

a cura di / edited by  
Cristiana Cellucci, Rosaria Revellini,  
Valeria Tatano, Dario Trabucco

# STRADE PER LA GENTE

Le persone negli spazi aperti:  
progetti, pratiche e ricerche  
per il benessere psicofisico

# STREETS FOR PEOPLE

Individuals in outdoor environ-  
ments: projects, practices and  
research for the psychophysical  
well-being



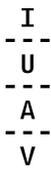
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Università Iuav  
di Venezia

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## **STRADE PER LA GENTE / STREETS FOR PEOPLE**

Le persone negli spazi aperti: progetti, pratiche e ricerche per il benessere psicofisico /

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## STREETS FOR PEOPLE

Individuals in outdoor environments: projects, practices and research for the psychophysical well-being

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*This volume collects the contributions presented after the call for papers and selected through a double blind review process by the Scientific Committee. The International Conference, of the same name, took place at the Università luav di Venezia, Palazzo Badoer, on 7th November 2025 and was organised by the members of the luav Environmental Accessibility Cluster, with the patronage of SITdA, INU and the luav Foundation.*



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Il volume affronta il tema degli spazi pubblici come luoghi in cui poter vivere una esperienza spaziale autonoma e non segregante, attraverso riflessioni e proposte raccolte in forma di contributi per il Convegno Internazionale dal titolo *Strade per la gente*, organizzato a Venezia il 7 novembre 2025.

Il Convegno nasce dalla volontà del cluster Accessibilità Ambientale della Società Italiana della Tecnologia dell'Architettura SITdA di dare continuità agli incontri di confronto organizzati negli ultimi anni sui temi del benessere psicofisico e dell'autonomia di vita delle persone, per migliorare sempre di più il mondo dell'architettura ai fini dell'inclusività.

The volume addresses the theme of public spaces as places where people can experience spatial autonomy and non-segregating environments. It brings together reflections and proposals presented as papers to the International Conference *Streets for People*, held in Venice on November 7, 2025.

The Conference originates from the desire of the Accessibilità Ambientale (Environmental Accessibility) cluster of the Società Italiana di Tecnologia dell'Architettura (SITdA) to continue the series of meetings held in recent years on the themes of psychophysical wellbeing and people's life autonomy, with the aim of increasingly improving inclusivity in architecture.

# WaVe. Design and ICT for an Inclusive Urban Space

## WaVe. Design e ICT per uno spazio urbano inclusivo

*Il progetto WaVe (Walking Venice) esplora come il Design e le tecnologie digitali possano migliorare l'accessibilità urbana per le persone ipovedenti. Con la crescente complessità delle città moderne, gli ambienti tradizionali spesso trascurano il design inclusivo, rendendo difficile orientarsi per chi ha problemi alla vista. WaVe affronta questa problematica attraverso un sistema assistivo open source co-progettato, composto da un bastone intelligente con rilevamento RFID, un'applicazione mobile e una piattaforma web collaborativa. Il sistema consente agli utenti ipovedenti di ricevere feedback multisensoriali (vibrotattili e acustici) nelle vicinanze di punti di riferimento urbani contrassegnati, aiutandoli a orientarsi e, al contempo, permettendo di arricchire e condividere informazioni specifiche sul luogo.*

*Sviluppato utilizzando la metodologia di design Double Diamond, il progetto si basa sul coinvolgimento diretto di utenti ipovedenti durante tutto il processo di progettazione. Esso prevede inoltre un processo di coinvolgimento di più utenti a livello di community, metodi di fabbricazione digitale a basso costo e l'utilizzo di risorse open source orientate alla sostenibilità e alla replicabilità. Sebbene permangano sfide tecnologiche e sociali, come la qualità dei dati, i limiti di portata dell'RFID e alla difficoltà di scalare le soluzioni open source, il progetto intende dimostrare il valore del design inclusivo, dei metodi partecipativi e delle ICT nella trasformazione della mobilità urbana per le persone con disabilità.*

*Questo articolo offre inoltre una riflessione sui limiti dei modelli di business convenzionali per le tecnologie assistive. L'approccio open source, pur essendo inclusivo ed economico, deve affrontare ostacoli in termini di scalabilità, finanziamenti e sostenibilità economica. Il contributo contiene infine alcune considerazioni specifiche relative allo sviluppo e l'applicazione della soluzione in un contesto reale ricavate dalla realizzazione e sperimentazione del prototipo.*

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## Introduction

Today, the world population is about 8.2 billion. According to the United Nations (UN, 2018) and Food and Agriculture Organization (FAO, 2023), 55% of the world's population lives in urban areas, and it's expected to increase to 68% by 2050. Although cities were originally created to ease access to all the resources created by human communities, modern urban environments have become such a mix of artifacts and functions that they can sometimes be hostile, especially for people with special needs. As argued by Espinosa *et al.* (1998), urban space is an increasingly complex organism and, normally, it is not inclusive at all, which often makes our cities inhospitable towards people with both ordinary and special needs.

