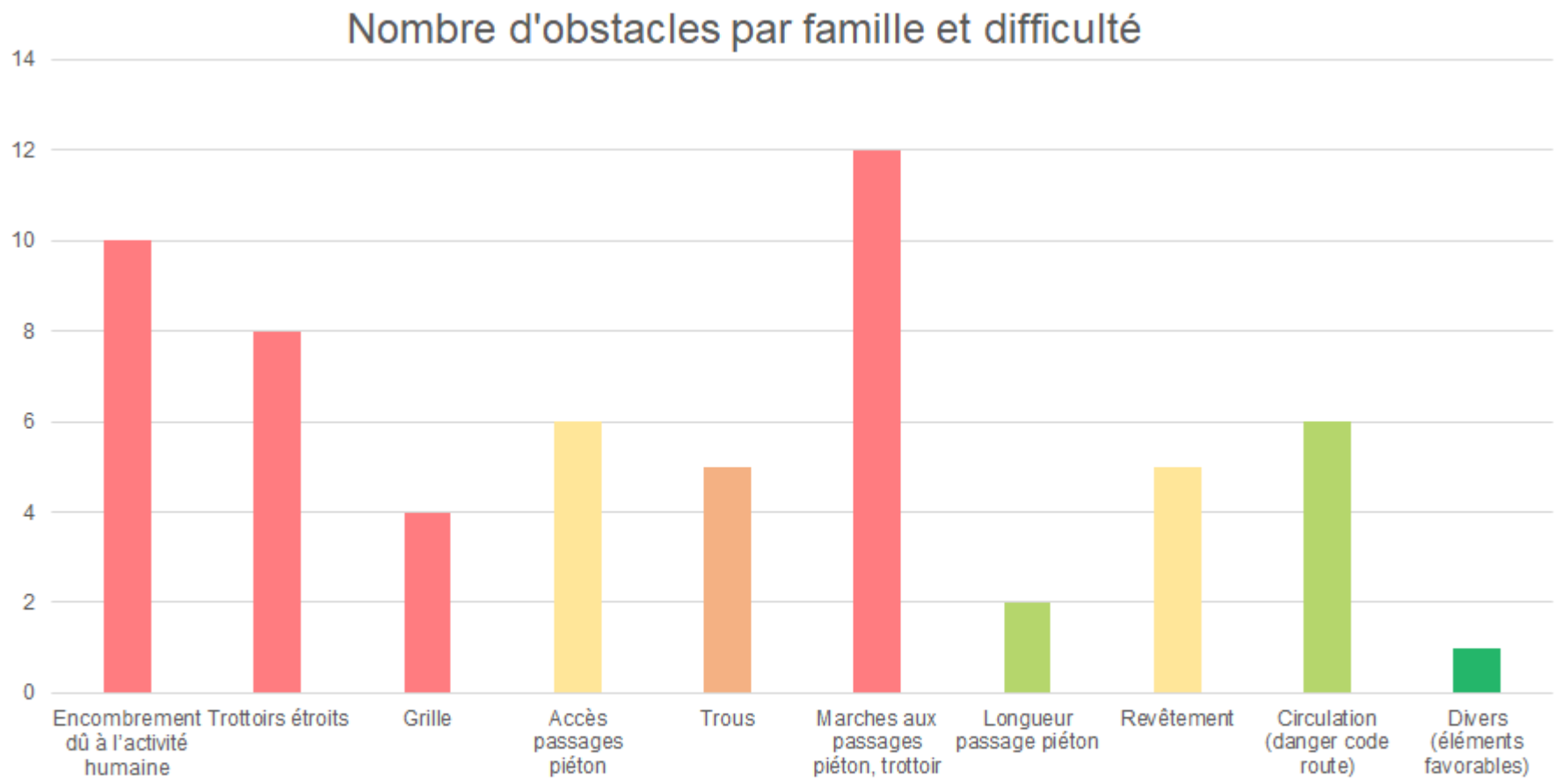



modos

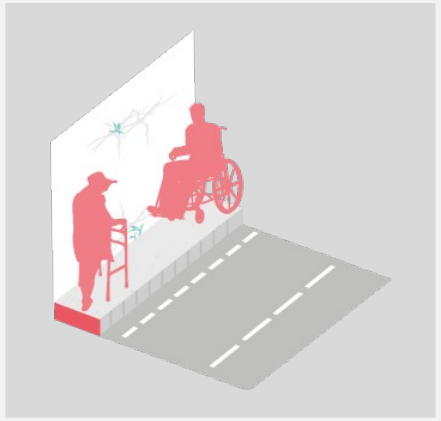
The point of view of senior citizens

modos

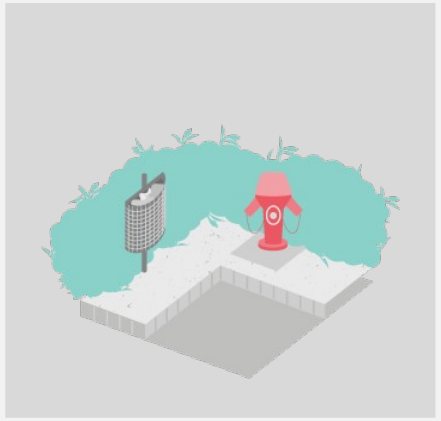
A “raw” typology



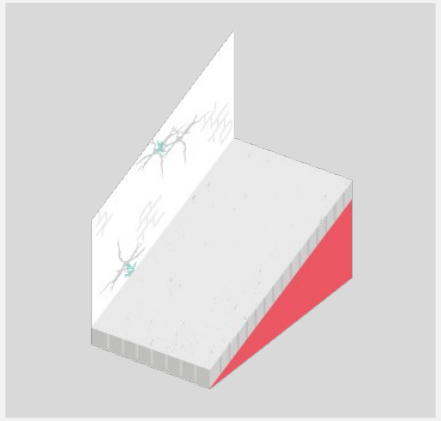
difficulté 1 2 3 4 5



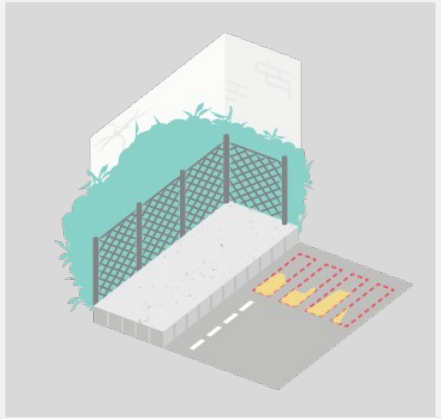
Sidewalk width: too narrow to cross other people or to pass with walking aid



