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Operator help Services for blind users

120 – Digital Business Transformation – Open Innovation, neue Geschäftsmodelle, Produktivitätssprünge und neue Arbeitsformen im digitalen Zeitalter

Abstract

This research describes the development of a help center for blind users in order to assist blind to navigate independently, easily and safety, is part of our project „INK 2016“, a navigation system for blind people. The system that supports the orientation and mobility of who are blind in the transportation section. The Help4U system help blind people to insert themselves into society and to participate like every other in the world of around themselves.

Keywords:

Ways4all, Blind, Operator, map, video call

Introduction

There is about 285 million people worldwide who are blind or partially sighted and regard blindness as inability to see [14, World Healt Organistion, 2017]. There are no reliable current statistics on the use of canes or dogs' guides in the world.

People with sight loss are from all walks of life, have different backgrounds, education and social status. The way in which each individual is affected, is highly unique and can be a totally difference experience from one person to the other. Support, rehabilitation, social benefit system is some of the factors that make coping with sight loss easier.

Independent mobility is an important life issue but when it comes to visually impaired or blind people this implicitness gets a different perspective. In fact, visually impaired or blind people have to rely on public transportation in order to travel from one place to another. However, their journey is often accompanied by several obstacles such as several heavy traffic, noisy environment or indoor navigation at subway stations. Another but rather critical aspect is the restricted communication between a bus driver and a traveller, respectively the public transport systems and a smartphone. Normal-sighted people usually do not have difficulties to look for a bus or tram heading in the right direction, to read

departure times from info screens or just signal a bus driver to get a lift. Visually impaired and blind people, however, have major difficulties in communicating and locating their needs due to their Visual restriction.

This research discusses several improvements which developed in the INK 2016 System for support visually handicapped people while using public transport.

The main contributions in this article discuss the Help4U System based on maps and video calls interacted by an operator's system and the use of mobile devices which are quite popular among people suffering from visual impairment.

The operator helps services for blind users „Help4U "should help blind people in providing a routing from door to door with instructions to the visually impaired around daily works, provide recommendations of the operator on key elements of accessible audio or video-calls.

Related Work

In recent years, there has been substantial research in the support of visually impaired and blind people in terms of public transport. Common problems these people face, are the appropriate routing on footpaths for pedestrians [3,6, Markus Dornhofer, Werner Bischof, and Elmar Krajnc, 2014] the support of orientation and localization within buildings [11,8, Jesus Zegarra Flores and Ren´e Farcy, 2014, Thomas Moder, Petra Hafner, and Manfred Wieser, 2014] as well as the orientation at intersections on heavy traffic roads [4, Giovanni Fusco, Huiying Shen, Vidya Murali, and James M. Coughlan, 2014]. These are significant situations demanding general guidance and support, in particular for people with visual impairment [5, Reinhard Koutny, Peter Heumader, and Klaus Miesenberger, 2014, 9, Wolfgang Narzt, 2014]. In this setting, supporting in critical situations if the orientation is total lost or in the communication with vehicles (or bus drivers if necessary) is crucial in order to facilitate independent travelling. [2, Werner Bischof, Elmar Krajnc, Markus Dornhofer, and Michael Ulm, 2012, 10, Hsiao-Lan Wang, Ya-Ping Chen, Chi-Lun Rau, and Chung-Huang Yu, 2014]. Last, but not least an interactive, multimodal and intuitive user interface [1, Genevieve Baudoin, Olivier Venard, G. Uzan, A. Paumier, and J. Cesbron, 2005, 7, Elmar Krajnc, Mathias Knoll, Johannes Feiner, and Mario Traar, 2011] is essential for the acceptance of any supporting system.

The INK2016 system consists of different applications for the smartphone, which in each case communicates with appropriate hardware for example: in the bus, navigation server, EFA server, ...). Based on a timetable information for all of Austria (VAO), all important modules (ie partial applications - for example: navigation inside and outside) can be activated exactly according to the user profile (- for example: wheelchair user) and offer corresponding support. The Help4U Support System has been developed as a logical extension as an additional module to provide fast and secure assistance in critical situations or complete disorientation.