Studies on urban accessibility and inclusion (Doniyorov *et al.*, 2024) shows how difficult it can be for people with some mobility or sensorial limitations to be autonomous when living in modern cities. For visually impaired people, in addition to the well-known architectural barriers, urban contexts hide new invisible obstacles and constraints every day so they must explore their paths as if it were always the first time. These issues are almost unknown for common people thinking architectural barriers are only stairs steps, cars on the sidewalks and so on. Actually, any street network, even a pedestrian one, can become like a labyrinth when there are too many elements that confuse a person who needs special support to move like, for example, a blind with his walking stick.

These studies tell us that we need more Design to improve accessibility in urban space, since these issues are not simply architectural or bureaucratic. It is often also a cultural fact. Frequently, urban environments are essentially “visually centric” as it has become more difficult “interpreting spatial layouts, avoiding physical obstacles, identifying landmarks, and finding and accessing public services such as transport and health facilities” (Doniyorov *et al.*, 2024).

The Vision and Eye Health Surveillance System (VEHSS) of the U.S. Centers for Disease Control and Prevention, estimate that visually impaired people are about 2.2 billion in the world and it is estimated that around 15% are totally blind. In Italy, the statistics are in line with those of the EU. 1.9% of people aged 15 and over have severe vision impairment. These rates increase to 5.0% and 8.0%, respectively, for those aged 65 and 75 and over (Governo Italiano - Ministero della Salute, 2020). The UN Convention on the Rights of Persons with Disabilities adopted in 2006 pushes towards improving autonomy of people by leveraging both urban planning or product design approaches and the use of digital technologies to find new and affordable solutions for such a relevant segment of the population.

Literature about designing inclusive cities and enhancing accessibility for the visually impaired (Doniyorov *et al.*, 2024) highlights a wide range of solutions ranging from those that can be implemented by the government to those by architects and urban planners, designers and citizens or communities. Governments can actuate general policies aimed at improving environment accessibility as they benefit society as a whole, also from an economic point of view, but also promote the implementation of the Sustainable Development Goals to create synergies between inclusivity and sustainability. Architects and urban planners should address the visually centric issue exploiting both multisensory approaches and co-design tools techniques leading to more inclusive spaces. Product designers can explore different solutions based on the development of new Product-Service system solutions that includes tactile models, audio support and navigation aids, also taking advantage from the integration of digital tools and ICT. Also communities, citizens and visually impaired users can play a relevant role in achieving a more accessible city by getting involved in training and guidance projects and awareness-raising initiatives.

## Objectives

A robust design methodology is essential for developing assistive technology solutions aimed at improving the accessibility and inclusivity of open spaces in urban environments.

The overall Wave project focuses on the development of an assistive technology device whose purpose can be summarized in three main points:

- it allows visually impaired to effectively deal with the growing complexity of modern cities, particularly considering the richness and rapid variability of stimuli and resources that make cities both fascinating and often challenging;
- it leverages the “community potential”, a crucial value in the urban life, with particular reference to the opportunities provided by ICT (also with a product/service approach), the engagement strategies and tools (social networking - data sharing), and the citizen science (structured data collection and processing: classification/correlation/geolocation);
- it provides an economically sustainable assistive solution based on open-source, making and digital fabrication approaches.

More specifically, the paper aims to demonstrate how, in designing solutions aimed at inclusivity, co-design with users belonging to the target segment improves both the effectiveness of the design process and final result. From a more technical perspective, the paper shows how certain emerging technologies can be used to develop more accessible and customisable solutions for niche market segments.

### State of the Art

The first phase of the desktop research is about defining the relevant aspects of the urban mobility issue for visually impaired people and finding possible approaches to the solution. About possible approaches to this issue, Espinosa *et al.* (1998) says that “Visual information requires less work to integrate it into a well-structured cognitive map of the area compared with information from the remaining senses. Therefore Wayfinding becomes a minutely detailed and effortful task for the blind or visually impaired navigator”.

According to Fernandez *et al.*, (2014), in recent years some research teams (Chumkamon *et al.*, 2008; Willis *et al.*, 2005; D'altri *et al.*, 2007) have developed navigation systems based on this technology. In the case of outdoor environments, some hybrid systems have been proposed that use GPS as the main information source and use RFID for correction and minimization of the location error (Fernandez *et al.*, 2011).