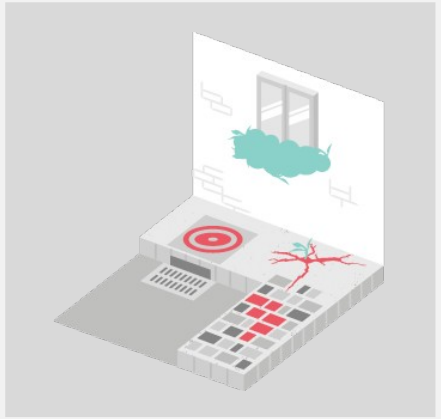
Obstacle in the path: permanent or temporary (e.g. lamp pole, fire hydrant, restaurant easel, ...)



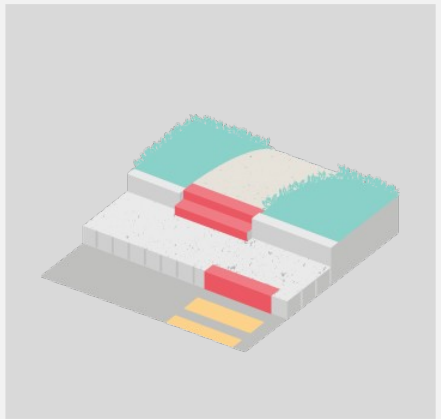
Slope: steepness of street (also critical in unfavourable weather conditions)



Security: related to the traffic, missing or inadequate urban design (e.g. missing signs, crossing, visibility, island, ...)



