How to Use Mobile Technology to Support & Connect with People with Visual Impairments

The AWARE Mobile App from Sensible Innovations

Executive Summary

When was the last time you saw a person with a visual impairment shopping at the mall, strolling through a museum, or independently navigating any other type of indoor public space?

Even though there are nearly 21 million visually impaired adults in America, we don't often see them.[1] That's because their movements are restricted to places in which they feel comfortable and where they've memorized routes and landmarks.

Without the ability to see signs, architectural cues, and other location information, they find it difficult to determine where they are, what opportunities are available to them, and the direction they need to travel to move efficiently from place to place.

Fortunately, mobile technology has advanced to the point where malls, public venues, and other facilities can close the information gap. You can now give people with visual impairments all of the information they need to travel independently.

This white paper introduces the AWARE mobile app for iOS and Android devices. Designed to provide ambient and on-demand audio and text-based information about their location and surroundings, AWARE uses iBeacon technology to help people with visual impairments explore the world with confidence.

[1] American Foundation for the Blind. (2014). Research Navigator: Just How Many Blind Folks Are There Anyway?

The Amazing Way Humans Navigate and Interact with Our Surroundings

Sighted individuals seem to navigate personal and public environments with little effort. We give no thought to the countless tasks the brain performs with the visual cues it is constantly receiving.

Actually, the way we navigate is amazing.

We find our way through large or unknown environments by taking in visual information then conceptualizing it in our minds like a map. Thanks to our ability to create a spacial memory, we store everything we see in a three-dimensional cognitive map.[2] Both consciously and subconsciously, we memorize and recall routes from one place to another as well as the location of landmarks, buildings, stairs, doors, and objects.

Since we can see the world around us, we can afford to rely less on that cognitive map. That's because it is easy for us to instantly update that map with new visual information. For instance, there is no need to remember exactly where a public restroom is located. All we need to do is find a sign that will direct us to where we want to go.

A person with a visual impairment doesn't don't have this luxury.

People with Visual Impairments Live in a Unique World

Imagine yourself standing blindfolded in the middle of your favorite shopping mall. Now, imagine yourself trying to find the public restroom. Even though you've been in the mall countless times, it's unlikely you can easily locate the restroom. Which way do you turn? How to you seek assistance? Are you insecure? Afraid?

The Cognitive Map

The visually impaired live in a unique world because they must rely almost entirely on their cognitive map for wayfinding.

This places a heavy burden on their memory.

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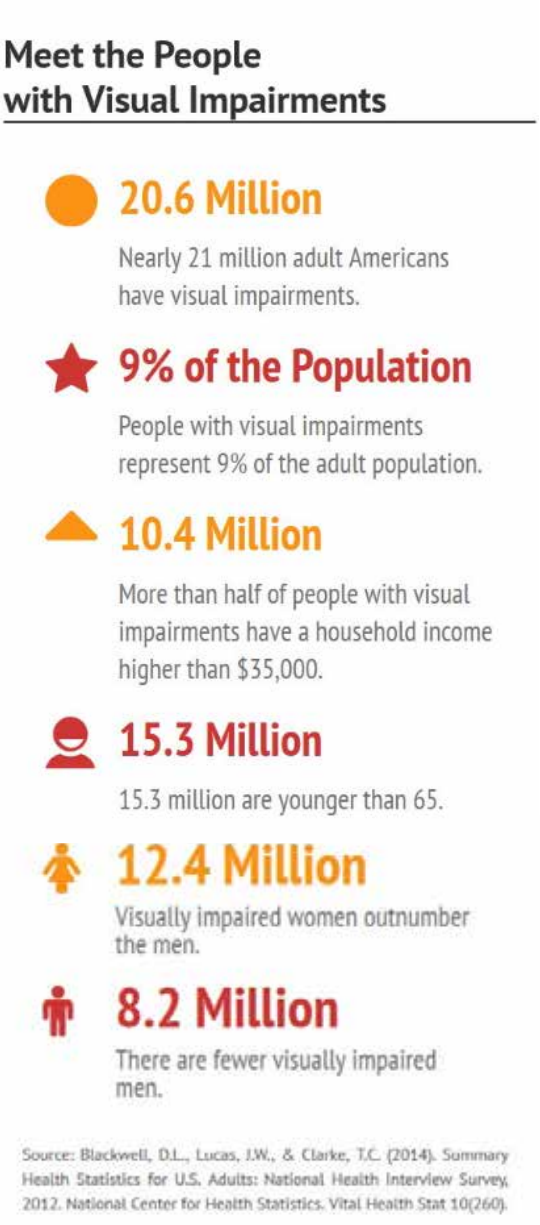
[2] Zhao, C., Hiam, J. W., Morgan, J. H., Ritter, F. E. (2011). A Multi-Strategy Spatial Navigation Model in a Text-Based Environment. In *Proceedings of the 20th Conference on Behavior Representation in Modeling and Simulation*. (pp. 251-258). 11-BRIMS-036.