The state of the art was also derived from an analysis of the following seven significant case studies:

- Ariadne GPS (Giovanni Ciaffoni). GPS based navigation with audio and vibro-tactile feedback
- Magellan (Simone Miraldi). Smart cane prototype based on image recognition
- BlindMaps (Copenhagen Institute of Interaction Design). GPS navigation system prototype with Braille actuator
- Smart Guide (Centro de Investigación y de Estudios Avanzados Unidad Guadalajara). Smart glasses prototype with GPS navigation, image recognition, ultrasonic sensors and audio feedback
- Sesamonet (Centro Ricerche Ispra). Navigation system prototype based on RFID tags and mobile app
- Ultracane (Sound Foresight Technology Ltd). Smart cane with ultrasonic sensors hindrances detection and vibro-tactile feedback
- SmartCane (Assistech Group). White cane handle with ultrasonic sensors, hindrances detection and vibro-tactile feedback.

	Digital components	Support functions					Development stage	
		position	space scan	proximity	apt./accus. feedback	augmented web info		mobile app
<b>Ariadne GPS</b>	GPS antenna, web server	X			X	X	X	Available for purchase (low cost mobile App)
<b>Magellan</b>	Camera, image recognition software, GPS antenna	X		X	X		X	Testing prototype
<b>BlindMaps</b>	GPS antenna, braille actuator, Bluetooth radio	X			X		X	Testing prototype
<b>Smart Guide</b>	HD camera, Ultrasonic sensor		X	X	X			Testing prototype
<b>Sesamonet</b>	RFID, Bluetooth radio			X	X	X	X	Testing prototype
<b>Ultracane</b>	Ultrasonic sensor		X		X			Available for purchase (high cost physical device)
<b>SmartCane</b>	Ultrasonic sensor		X		X			Available for purchase (average cost physical device)

Tab.01 Case studies comparison table.

A more recent literature review based on twelve papers and three case studies provided by Doniyorov *et al.*, (2024) states that people with visual impairments face different challenges when navigating the “complex, often visually centric urban environment: interpreting spatial layouts, avoiding physical obstacles, identifying landmarks, and finding and accessing public services such as transport and health facilities”.

The aspects of accessibility from an economic point of view and lack of integration with other technologies are also relevant. In this regard, Fatima highlights that “different technology markets have been developed in isolation with solutions for a specific area and very high cost” and that “there is no clear effort to unite different streams of technologies as disabilities themselves”. Furthermore, “beyond phones, other apps and crowdsourced Smart Cities services are making city life simpler” (Fatima *et al.*, 2024).

## Methodology

The general approach of the WaVe project is based on the Double Diamond method (Design Council, 2007). According to this method, the process begins with a Discovery phase, which involves researching the everyday lives of visually impaired people through literature reviews, case studies, interviews and observations. This is followed by a Definition phase, aimed at identifying the specific goals for the solution, a Development phase including iterative prototyping tests, and a final Delivery phase of the product and the tutorials to enable reproduction.

The development stages address these particular aspects with a co-design approach with visually impaired as possible final users, to explore how to combine open source low-cost digital resources and customization techniques in defining a concept where online information can be provided to visually impaired users in real time during walking.

Since the amount of information to memorize and the physical complexity of the routes



**Fig.01** TAG detection and interface tests during co-design process with visually impaired user.

makes it difficult to walk to a place never visited before or along a path where something has changed, one of the goals of this approach is to allow users to both store personal information about favorite routes within the city and retrieve it whenever they need it by using a dedicated digital tool. The research highlighted that visually impaired people usually have a limited set of tools to face this challenge, but new effective solutions inspired by the Smart Cities model can be developed, especially directly involving end users in the design process with a bottom-up approach.

### **Implementation**

The design stage began with the definition of a brief including possible digital solutions and architecture implementation. In this phase, the visually impaired user has been directly involved in the creation and testing of models and prototypes, providing crucial feedback on several aspects, such as the differences between visually impaired and blind people, the most effective existing aids, critical issues related to the cost of solutions, type of interfaces, differences between indoor and outdoor mobility, personal orientation strategies, and needed educational and training.

During the prototyping stage, the involved user was particularly helpful in testing the effectiveness of RFID detection of different types of tags and placement points (Fig. 01 on the left) as well as in evaluating the usability of the physical interface (Fig. 01 on the right).

The last steps included in-field usability testing and gathering user feedback, as well as the development of a prototype of the web platform.