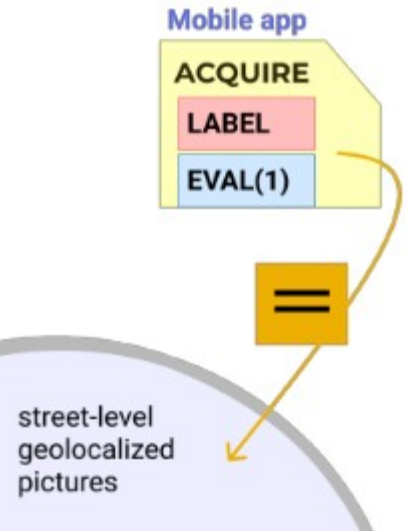
Surface problem: which impedes progress when rolling (e.g. wheel walker, wheelchair) or is likely to cause a fall (stumble)



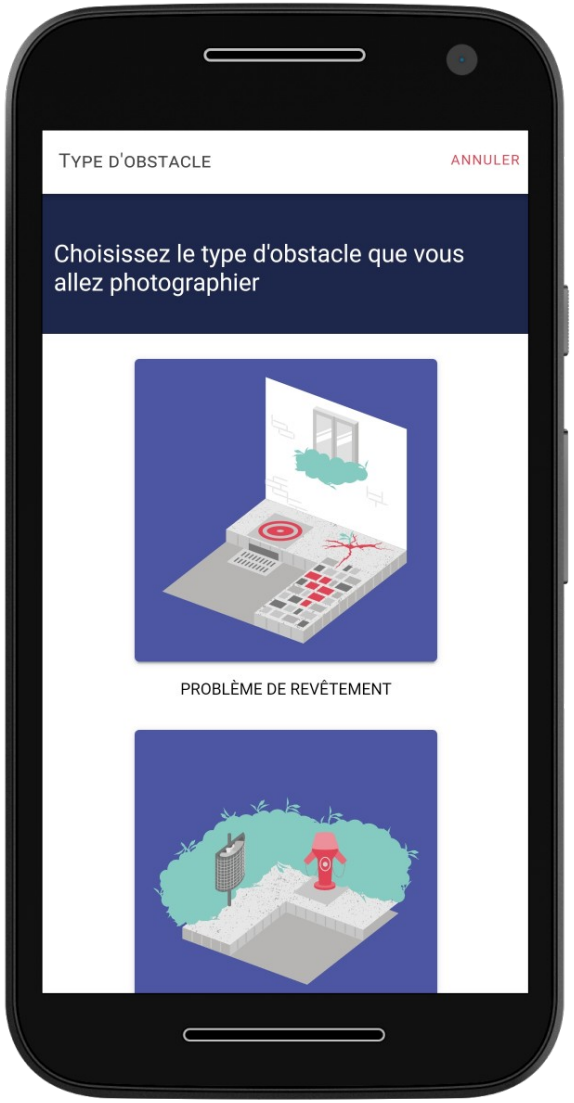
Passability: related to some stepping over (access to sidewalk without curb ramp, high kerbside, small stairs, ...)

