



Easy Reach Store : Shopping Application for Visually Challenged

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Abstract—This study describes the creation of a cutting-edge mobile app intended to improve the supermarket shopping experience for those with visual impairments. The Android Studio-based program functions as a digital map inside a particular grocery shop, providing step-by-step guidance to desired sections and items without relying on real-time location monitoring. With just one voice input button, the user interface is purposefully kept simple. Users can just speak commands into the app, and it will answer by speaking out loud step-by-step directions to the location of their choice inside the store. Users also have the option of listening to the audio output again to make sure they fully comprehend each step. The app's capacity to recall prior locations is a remarkable feature. The software prompts users to select whether they want directions from their current position or from the sector they just left when they want to move to another area of the store. The user's comfort and flexibility are increased by this adjustment. Recognizing the special needs of visually impaired users, the administrative features of the app incorporate a long-press login method to avoid inadvertent access. Administrators may effectively control store sections and product listings once they are logged in. Administrators might, for instance, add categories like "Biscuits" and specific products like "Chocolate Biscuits" to the site to give visitors a precise and thorough purchasing experience. Although this research did not directly interview visually impaired people, it relied from prior studies on related apps and the particular needs of this user group. This app seeks to improve the quality of life of visually impaired people by emphasizing accessibility and user-friendliness while enabling them to independently and effectively navigate grocery stores.

Keywords—Visually impaired, Navigational assistance, Section and product management, Quality of life, User customization, Digital guide.)

I. INTRODUCTION

In an interconnected society undergoing significant transformation due to technology, various aspects of human life are being reshaped. A prominent area greatly impacted is assistive technology for individuals facing impairments. Notably, there has been remarkable progress in the realm of apps tailored to address the unique needs of the visually

impaired. A research paper delves into the exploration and outcomes of an assistive application designed to enhance the shopping experience for those with visual challenges. Referred to as the "Easy Reach Store," this application strives to empower individuals with visual impairments by offering a voice-guided navigation system within physical retail settings. The application facilitates an accessible method for visually impaired shoppers to confidently navigate store layouts and locate desired products through voice commands and step-by-step audio instructions. The research article comprehensively examines the technological underpinnings, user experience considerations, and potential societal implications of this innovative approach. Through an assessment of the challenges, advantages, and future prospects of the Easy Reach Store, the research contributes to the ongoing discourse surrounding inclusive technology and its capacity to create more equitable and empowering encounters for individuals with visual impairments.

II. LITERATURE REVIEW

In an interconnected society undergoing significant transformation due to technology, various aspects of human life are being reshaped. A prominent area greatly impacted is assistive technology for individuals facing impairments. Notably, there has been remarkable progress in the realm of apps tailored to address the unique needs of the visually impaired. A research paper delves into the exploration and outcomes of an assistive application designed to enhance the shopping experience for those with visual challenges. Referred to as the "Easy Reach Store," this application strives to empower individuals with visual impairments by offering a voice-guided navigation system within physical retail settings. The application facilitates an accessible method for visually impaired shoppers to confidently navigate store layouts and locate desired products through voice commands and step-by-step audio instructions. The research article comprehensively examines the technological underpinnings, user experience considerations, and potential societal implications of this innovative approach. Through an assessment of the challenges, advantages, and future prospects of the Easy Reach Store, the research contributes

to the ongoing discourse surrounding inclusive technology and its capacity to create more equitable and empowering encounters for individuals with visual impairments.

TABLE I. COMPARISON OF EXISTING PRODUCTS AND EASY REACH STORE

Feature	Tinetra	iCare	GroZi	Easy Reach
Comprehensive Shopping Assistance	×	×	×	✓
Voice-Guided Directions	×	×	×	✓
Step Count Information	×	×	×	✓
Live Location-Free Solution	×	×	×	✓
User-Friendly Interface	×	×	×	✓
Cost-Effective for Users	×	×	×	✓
Hardware-Free Solution	×	×	×	✓

III. METHODOLOGY

The "Easy Reach Store" application, created to make grocery shopping easier for people with visual impairments within a single store, was developed using a methodology that is outlined in this article. Users may easily navigate the store with the help of the application, which was mostly designed on the Android Studio platform. A summary of the Easy Reach Store application's components and features is shown in Figure 1, which also demonstrates the architecture of the program. Direct interviews with people who are blind or visually impaired were not a part of the research approach, which instead relied heavily on an in-depth examination of the applications that are already available and pertinent academic studies.