Help4U Support System

Help4U can change the world of millions of blind. The Help4U system by which a blind person travels, is a matter of personal choice. It works to give a new sense of freedom, an increased level of confidence, and a feeling of safety. The Help4U can show a great deal about traveling independently, safety, walking to bus or train station, riding a bus, and locating doorways. help him or her practice getting to and from him or her workplace, house of worship, the local grocery store, and other places which visit regularly. Eventually, however, want to meet some new places, that he or she have never been before.

The system our group has working on, The Help4U system(Figure 1: Help4U). Our goal has been and continues to be to contribute to the development of a self-contained system that will allow Blind to travel through familiar and unfamiliar places. Our system, provide the blind people with detailed information about the place which want to go and give audio and video support(Figure 2: Help4U-Process).

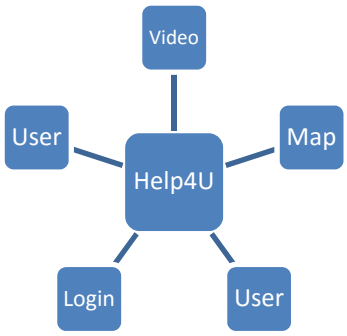

Figure 1: Help4U
Source: [own diagram]

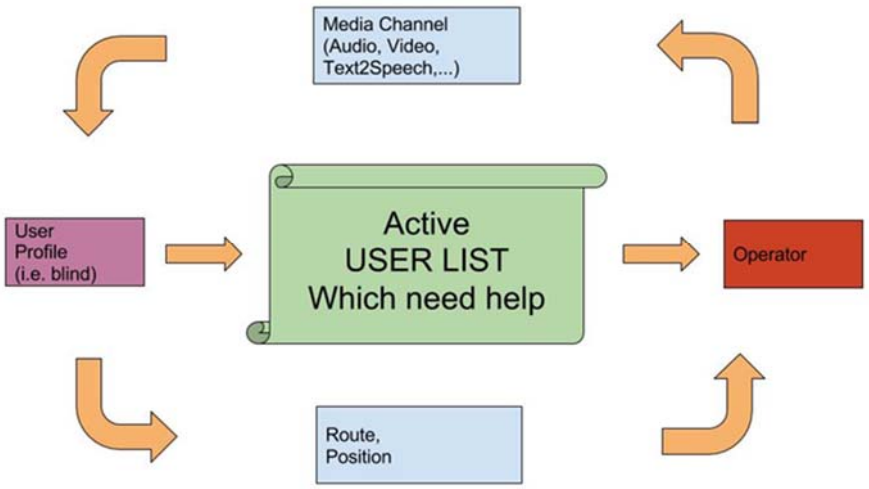

Figure 2: Help4U-Process
Source: [own diagram]

User

In the first step the blind person should identify his or her self as a user in the Help4U system, the user alternatively referred to as an account name, login ID, und User ID, this name is commonly an abbreviation of the user's full name or his or her alias, the username allows he or she to have his or her own personal settings and identification with service. The username contains name, last name, age, Address, Postal code, City, Country, phone, OS, E-Mail, photo, Disability, Start, Aim, user name, and password(Formel 1: fake).

```
<FakeUser>
  <NAME>Josef</NAME>
  <Lastname>Hofer</Lastname>
  <AGE>30</AGE>
  <Address>8020 Graz, Jakominiplatz 5</Adress>
  <Postal-code>069922554158</Postal-code>
  <City>Graz</City>
  <Country>Austria</Country>
  <Phone>Samsung S5</Phone>
  <OS>Android</OS>
  <e-mail>mail</e-mail>
  <Photo>Josef_Hofer_jpg</Photo>
  <Disability>totally_blind</Disability>
  <Start>8020 Graz, Jakominiplatz 5</start>
  <Aim>Vienna 1040 Südtirolerplatz 15</Aim>
  <username>Josef</username>
  <Passwort>Abe</passwort>
</FakeUser>
```

Formel 1: fake User
Source: [XML]

Login

After making of a Username and password, login is the procedure used to gain access to an operating system of application this requires the user to have a user ID and a password, which in turn identifies the blind person to the system. The Login process is almost finished after a correct video Call has been placed with the automated test system.

Operator

Depending on the pressing of the user's help button on the smartphone, the operator is activated and starts its activities. The system on the mobile phone is sending the help of the operator, and transfers the ID of the route to the operator. The operator provides information by accessing alphabetical, geographical, or other directories to answer the questions of the user. The Route support is based on the route stored on the smartphone and in the operator system at the beginning of the route(Figure 3: User & Operator).