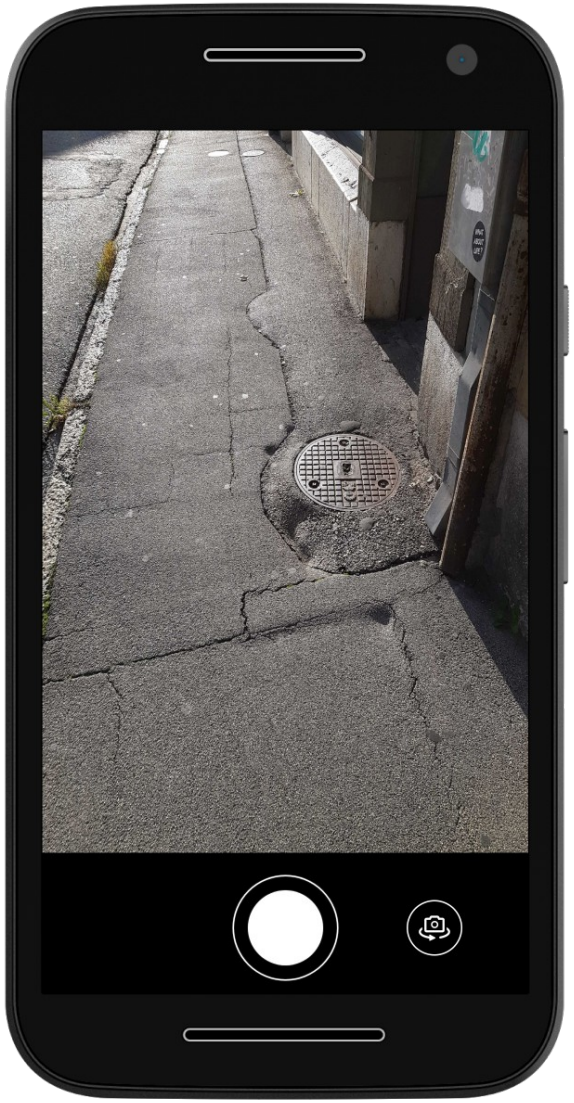
modos

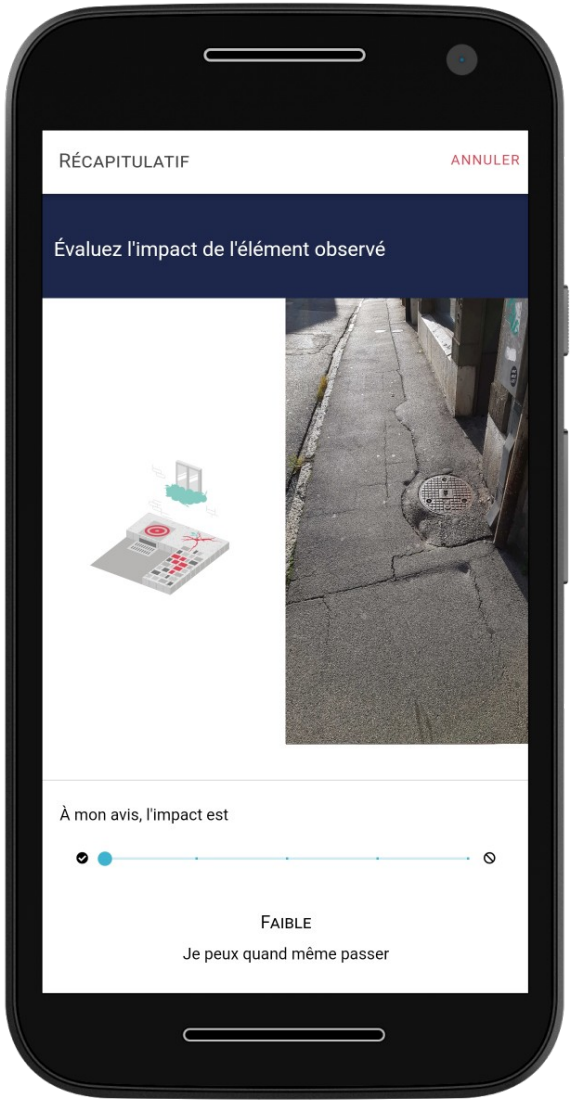
modos Explorer app



modos

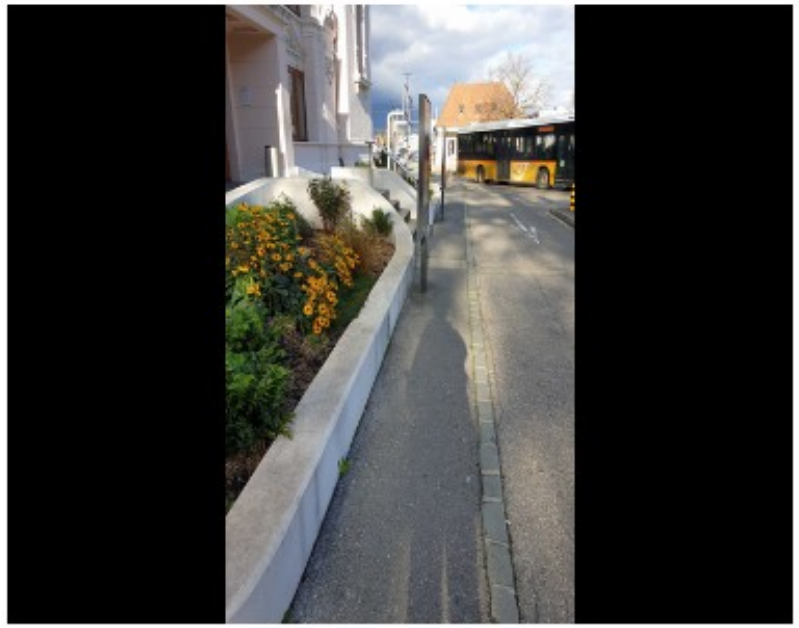

TYPE D'OBSTACLE
ANNULER
Choisissez le type d'obstacle que vous allez photographier
PROBLÈME DE REVÊTEMENT