### **Results**

This document presents the main result of the project, the WaVe system prototype, a co-designed digital assistive solution for the visually impaired, in which the entire design process was conducted in collaboration with a visually impaired user and tested within the complex urban environment of the city of Venice. Indeed, “WaVe” stands for “Walking Venice”; the intention to develop and test the solution in Venice stems mainly from the aim of addressing a context that is particularly challenging, albeit more suitable than others, for the independent mobility of people with special needs or disabilities.



Fig.03 TAG installation, geolocation and data integration via mobile App.

The design concept of tagging the physical environment led to the choice of using RFID technology as the “smart” element of the solution. As active and semi-passive tags were found to be too expensive and complex, the focus shifted to identifying the most suitable passive tags for the purpose, such as discs or pegs, easily attachable to different surfaces without affecting or damaging the environment.

Ultimately, the WaVe system is composed of a smart cane, a bunch of TAGs and a Web-oriented mobile application.

The smart cane is made up of a foldable body, a handle embedding microcontroller, sensors and actuators and a tip with an enhanced radio frequency technology (RFID) antenna able to detect nearby TAGs. Each TAG has its own unique identification number that enables online data association; as soon as the smart cane recognizes a TAG (strategically located in the street corners, where visually impaired people use to touch with the cane), the mobile App gives vibrotactile feedback to the user. If desired, the user can follow the audio instructions provided by the app, or ignore them. Information associated with each tagged point can be updated dynamically via a web platform that provides data sharing and social networking functions.

Each user can place new TAGs and attach information to them. As the tags are unobtrusive, they can be placed potentially anywhere (Fig. 02). Indeed, the main idea is the implementation of a progressive “city tagging”, whereby significant landmarks used for orientation along different city routes are marked using the TAGs. In this way, each route is “augmented” and enriched by the history of users who have interacted with each location. As well as being easier for visually impaired people to retrace, the routes provide additional feedback that improves accessibility and enjoyment of the city’s places and services.

In summary, the design of WaVe is based on four specific features:

- user content customization;
- dynamic updates of information within the web community;
- multi-sensory feedback;
- replicability/expandability in different neighborhoods or cities.

User-side customization is essentially achieved by each user through a personal area on the web platform. Within this area, users can register new TAGs, fill information, create favorite routes as well as interact with other community members.

Real-time access to information is a crucial function of the whole system. It is achieved through the smart cane equipped with the enhanced RFID antenna able to detect tags from a few meters away.

Feedback to the user is sent in a multi-sensory mode; the details related to the detected landmark are sent both in audio via a smartphone application and through vibrations produced by embedded vibrotactile actuators. The system is designed to be continuously upgrading and integrating due to the choice of using miniature, noninvasive TAGs that can be installed outdoors in a safe and non-impactful manner. While the placement of the tags is an operation that the visually impaired user commonly performs with the help of an assistant, once they are in place, the route can be followed independently and potentially provide additional, updated information at each new visit.

### **Discussion, Limitations, and Conclusions**

Designing solutions for people with special needs requires a different approach than designing standard products. The direct participation of real users in the process is almost always required, as well as co-design skills specific to involving users or stakeholders in design processes. In addition to providing a better understanding of specific needs, co-design also allows deepening the relationship between users and their environment (the city), uncovering aspects that most people do not normally see. From this point of view, inclusion is about more than just listening; it's primarily about cooperative design.

The development of the WaVe project shows that people with visual impairments experience a much greater reduction in autonomy outdoors than indoors, mainly due to the environment being more complex and variable over time. This opens up interesting scenarios for the development of technological solutions based on sensors and data driven web applications.

The technology adopted by WaVe has its limitations. The maximum RFID detection distance requires antennas to be considerably larger and heavier the further away the tag is.

Creating shared online databases raises issues of information quality and data security that should not be underestimated. In addition, access to the community may not be completely open, but rather managed by an accountability process to provide a higher level of security.

All comments and feedback received regarding the cost issue led to the development of an open-source web oriented solution based on making and knowledge sharing technologies. For this reason, the instructions and digital materials needed to develop WaVe yourself were published on the Posta – Open Source Projects of Assistive Technologies web platform, which was created as a result of a cooperation program between Italy and Argentina (more information about the project at [www.postaproject.org](http://www.postaproject.org)).

Projects like Wave, and many others analyzed in the literature, are often short-lived also due to the tiny market for this target. Furthermore, business models based on Open Source projects are not known as typical for for-profit businesses. They are often based on open knowledge and voluntary collaboration of many actors, so these kinds of solutions are not patentable. It is unlikely that all developers and contributors can be involved in a business and, to define the percentages of ownership of an Open Source project is difficult (in addition to a philosophical contradiction). Although a part of the Wave development team attempted to bring the solution to the market through an academic incubation process, it never succeeded. Maybe, the old recipes, naively applied, do not fit new and complex collaborative philosophy.

