First Iteration Test of the Navigation User Interface from ADAPEI Transport App with Adults Having Intellectual Disabibilities

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***Abstract*— People with intellectual disabilities face cognitive problems that affect their memory, spatial and time perception. The "ADAPEI Transport" app has been created by Capgemini engineering and the ADAPEI association from Belfort in France. It is a tool to help children and young adults having intellectual disabilities to learn how to use a public transport and to walk in their own cities independently. The reference route is first physically (in situ) created by a specialist. Along the path, steps are recorded to help the user with intellectual disabilities to interact with his/her environment in the navigation part. The aim of this article is to show the results of a first iteration feedback done with three adults having intellectual disabilities and a specialist in mobility to improve and adapt the app to adult's special needs to walk and to take the public transport independently in unknown environments.**

Keywords-GPS; intellectual disability; user interface, mobile app.

I. INTRODUCTION

The ADAPEI (association of friends and parents of mentally disabled people in France) is working with educators to teach intellectual disabled children (aged 10 to 20) to become more autonomous to take public transport. Specialists are currently working with paper leaflets to teach them which point of interests to look for and what action to do (pedestrian crossing, stop a bus, walk to a bus station, etc.) for the journey. The creation of leaflets and learning process can be long, a solution to accelerate this learning has been the creation of the ADAPEI Transport app [1].

Currently, most navigation tools are not accessible enough, to people having intellectual disabilities. Most of the mobile apps rely on Google Direction API to define simple instructions to guide the user. An application is WaytoB, which serves to guide the disabled person with his/her phone and a smartwatch [2], the person is tracked on real time by his/her caregiver thanks to internet connection. Another mobile app is AssisT-OUT [3], which provides street views from Google Maps to help the user to recognize his/her environment and to take decisions. Indeed, these mobile apps do not focus enough on the learning notion, which is essential to help children to become independent. In this article, we will show a first iteration test done with adults having intellectual disabilities for improving and adapting the current ADAPEI transport app developed for children to adults who work and are autonomous in known paths and environments.

In Section 2, authors will explain the current ADAPEI transport app, the different user interfaces and how the information is delivered to have feedback form end-users. In Section 3, feedback results from 3 adults having intellectual disabilities and a specialist are presented. Finally, the conclusions and the future work are presented in Section 4.

II. METHODOLOGY

In this section, it is going to be presented a brief explanation of the current adapei transport app, some information about the user navigation interface and the kinds of pedagogical videos created to be shown to adults having intellectual disabilities.

A. ADAPEI Trasnport app

The app (created in Android) has been developed in narrow collaboration with the specialists and young adults from the transport workshop from the ADAPEI's Belfort local branch. It has been tested constantly from 2018 with end users (aged from 10 to 20) to meet their special needs. The app allows the specialist to create an adapted reference path using GPS, pictograms, photos, times and voice message indicating the action to do. The app also has a navigation part in which a specific user interface has been developed delivering information of the whole path selected and from every step of this path when the person is close to a landmark.

B. The navigation user interface

Firstly, the app recovers the reference path selected already recorded by the specialist. The user interface of the navigation part is presented in a way of list showing all the steps to do (Figure 1) with pictograms, photos and vocal message. The GPS starts working and when the person is close to the zone of a landmark step (less than 30 meters), the

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smartphone will vibrate and will show in a bigger size the current step information to do on the screen (for example, crossing the street or going to the bus station Emile Mathis, get into the bus at 9 o' clock, etc.) compared to the other steps.

Additionally, it will launch the voice message information if it is demanded. When the person has finished the action, the current action disappears and the next action to do will appear in a bigger size. Many algorithms and GPS data filters have been implemented to understand when the person has finished an action and that a new action has to be done. A video of the app can be watched in [4].

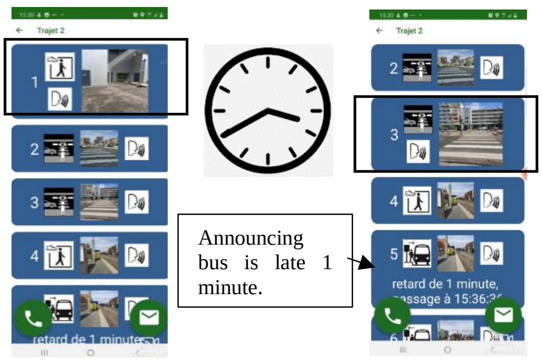

Figure 1. Navigation user interface in a list mode.