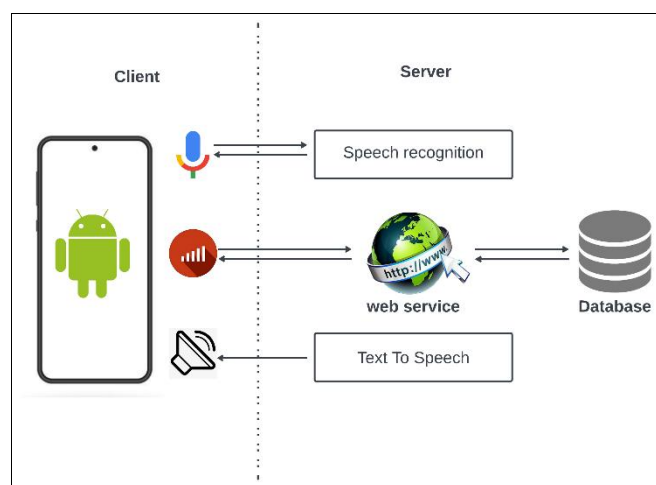


Fig 1 : Architecture of Easy Reach Store.

The Easy Reach Store app's main role is to give customers step-by-step directions that take them to the store's

desired areas without relying on live location services. The app's interface is purposefully simple and only has one button for voice input. Users simply voice their preferred product or segment to start the procedure. The program then replies with succinct vocal instructions, making it simple for users who are blind or visually impaired to use. Users of the software can replay audio output instructions for each stage to improve usability and aid in navigation and orientation.

The Easy Reach Store app also gives consumers the option of easily switching between sections. The software optimizes the shopping experience by giving users the option to start at the beginning or continue from the section they were in when they decide to move to a different section.

The application has a long-press login button on the administrative side to prevent accidental activation by users who are blind or visually impaired. The app's database of shop categories and goods must be kept up to date, which requires the admin interface. To keep the app current and relevant to the store's inventory, administrators can easily add and manage sections and the related products. This is demonstrated by the admin's ability to enter details like "Section: Biscuits" and identify specific items inside that section, such as "Chocolate Biscuits."

In conclusion, the process used to create the Easy Reach Store app mainly comprised intensive study on already-existing programs and studies pertaining to helping people who are visually impaired with daily duties. The app's UI is user-friendly and offers clear voice-guided directions, placing a priority on simplicity and accessibility. By including an admin interface, the app may be updated often to reflect changes in the layout and product selection of the store. Figure 2 provides a visual representation of the user journey through the app and their interaction with the backend system, illuminating the system flow.

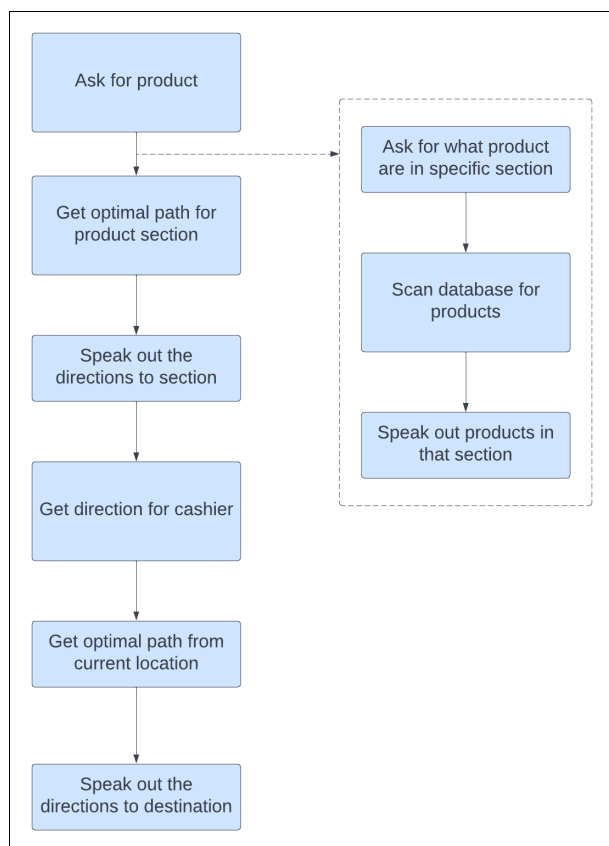


Fig 2: Flow of the system.

