

Wayfinding and indoor navigation for persons with visual impairments: an overview of support innovations by Mada

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Abstract- Technology has become an essential part of our lives, and many of our daily tasks have become entirely dependent on it. For example, routine chores such as shopping for household necessities, booking travel tickets, going to places using all different kinds of transportation, etc., are quickly done through mobile phones. And because how it is easy to use mobile phones, we may forget that others, such as the visually impaired, may face many difficulties when using them. The task of navigating through new spaces can often be challenging for people with disabilities, especially for people with visual disabilities and the elderly unless they were already acquainted with the pathways and key landmarks. This applies to both indoor and outdoor spaces. People with Disabilities (PWD) typically rely on published information, experience, other people's expertise, and/or technology to navigate through unknown outdoor and interior areas to attain safe and independent movement. Wayfinding technology has made it possible for accessible and inclusive mobility for persons with visual impairment, and independent travel is a crucial component of this.

Keywords- persons with visual Impairments, digital accessibility, wayfinding technology, indoor navigation

1. Introduction

Technology is changing the way we interact with the world and access services and products. Companies are eager to use technology to reach as many clients as possible. Although many companies are missing digital accessibility, leaving a growing population out without them knowing. Wayfinding was critical for independent mobility, and it is still a complicated ability that is linked to the quality of life, mental health, and economic wealth today (Allen, 2007; Golledge, 2003). Wayfinding for those who are blind, have low vision, or are deafblind may also be known as “orientation and mobility” (O&M), “orienteeing,” “travel,” and “visually impaired mobility.” The term “wayfinding” is used to describe orientation and navigation through an environment. Travelers can know where they are and where they are going by understanding where they have already been. It is described by Wiener et al. (2010) as “moving purposefully through the environment toward a destination” while using all the cognitive, motor, and perceptual skills that the traveler has already learned.

The task of navigating through new spaces can often be challenging for people with disabilities, especially for people with visual disabilities and the elderly unless they were already acquainted with the pathways and key landmarks. This applies to both indoor and outdoor spaces. To achieve safe and independent mobility, PWDs usually depend on published information, prior experience, the knowledge of others, and/or technology to navigate through

unfamiliar outdoor and indoor environments. Today, due to advances in various technologies, wayfinding and navigation systems and services are more common and accessible on all platforms for end-users.

2. Accessible Wayfinding for Visually Impaired

The use of accessible wayfinding technology can provide excellent indoor and outdoor directions for the blind and more generally for individuals with disabilities. By depending on interior and outdoor navigation solutions, public spaces such as metro stations, airports, bus stops, entertainment centres, malls, tourist attractions, and many more are now adapting to inclusive design (van der Bie et al., 2019a).

Among the many functions that smart cities offer, the safe and comfortable movement of pedestrians within the built environment is of particular importance. Safe and comfortable mobility requires that the smart city-built environment considers different mobility needs and preferences and is accessible to all pedestrians, people with mobility impairments, and people with mobility disabilities. Through this, coupled with advanced technologies such as wayfinding applications, pedestrians can get assistance in finding the best pathways to use at different locations and times. Wayfinding applications are usually comprised of two components, accessibility data, and appropriate algorithms that can utilize that data to meet the mobility needs and preferences of all individuals (Al-Khalifa & Albatati, 2022).

3. Key highlights of accessible wayfinding solutions

3.1. Seamless Indoor and Outdoor experience

The wayfinding application must be able to provide seamless routing and navigation between rooms, floors, buildings, and remote areas. A seamless indoor and outdoor experience refers to the smooth transition between the inside and outside of a building or space. This can be achieved through the use of large windows or doors that allow natural light to flow into the interior, as well as through the use of outdoor features such as patios, decks, and gardens that are incorporated into the design of the space. When the indoor and outdoor areas are connected in a cohesive way, it can create a sense of unity and continuity that enhances the overall experience of being in the space. Additionally, a seamless indoor and outdoor experience can provide a connection to nature and the outdoors, which has been shown to have numerous benefits for mental and physical health.