While probably not the ultimate solution, the Open Source approach is a way of making it accessible to users with limited budgets, particularly given the significantly lower prices of 3D printers and prototyping electronics. This approach also allows extensive customization which is difficult to achieve at an industrial level. Finally, a fully open business model could gradually evolve into different types of pay-for-performance solutions, offering new opportunities for system evolution by involving business actors.

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## Bibliographic references

- Chumkamon S., Tuvaphanthaphiphat, P., Keeratiwintakorn, P. (2008). A Blind Navigation System Using RFID for Indoor Environments, *5<sup>th</sup> International Conference on In Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology, Thailand*, n. 2, pp. 765-768.
- D'Atri, E., Medaglia, C., Panizzi, E., D'Atri, A. (2007). A system to aid blind people in the mobility: A usability test and its results, *Proceedings of the Second International Conference on Systems, Martinique*, pp. 35.
- Design Council (2007). *11 lessons: a study of the design process* (online). In <https://www.designcouncil.org.uk/our-resources/archive/reports-resources/11-lessons-managing-design-global-brands/> (accessed in June 2025).
- Doniyorov, A., Polvonov, J., Jalolova, S., Sattorova, Z., Yakubova, M., Gaybullaev, O., Abdullaev, A., Abdukarimov, A. (2024). Designing inclusive cities – The role of urban architecture in enhancing accessibility for the visually impaired. *Archives for Technical Sciences*, n. 2, pp. 393-402.
- du Buf J.M.H., J. Barroso, Rodrigues, J.M.F., Paredes, H., Farrajota, M., Fernandes, H., José, J., Teixeira, V., Saleiro, M. (2010). The SmartVision navigation prototype for the blind. *Proc. Int. Conf. on Software Development for Enhancing Accessibility and Fighting Info-exclusion (DSAI)*, pp. 167-174.
- Espinosa, M., Ungar, S., Ochaíta, E., Blades, M., Spencer, C. (1998). Comparing Methods for Introducing Blind and Visually Impaired People to Unfamiliar Urban Environments. *Journal of Environmental Psychology*, n. 18, pp. 277-287.
- FAO (2023). *Building sustainable and resilient city region food systems – Assessment and planning handbook*. Rome (online). In <https://doi.org/10.4060/cc5184en> (accessed in June 2025).
- Fatima, W., Hanif, S., Yaseen, A., Black, P., Khan, A. (2024). Designing out barriers for disabled: towards an inclusive urban environment. *Remittances Review*, n. 9, pp. 1887-1905.
- Fernandes, H., du Buf, J., Rodrigues, J.M.F., Barroso, J., Paredes, H., Farrajota, M., José, J. (2011). The SmartVision Navigation Prototype for Blind Users. *Journal of Digital Content Technology and its Applications*, n. 5, pp. 351-361.
- Fernandes, H., Faria, J., Paredes, H., Barroso, J. (2011). An integrated system for blind day-to-day life autonomy. *The proceedings of the 13<sup>th</sup> international ACM SIGACCESS conference on Computers and accessibility, Dundee, Scotland, UK*.
- Fernandes, H., Filipe, V., Costa, P., Barroso, J. (2014). *Location based Services for the Blind Supported by RFID Technology*. Doi: 10.1016/j.procs.2014.02.002.
- Governo Italiano - Ministero della Salute (2020). *Relazione del Ministro della Salute sullo stato di attuazione delle politiche inerenti la prevenzione della cecità, l'educazione e la riabilitazione visiva (legge 284/97)* (online). In [https://www.salute.gov.it/imgs/C\\_17\\_pubblicazioni\\_3402\\_allegato.pdf](https://www.salute.gov.it/imgs/C_17_pubblicazioni_3402_allegato.pdf) (accessed in April 2025).
- Makkonen, T., Inkinen, T. (2024). Inclusive smart cities? Technology-driven urban development and disabilities. *Cities*, n. 154, pp. 1-10.
- United Nations, Department of Economic and Social Affairs, Population Division (2019). *World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420)*. New York: United Nations (online). In <https://population.un.org/wup/assets/WUP2018-Report.pdf> (accessed in June 2025).
- Vision and Eye Health Surveillance System (VEHSS) (online). In <https://www.cdc.gov/vision-health-data/> (accessed in April 2025).
- Willis, S., Helal, S. (2005). RFID Information Grid for Blind Navigational and Wayfinding, *Proceedings of the 9<sup>th</sup> IEEE International Symposium on Wearable Computers, Osaka*, pp. 34-37.