With this information, the user profile and the current or last valid location, the operator can call the user via a video call. Depending on the network connection, this video call can also be made by one side (i.e. only the operator sees a picture from the front camera). With the activ call, a solution for the mobility problem can now be sought together. The operator can lead the person to the appropriate platform or else help others to do so. The operating system allows you to manage and prioritize multiple users. It allows a group circuit as well as a pause circuit. This might be used for example, if the user has to execute an instruction that will take longer: "Go to the end of the road" or if the the phone is handed over to another operator. To ensure safety for the operator, all of the calls and any active tours are stored for two days(Chart 1: Operator chart)

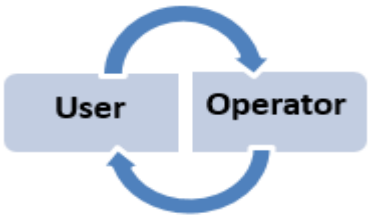

Figure 3: User & Operator
Source: [own diagram]

Number & Photo	Age	Gender	Level of Vision	Area
1	30	M	Totally Blind	Kapfenberg
2	26	M	Totally Blind	LKH Bruck an der Mur
3	41	F	Residual vision	FH Joanneum Bahnhof
4	50	M	Totally Blind	ECE Kapfenberg
5	21	F	Residual vision	Graz Schlossberg

Control Area:

Chart 1: Operator chart
Source: [own chart]

Map

Maps are graphic representations of places that use points, lines, and area symbols. In the past few decades, the use of maps has increased all over the world and maps themselves have been evolving along with the development of science and modern technology. Maps can be designed and developed in different ways depending on the objectives sought, Today's maps are displayed on computers and smart phones, providing a great deal of information. Blind people, however, are unable to use visual maps which discuss possible interaction modalities. Devices that truly achieve the usage perspectives desired by blind people need to be used [28 The use of maps in the exploration of geographic data, 2017]. New ways of interacting with a smart phone and possible solutions for making a map truly effective have been investigated. In order to better explain the issues and needs of blind users accessing visual maps, the visually impaired users need text information that can be transferred to audio via text2speech technology. The Help4U map is a solution for providing the blind with access to his or her personal choice of travel options independently, safely, and step by step via audio guide information(Figure 4: Textual-route-infromation).

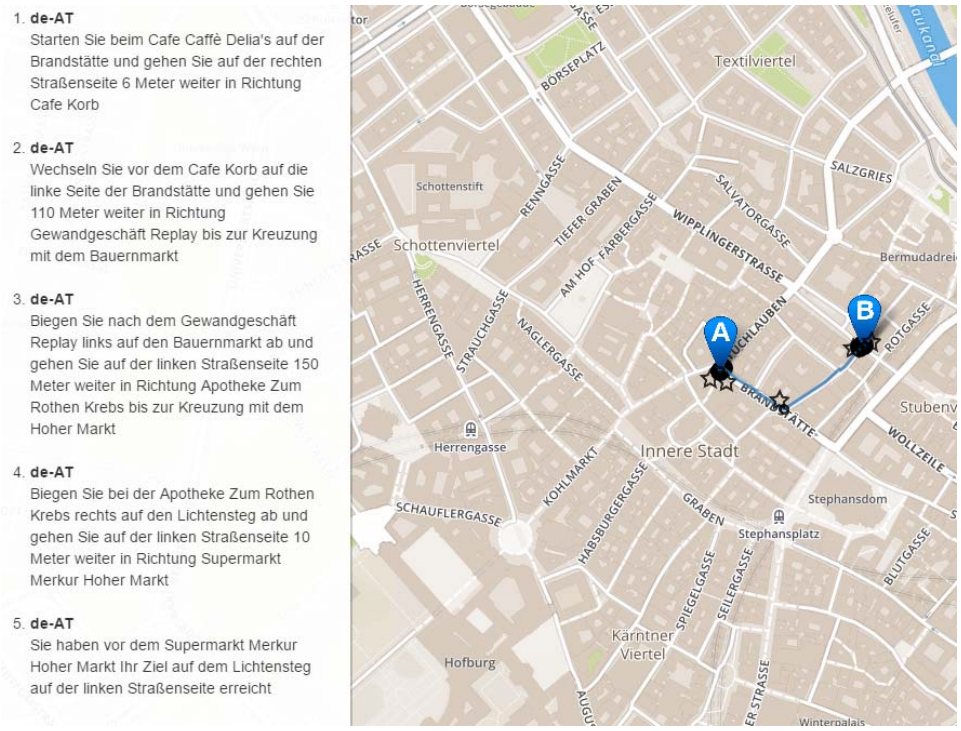

Figure 4: Textual-route-infromation
Source: Perron Project: [http://62.218.164.207:8080/perron/, 07.02.2017]