3.2. Indoor positioning with Bluetooth Low Energy beacons

The easiest, most cost-effective method with the smallest interference with other IT networks is to use commercial matchbox-sized BLE beacons. These beacons are usually attached with double-sided tape, to crucial locations inside buildings, to deliver location services for mobile phones.

Indoor positioning with Bluetooth Low Energy (BLE) beacons involves the use of small, low-power devices that transmit a Bluetooth signal to enable location tracking within a confined space, such as a building or shopping mall. BLE beacons can be placed strategically throughout a space to create a network that allows for the accurate tracking of a user's location in real-time. This technology is often used in conjunction with a mobile app or other software to

provide information about the user's location and any nearby points of interest. For example, a shopping mall might use BLE beacons to help customers find their way to specific stores or restaurants, or a museum might use them to provide interactive exhibits or audio tours. BLE beacon-based indoor positioning systems offer a number of benefits, including high accuracy, low cost, and the ability to work with a wide range of devices.

3.3. Easy Map Editor tools

It should be easy for novice users with IT skills to update digital maps to accommodate small changes and create points of interest, using simple drag-and-drop gestures. Map editor tools are important for indoor navigation systems because they allow for the creation and maintenance of accurate and up-to-date maps of the space being navigated. These tools allow users to input data about the layout and features of the space, including the location and size of rooms, corridors, and other features such as stairs, elevators, and restrooms. This information is then used to create a digital map that can be accessed by the navigation system to provide users with directions and other information.

Map editor tools are important because they allow for the creation of maps that are as accurate and detailed as possible. This is especially important in large or complex spaces, where it can be challenging to navigate without a clear map. In addition, map editor tools allow users to update and maintain the map as the space changes over time. For example, if a new store is added to a shopping mall, the map can be updated to reflect this change.

Overall, map editor tools are an essential component of indoor navigation systems because they enable the creation and maintenance of accurate and up-to-date maps that are essential for providing users with reliable navigation and other information.

4. Lazarillo app supported by Mada Innovation Program

Out of its commitment to perform its role as an ICT Accessibility strategic enabler, and in line with its efforts to enable independent equal basis for PwDs and the elderly to take part in cultural life via ICT, Mada developed an innovative project together with the Mada strategic partners to implement Lazarillo at Mathaf, Metro Station and Galleria Mall (Thani et al., 2019). The initiative seeks to allow visually impaired people to visit a wide range of facilities, using an internal navigation system that is currently live at the locations. Such an initiative is about making art more accessible for everyone, the Lazarillo audible guide and map will help users experience independent mobility and find their way around the locations (Arditi and Tian, 2013). Lazarillo with its free mobile app helps persons with disabilities navigate the physical and digital world of companies and public institutions services, reducing anxiety and saving time for customers with audible assistance that expertly guides them through their physical space and connects them to services while being at home too. Companies Improve the experience of their customers with disabilities in an easy, simple, and secure way.

Lazarillo is a tool used every day by persons with disabilities to help them navigate their world. It can be also used as a communication platform by uploading content and services to further inform customers about various services and benefits. Lazarillo is designed for people with disabilities who use smartphones with Android or IOS systems. Accessible for visually

impaired users using Talkback and Narration screen readers. Persons with visual impairments receive audible directions with information to guide them through their surroundings. For persons with a physical disability, it provides information on accessible routes, showing the best way to manoeuvre without problems.

Conclusion

Of the many features that smart cities offer, the safe and comfortable mobility of pedestrians within the built environment is of particular importance. Safe and comfortable mobility requires that the built environments of smart cities be accessible to all pedestrians, mobility abled and mobility impaired, given their various mobility needs and preferences. Through this, coupled with advanced technologies such as wayfinding applications, pedestrians can get assistance in finding the best pathways to use at various locations and times. Wayfinding applications are usually comprised of two components, accessibility data, and appropriate algorithms that can utilize that data to meet the mobility needs and preferences of all individuals. Accessible wayfinding technology offers great solutions to guide the blind and more generally people with disabilities indoors and outdoors. Public places like metro stations, airports, bus stations, entertainment centres, malls, tourist spots, and much more are now adapting to inclusive design by relying on indoor and outdoor wayfinding solutions.

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