In the Figure 1 above we can see a sequence, once the person has done the first action, after walking in the path, the closest current action is crossing the street (3) but before he/she has to cross a previous street (2) (steps 2 and 3 are very close).

C. Creation of the pedagogical videos

The video was created and edited in order to show in a pedagogical way how the information appear during navigation. Two paths were created as reference paths using the app recording all the information. After, a navigation simulation is created using the navigation interface screen synchronized with the video from the environment showing the information presented to walk from one-step to another. We have edited two videos: one having the information of photos of landmark, pictograms and the actions to do (see Figure 2) and another who has photos, pictograms and arrows to indicate to turning right or left in an intersection.

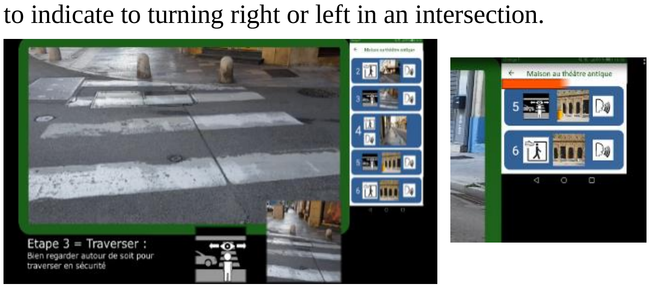

Figure 2. On the left, crossing the street (step 3) from a video, on the right progression bar (the person has walked half of the distance going to the step 5)

Because of the COVID sanitary problem, these videos were presented using Microsoft Teams meetings.

In the focus group, there are three adults having intellectual disabilities who are able to walk independently in known paths and environments and a specialist in mobility. The 3 disabled subjects are older than 20 years old. One of them, is not familiar with the use of smartphones.

The paths shown in the videos and the app are unknown for the subjects. (an example of the video shown can be found in [5]).

In the TEAMS meeting, researchers have explained the different information (pictograms and photos) to them and we have asked to the participants what they will do in every step. We have taken notes from their responses.

III. RESULTS

In this part, we are going to present the feedbacks from the adults and a specialist.

The progression bar showing the distance walked by the person was not very visible. It should be bigger and with more contrast color compared to the background.

All of them agree that images and pictograms are more understandable than turning right and turning left arrows on the screen.

Currently, the landmark steps of the path disappears automatically once the person has finished the action and gets out from the step zone. For the specialist, one improvement is not to make the image of the step disappears, in contrast, to validate a landmark step it could be more convenient to put on the step a big X cross once the step has been done by the user.

Currently, the validation when a person is in the zone of a step is done 30 meters before the GPS coordinates recorded of the step position. Users ask if that could be done the closest possible to the step position to avoid confusion when 2 steps are very close.

A user who already uses Google maps in cars has told us that one of the problems about car navigation is that they do not have the photo or image of the destination. An advantage of our app is that we can create and edit a specific path with the photo of the landmarks and the destination.

According to the specialist, the subjects seem not to have problems of comprehension of the environment but they could experience lack of self-confidence in new environments. The app can help them to be reassured.

All the subjects would also like to be informed that they do not take the right direction in the path (for example, in case of intersection).

IV. CONCLUSIONS AND FUTURE WORK

In this article we have presented a brief explanation of the adapei transport app and the pedagogical videos edited to show the possibilities to adapt the user interface app to the special needs of adults having intellectual disabilities.

In general, the three people having intellectual disabilities seem to have understood, after asking them, the indications in our video and all the steps using the images and the pictograms.

The app can be used to reassure the person that he/she has taken the right path especially in unknown environments.

For giving information about if he/she has taken the wrong path in an intersection, the use of the information of the compass of the phone could be integrated.

After this first iteration, we will rework on the code to add and change the parts in the app to improve the user interface.

The next iteration will consist on testing the user interface of the app with end-users using the path creation and navigation user interfaces in a real situation.

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