To transfer the in the Perron project [23, Perron Project, 2017] the route was simplified by combining multiple routing segments into one single route. The route itself is reinforced by landmarks (i.e. shops, restaurants) [20, Development of a Navigation System Using Smartphone and Bluetooth Technologies to Help the Visually Impaired Navigate Work Zones Safely, 2017]. In the project POPTIS by Wiener Linien (Vienna Public Transport) [25, POPTIS, 2017], the routing text is generated by human beings. This has been done for every subway station and it is a very time consuming task(Figure 4: Textual-route-infromation).

Video call

The video call function on a smartphone is a new type of technology ideal for use by blind people. It acts as the eyes for a blind person in need of help by being accessed remotely through a live video connection. The blind users can communicate with their assistants for help in various tasks. Nevertheless, several drawbacks have been found that must be overcome in order to make the application equally usable for both the user and his or her assistant. In this work, we focus on the fact that blind users lack the capability to video the necessary frames their assistants must see in order to be able to help the blind person with sight-demanded tasks. A feature such as this is integrated into our video-call system using WebRTC technology. Commonly used video call systems like Skype will be able to be supported as well.

The “Be my eyes” app [26, Be my eyes, IPone App, 2017] also follows a similar approach. This app allows visually impaired people to be helped by volunteers via video support.

Conclusion

We discuss possible strategies for the creation of operator help services in order to enhance the mobility of blind users. These services consist of new technologies such as smartphones, video calls between the user and the operator, audio service and maps providing step by step information. The working range of the system depends on the user, the operator and the software. It gives the user greater traveling independence. It is our goal to develop operator help services for blind users in such a way as that these services will enrich the lives of the blind people using them, and give the blind user a newfound sense of independence when navigating familiar and unfamiliar places.

Reference

1. Genevieve Baudoin, Olivier Venard, G. Uzan, A. Paumier, and J. Cesbron. Le projet rampe: SystEme interactif d'information auditive pour la mobilitE´ des personnes aveugles dans les transports publics. In Proc 2nd French-speaking Conference on Mobility and Ubiquity Computing, UbiMob '05, pages 169–176. ACM, 2005.

2. Werner Bischof, Elmar Krajnc, Markus Dornhofer, and Michael Ulm. Computers Helping People with Special Needs: 13th International Conference, ICCHP 2012, Linz, Austria, July 11-13, 2012, Proceedings, Part II, chapter NAVCOM – WLAN Commu- nication between Public Transport Vehicles and Smart Phones to Support Visually Impaired and Blind People, pages 91–98. ICCHP 2012. Springer Berlin Heidelberg, 2012.

3. Markus Dornhofer, Werner Bischof, and Elmar Krajnc. Comparison of open source routing services with openstreetmap data for blind pedestrians routing, opentripplanner and opensourceroutingmaschine. Foss4g Europe'14, 2014.

4. Giovanni Fusco, Huiying Shen, Vidya Murali, and James M. Coughlan. Computers Helping People with Special Needs: 14th International Conference, Paris, France, July 9-11, 2014, Proceedings, Part I, chapter Determining a Blind Pedestrian's Location and Orientation at Traffic Intersections, pages 427–432. ICCHP 2014. Springer International Publishing, 2014.

5. Reinhard Koutny, Peter Heumader, and Klaus Miesenberger. Computers Helping People with Special Needs: 14th International Conference, Paris, France, July 9-11, 2014, Proceedings, Part II, chapter A Mobile Guidance Platform for Public Transportation, pages 58–64. ICCHP 2014. Springer International Publishing, 2014.

6. Reinhard Koutny and Klaus Miesenberger. Pons — mobility assistance on footpaths for public transportation. Studies in health technology and informatics, 217:440—446, 2015.