RÉCAPITULATIF
ANNULER
Évaluez l'impact de l'élément observé
À mon avis, l'impact est
FAIBLE
Je peux quand même passer


RÉCAPITULATIF
ANNULER
Observation terminée !
Votre observation a bien été envoyée.
Merci pour votre contribution !
RETOUR À L'ACCUEIL
Je peux quand même passer
Commentaire
Expliquez pourquoi

Observation N°53



Publié par mp1.arthurverdon

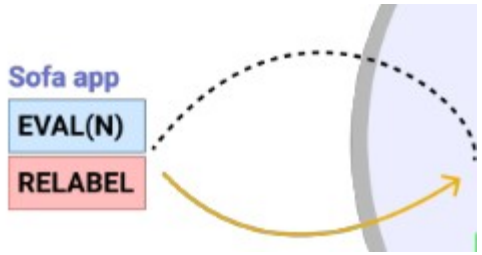
LARGEUR DU TROTTOIR

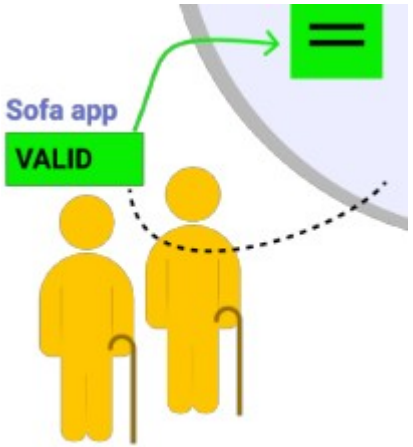
IMPACT

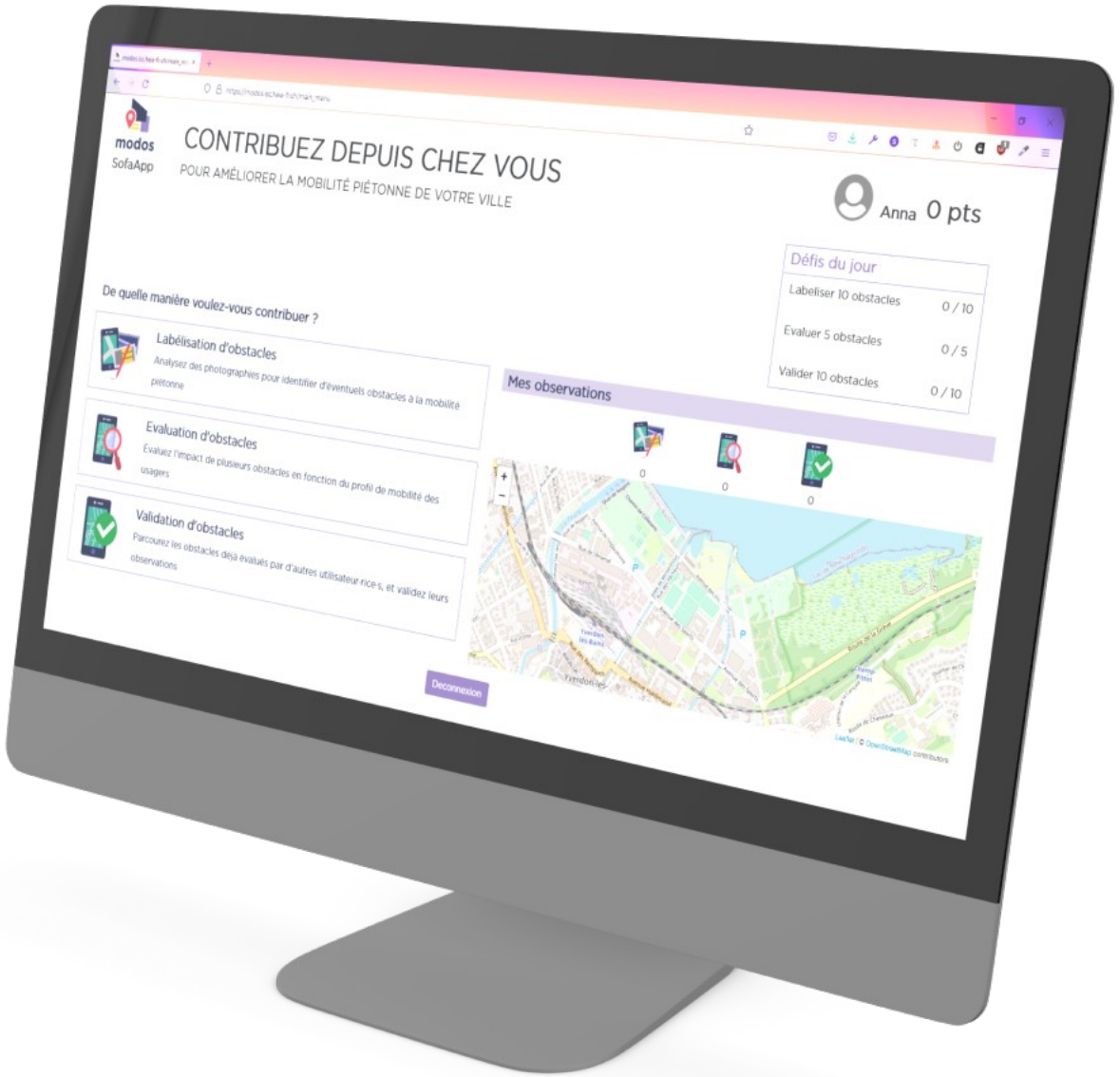
2

modos

Sofa App







modos
SofaApp

CONTRIBUEZ DEPUIS CHEZ VOUS

POUR AMÉLIORER LA MOBILITÉ PIÉTONNE DE VOTRE VILLE

Session anonyme 0 pts

Défis du jour

Labeliser 10 obstacles	0 / 10
Evaluer 5 obstacles	0 / 5
Valider 10 obstacles	0 / 10

De quelle manière voulez-vous contribuez ?

Labélisation d'obstacles

Analysez des photographies pour identifier d'éventuels obstacles à la mobilité piétonne

Evaluation d'obstacles

Évaluez l'impact de plusieurs obstacles en fonction du profil de mobilité des usagers

Validation d'obstacles

Parcourez les obstacles déjà évalués par d'autres utilisateur, et validez leurs observations