Essentially, wayfinding for both the sighted and visually impaired has four components:[3]

1. Orientation – Knowing the current location
2. Route Decisions – Finding the right path
3. Cognitive Mapping – Using cues to predict the next best step
4. Closure – Detecting and arriving at the right place



The third component—the cognitive map—is crucial to wayfinding. This map must include a large number and variety of paths, barriers, places, intersections, and landmarks.[4]

To develop their cognitive map, a person with a visual impairment must rely on friends or orientation and mobility instructors to help them locate where they want to go and figure out a route that will get them there.

Even with the use of a dog guide, a person with a visual impairment must know how to get where they need to go. Dogs can't read signs. They respond to directional commands are used as an added layer of safety for the independent traveler.

One unfortunate result of the enormous memory burden is that a person with a visual impairment will tend to take routes and visit places they are able to memorize.

Acoustic Wayfinding

Acoustic wayfinding involves using auditory cues to gather information about the location of surrounding objects needed to create a cognitive map. Success is limited because noisy environments interfere with this technique and existing architectural designs rarely provide the required acoustic response.

Generally, because people with visual impairments have such difficulty acquiring an essential level of awareness of their environment, they don't experience the greatest independence and freedom possible.

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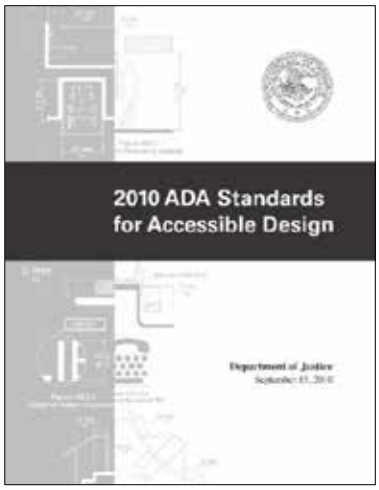
[3] Lynch, K. (1960). *The Image of the City*. Cambridge, Mass. Technology Press.

[4] Quinones, P. A., Greene, T., Yang, R., & Newman, M. (2011, May). Supporting Visually Impaired Navigation: a Needs-Finding Study. In *CHI'11 Extended Abstracts on Human Factors in Computing Systems*. (pp. 1645-1650). ACM.

The Visually Impaired Population Is Larger Than You May Think

According to the American Foundation for the Blind and the National Center for Health Statistics, there are nearly 21 million adult Americans with visual impairments—making up 9% of the total population.[5] That number includes those who are blind as well as those who report having trouble seeing even if they are wearing glasses or contact lenses.

The Americans with Disabilities Act is a First Step



The Americans with Disabilities Act (ADA) is a Federal civil rights law that was enacted to enable the more than 50 million Americans—18% of the population—who live with disabilities to feel welcome and live more independently.[6]

The ADA is currently celebrating 25 years of removing barriers and empowering people. It is a wonderful law that is full of good intentions. However, it doesn't go far enough in ensuring that people with visual impairments can navigate and explore buildings with ease and confidence.

To comply with the few provisions of the ADA that relate to people with visual impairments, state and local government facilities, public accommodations, and commercial facilities only have to be "accessible" and "usable."[7] This is typically accomplished in the form of a braille or large-print sign that requires the user to locate it to make it useable.

Sadly, the terms "accessible" and "usable" ignore the concepts of function and pleasure. As a result, most organizations don't make the modest enhancements to their facilities to enrich the experiences of people with visual impairments.

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[5] Blackwell, D.L., Lucas, J.W., & Clarke, T.C. (2014). Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2012. National Center for Health Statistics. Vital Health Stat 10(260).

[6] U.S. Department of Justice, Civil Rights Division. (2011). ADA Update: A Primer for Small Businesses.

[7] U.S. Department of Justice, Civil Rights Division. (2015). Information and Technical Assistance on the Americans with Disabilities Act.

Existing Signage and Architecture Don't Meet the Needs of the Visually Impaired

The unfortunate reality is that existing signage, map technology, and architectural design don't effectively address the information needs of people with visual impairments.

Braille Signs

The ADA requires the placement of braille architectural signs in certain facilities. However, it is often difficult for a visually impaired person to locate the signs so that they can be useful. Although helpful, braille accessibility serves a small portion of the visually impaired population because many lose their vision as they age and haven't learned the difficult skill of reading braille. Also, signs for marketing purposes such as logos or promotional signage are not required to be in braille.

Tactile Maps

Tactile maps use large print, tactile, and braille features etched in metal to describe a geographic area. The usefulness of tactile maps is limited because they are expensive and are typically installed in a permanent location, requiring people with visual impairments to locate them. These maps can be difficult to understand if the user is not familiar with them.

Infrared Audio Signs

Signs that send short audio signals triggered by infrared light beams can be useful. However, they are expensive to deploy require a special receiver. Also, they don't provide enough information to help people with visual impairments master their surroundings.