7. Elmar Krajnc, Mathias Knoll, Johannes Feiner, and Mario Traar. A touch sensitive user interface approach on smartphones for visually impaired and blind persons. In Andreas Holzinger and Klaus-Martin Simonic, editors, Information Quality in e- Health, volume 7058 of Lecture Notes in Computer Science, pages 585–594. Springer, 2011.

8. Thomas Moder, Petra Hafner, and Manfred Wieser. Computers Helping People with Special Needs: 14th International Conference, Paris, France, Proceedings, Part I, chapter Indoor Positioning for Visually Impaired People Based on Smartphones, pages 441–444. ICCHP 2014. Springer International Publishing, 2014.

9. Wolfgang Narzt.Facilitatingutilizationofpublictransportationfordisabledpersons by an open location-based travel information system for Mobile devices (viator). In Proc. 7th International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies, Porto, Portugal, Sept. 29 - Oct. 3, 2013, UBICOMM 2013, pages 7–12, September 2013.

10. Hsiao-Lan Wang, Ya-Ping Chen, Chi-Lun Rau, and Chung-Huang Yu. An in- teractive wireless communication system for visually impaired people using city bus transport. International Journal of Environmental Research and Public Health, 11(5):4560–4571, 05 2014.

11. Jesus Zegarra Flores and Ren´e Farcy. Computers Helping People with Special Needs: 14th International Conference, Paris, France, July 9–11, 2014, Proceedings, Part I, chapter Indoor Navigation System for the Visually Impaired Using One Iner- tial Measurement Unit (IMU) and Barometer to Guide in the Subway Stations and Commercial Centers, pages 411–418. CCHP 2014. Springer International Publishing, 2014.

12. Karen Duarte, Jose Cec ılio, Jorge Sa Silva, Pedro Furtado Information and Assisted Navigation System for Blind People, http://s2is.org/ICST-2014/papers/1569962037.pdf, visited 1.Feb. 2017.

13. Navigation System for the Blind, http://www.psy.cmu.edu, visited 3.Feb. 2017.

14. World Healt Organistion, http://www.who.int/mediacentre/factsheets/fs282/en/, 3. Feb.2017.

15. Kasetsart Journal of Social Sciences, http://www.sciencedirect.com, visited 3. Feb.2017.

16. Call Center for Blind Users- American Foundation for the Blind, http://www.afb.org/info/living-with-vision-loss/for-job-seekers/careerconnect-virtual-worksites/call-center-for-blind-users/1234, visited 6. Feb.2017.

17. Mobile Apps for Blind and Visually Impaired People, http://techpp.com/2013/05/25/mobile-apps-for-blind-visually-impaired/, visited 6. Feb.2017.

18. Accessible Video-Call Application on Android for the Blind, visited 6. Feb.2017.

19. Integrating Open Spaces into OpenStreetMap Routing Graphs for Realistic Crossing Behaviour in Pedestrian Navigation, GI_Forum 2016, Anita Graser, http://hw.oeaw.ac.at/0xc1aa500e%200x0033ffa5.pdf.

20. Development of a Navigation System Using Smartphone and Bluetooth Technologies to Help the Visually Impaired Navigate Work Zones Safely, http://www.dot.state.mn.us, visited 6. Feb.2017.

21. A NAVIGATION AND OBJECT LOCATION DEVICE FOR THE BLIND, [http://drum.lib.umd.edu, visited 8. Feb 2017]

22. Mobile GPS navigation application, adapted to visually impaired people, http://kst.tugab.bg, visited 8. Feb 2017.

23. Perron Project, http://perron-project.tech-experience.at/, visited 8 Feb 2017.

24. Developing an Open Pedestrian Landmark Navigation Model, Foss4g 2016, Anita Graser https://www.youtube.com/watch?v=chGlRnYGvDg.

25. POPTIS, Wiener Linien, http://www.wl-barrierefrei.at/index.php?id=8034, visited 8. Feb 2017.

26. Be my eyes, IPone App, http://www.bemyeyes.org/, visited 8.Feb 2017.

27. Apps for People with Disabilities and Older People, http://www.assistireland.ie, visited 8. Feb.2017.

28. The use of maps in the exploration of geographic data, https://www.itc.nl, visited 8. Feb.2017