Mes observations

0 0 0

Deconnexion

Screenshot

Evaluation d'obstacles

modos

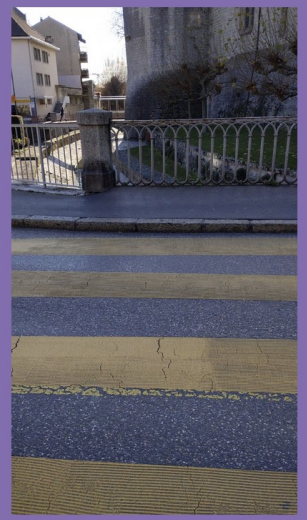
SOFA APP - EVALUATION DES OBSTACLES

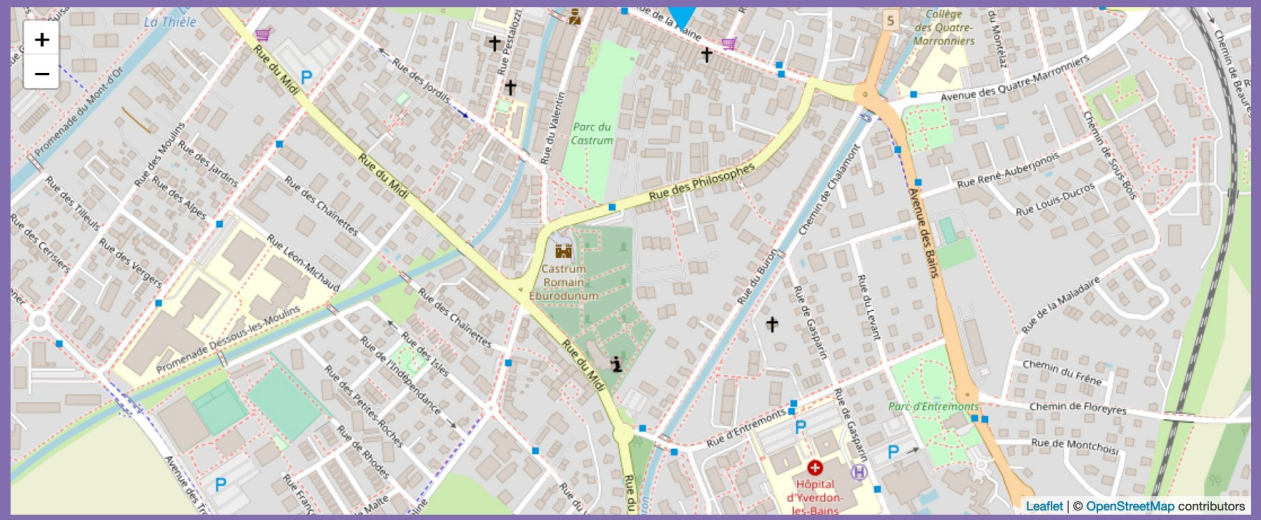
Obstacle 1/5

Retour à l'accueil

Évaluez l'impact de plusieurs obstacles en fonction du profil de mobilité des usagers

Obstacle à évaluer





Type d'obstacle ? :

Franchissabilité

Proposer un autre type d'obstacle pour cette photographie

À mon avis, l'impact est:

	INEXISTANT *Je peux passer sans difficulté*	FAIBLE *Je peux quand même passer*	MODÉRÉ *Je dois passer avec précaution*	MARQUÉ *J'ai du mal à passer*	SÉVÈRE *J'ai beaucoup de mal à passer*	BLOQUANT *Je ne peux pas passer du tout*