Insufficient Accommodation

It's not just signage and technology that have been failing people with visual impairments. Few, if any, facilities are prepared to accommodate them sufficiently. Having complied with ADA requirements, facilities typically only go so far as allowing dog guides and giving free admission to assisting companions.

The AWARE Mobile App Helps the People with Visual impairments Master their Surroundings

More than just navigation, the AWARE mobile app gives the visually impaired mastery of their surroundings.

It enables users to explore and navigate places where they have never been, or revisit places with more confidence and independence, on their own schedule.

Research shows that supplying information about the specific types of locations and landmarks, along with turn by turn navigation information, is essential for assisting the visually impaired with building efficient cognitive maps to become better aware of their surroundings. Using up-to-date and consistent information as cues to direction also helps them make informed wayfinding decisions, verify their routes, and recover from mistakes.[8]

The AWARE mobile app works seamlessly with strategically placed iBeacons to provide essential information to app users. Using large fonts, high contrast graphics, and spoken words, the app delivers directions and descriptions both automatically and on demand.

Here are a few essential features of the AWARE mobile app.

Location-Based Announcements

AWARE helps the visually impaired embrace their ability to explore unfamiliar places by reciting the names of landmarks and locations as they approach them.

Detailed Description of Locations

If the user wants to know more about a location, she can say “tell me more” and the AWARE will give a pre-programed, detailed description in real time.

Audio Turn-By-Turn Navigation

With its speech recognition feature, users can say the words “take me to” along with their desired destination and AWARE will guide them there with audio turn-by-turn directions.

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[8] Quinones, P. A., Greene, T., Yang, R., & Newman, M. (2011, May). Supporting Visually Impaired Navigation: a Needs-Finding Study. In CHI'11 Extended Abstracts on Human Factors in Computing Systems. (pp. 1645-1650). ACM

AWARE is also able to detect when the user is headed in the wrong direction. Using a built-in navigation algorithm that works just like GPS, AWARE will automatically calculate a new route.

With the AWARE app on their mobile phone, a person with a visual impairment will never get lost again.

The AWARE Mobile App Helps You Connect with People with Visual Impairments

Because half of the nearly 21 million people with visual impairments enjoy a household income in excess of $35,000, they represent a large group of viable customers.[9]

Here are some of the ways that the AWARE mobile app helps you connect with the visually impaired.

Location-Based Promotional Messages

Because AWARE interacts with iBeacons, you can program the system to provide promotional information when a person with a visual impairment walks by or requests more information.

Targeted Messaging

If you have a message that is intended specifically for people with visual impairments, you can use AWARE to communicate it directly to them. This feature is helpful in situations where unexpected event or program changes can't be communicated effectively in any other way.

Orientation and Mobility Training Aid

AWARE is an excellent teaching aid for orientation and mobility because the app allows the instructor to set up the site with iBeacons and customize the audio descriptions to suit the trainee so he can practice at his own pace and at his convenience.

Audio Tours for Museums, Art Galleries, and other Venues

By deploying AWARE in your venue, you can reduce or eliminate the necessity for physical guides and allow users to hear detailed information about each exhibit when and where it's relevant.

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[9] Blackwell, D.L., Lucas, J.W., & Clarke, T.C. (2014). Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2012. National Center for Health Statistics. Vital Health Stat 10(260).

Supports Advancements in Architectural Wayfinding

Good architectural wayfinding design is important because it facilitates access and reduces isolation of users with disabilities. AWARE can serve as a useful tool in improving the "legibility" of an environment by increasing the amount of information a person with visual impairments can access.

Works with Existing iBeacon Infrastructure

AWARE works through Bluetooth technology that allows wireless devices to interact with short-range signals sent by small strategically placed iBeacons. AWARE's flexible application programming interface (API) that allows it to work with its own inexpensive iBeacons as well as with any existing iBeacon infrastructure.

Easily Editable Database

Entering information into the AWARE database is easy. Using a web-based portal, anyone can enter and update information as necessary.

Conclusion

Whether you are a responsible for managing a facility or venue, or you are planning the construction of a new building, you now have a tool that will help you connect in a meaningful way with people with visual impairments.

Because every person with a visual impairment is a potential customer, AWARE is an efficient marketing tool for retail outlets because it can communicate location-based promotions.

Additionally, architects and builders can use AWARE to help them create more exciting environments that support the desire of people with visual impairments to become more active and feel included in mainstream activities.

It only takes the AWARE mobile app wayfinding system and a few strategically placed iBeacons to empower people with visual impairments to explore their world with confidence.

To begin providing your visitors with visual impairments with the essential layer of information they are missing, visit Sensible-Innovations.com today.

About Sensible Innovations, LLC

Sensible Innovations is dedicated to helping people with visual impairments gain the crucial level of awareness that will give them mastery of their surroundings. By giving people with visual impairments access to the same information that sighted people have when visiting places, Sensible Innovations drives their curiosity and courage to explore and enjoy their surroundings more independently and become more involved in mainstream activities.

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