à mobilité complète	○	○	○	○	○	○
aidées d'une canne	○	○	○	○	○	○
aidées d'un déambulateur	○	○	○	○	○	○
en chaise roulante	○	○	○	○	○	○

Évaluer un autre obstacle (passer)

Valider mon évaluation

Validation d’obstacles

modos

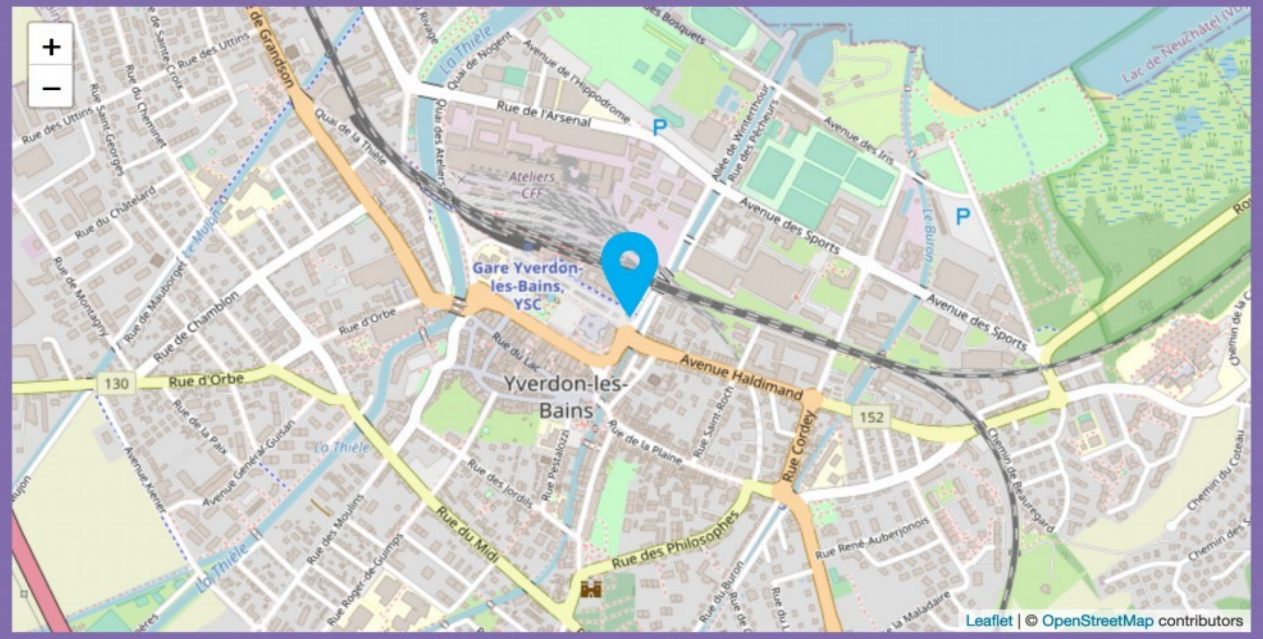
SOFA APP - VALIDATION DES OBSTACLES

Obstacle 1/5

Retour à l’accueil

Parcourez les obstacles déjà évalués par d’autres utilisateur, et validez leurs observations

Obstacle à valider



Type d’obstacle ? :

Obstacle sur le passage

L’impact de cet obstacle a été évalué comme

FAIBLE (1/5)

Je peux quand même passer

Êtes-vous d’accord avec cette évaluation ?

Je suis d’accord

Je ne suis pas d’accord

Je ne sais pas

Screenshot

Valider

In more details ...

modos

Explorer app

ACQUIRE

LABEL

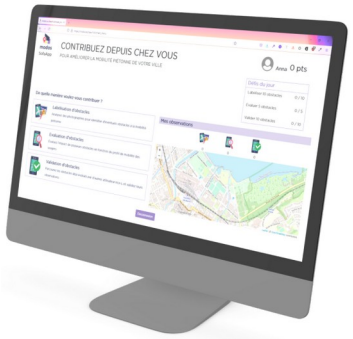
EVAL(1)

street-level geolocalized pictures

Sofa app

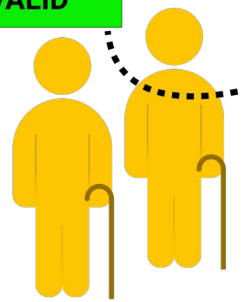
EVAL(N)

RELABEL

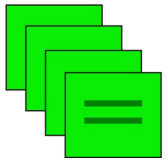


Sofa app

VALID



N(modos party)*



Routing database

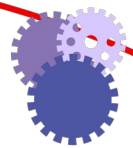
Calculate segment weights

Mass capture

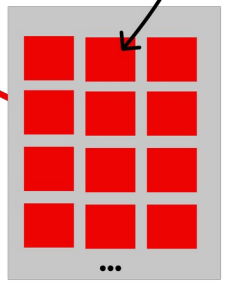
ACQUIRE

LABEL

(prediction)



Machine learning



CLASSIFY WEB SERVICE

e.g. walkability assessment

modos

Routing app

Methodology with routing cost function

UI design and impl. in progress

Weighting of the edges of the pedestrian network for a user profile

One starting point, one destination point, many user profiles...

modos

Typology

Urban safari, workshop

Collect points

usability
field experience
motivations

Safari/workshop was done and **successful**
The need to **close the loop** with seniors from COSY council ...

One modos party organized, with students/colleagues (due to pandemic). From open discussions and questionnaire:

- straightforward/**easy** to use, willing to label with two classes
- hesitation in **posture** (little details, empathize, ...)
- **subjectivity** (requires many inputs)
- importance to feel part of a **collective effort**
- a sense of accomplishement (esp. **the map** showing the job done together), knowing impaired people is a motivation lever, ...

modos

User engagement

Communication strategy and pre-training with **common charter/rules** (e.g. no room for NIMBY attitude, non-violent communcation, etc)

Misc

- sometimes **GPS** low precision (e.g. snapping issues)
- not only technical or functional aspects, also and still **UX/UI** consideration (e.g. gamification)
- collect also **positive assets** or integrate **existing data sources** (e.g. benches, shaded areas, greenness/parks, water fountain, etc)

modos

Perspectives

What relevancy of the whole framework

Upcoming: a next project

- Software almost ready for full experiment
- With **more cities** in the loop : Yverdon-les-Bains (30k), Lausanne (140k), Renens (21k), Vevey (20k)

  > engage **enough citizens**, connect seniors and mobility **councils**
  > population with a **diverse socio-economic** profile
  > particularities of the terrain (e.g. Lausanne = city in a slope)

- Helping **city planners** to solve hotspots of poor walkability
- **Involve** them actively / develop a **negotiation process** between citizens and authorities.

HEIG VD
HAUTE ÉCOLE D'INGÉNIERIE ET DE GESTION DU CANTON DE VAUD

Citizen participation & digital tools to improve pedestrian mobility in cities

Romain Sandoz, Olivier Ertz - olivier.ertz@heig-vd.ch
HES-SO // HEIG-VD, ***Media Engineering Institute***

modos

6th International Conference on
Smart Data and Smart Cities (SDSC'21)
September 15–17, 2021 · Stuttgart, Germany

UDMS