IV. RESULTS

According to our findings, the EasyReach mobile application provides a highly user-friendly shopping experience, differentiated by its simple interfaces, clear voice instructions, precision tailored to a single grocery store, and the option for users to get list of all products in each section. This research focused on a single grocery shop, and the results revealed some considerable benefits for users.

The design of the EasyReach mobile application highlights simplicity, with user-friendly interfaces that allow for easy navigation. Users liked the presence of clear and simple audio instructions in the EasyReach mobile application. Shoppers enjoyed the assistance provided throughout their shopping trips, which significantly improved their entire shopping experience.

EasyReach, which is specific to a certain grocery shop, succeeds at properly identifying product locations inside that store. It ensures that customers obtain accurate information regarding the path or sector in which items are placed. New sections, products and the step counts can be added to the system through the admin account. Also, they can update. So, every information can update regularly, and this improved accuracy enables users to effectively identify the things they need, saving time during shopping trips.

EasyReach extends the shopping experience even further by allowing customers to ask for every product provided in any section of the grocery store. This feature allows users to listen all the products in a certain section, guaranteeing a complete and efficient shopping experience.

Many approaches, although with limited capabilities, have been created to solve the above problem. The EasyReach application, on the other hand, stands out as a comprehensive solution that covers all user needs via smart phones. EasyReach distinguishes itself from previous projects by cutting out the need for expensive devices like RFID readers and barcode scanners, as well as the difficulty of carrying bulky shopping equipment. This research effort resulted in a very effective solution that is customized to fulfill the needs of visually impaired people while also aiding the smooth execution of daily duties for shop owners and staff members.

In summary, the EasyReach mobile application provides a great shopping experience for visually challenged, distinguished by user-friendly interfaces, clear voice instructions, accuracy matched to a specific grocery store, and the useful option for users to ask for list of all products in each section. All these factors combine to improve the shopping experience, identifying it as an essential tool for visually challenged people.

V. DISCUSSION

A big step toward improving accessibility and freedom in daily activities has been made with the creation and adoption of the grocery shopping app specifically designed for people with visual impairments. The main characteristics of the app, its potential impact, as well as some of the limitations and challenges that were experienced during the development process are all covered in this section of the study report.

A. Enhancing Accessibility and Independence

The main purpose of the app is to enable visually impaired people to find their way through a grocery shop on their own. The software equips users to carry out their grocery shopping activities quickly and confidently by providing step-by-step directions to specific departments and products within a store. The straightforward user interface, which includes a voice input button and good audio output, assures ease of use and makes it a useful tool for people who are visually impaired.

B. Efficiency and User Experience

The app's emphasis on efficiency stands out as one of its significant advantages. Users have the option to replay the audio output of the step count, which gives them the ability to traverse the store. The user-friendly design of the app is further enhanced by its capability to remember the last section that was accessed and ask the user if they want to continue from that point or start anew.

C. Administrative Control

It is an acceptable plan to include an admin option that is accessed by long-pressing a button. Using this functionality, authorized users can control the app's sections and products. Because the grocery store's layout or goods are subject to change over time, this control guarantees that the app is updated and useful to users.

D. Research and App Design

While the research completed without conducting direct interviews offers a foundational understanding of the demands and difficulties faced by people who are blind or visually impaired, it is important to realize that user feedback from actual situations might have provided more insightful

information. However, the design and functioning of the app were significantly influenced by research into existing apps, analysis of those apps, and pertinent studies.

E. Limitations and Challenges

The app has several interesting features, but it also has some issues that need to be addressed. One major drawback is how challenging it is to perform live location tracking in a relatively small area like a grocery store. Furthermore, it can be prohibitively expensive to deploy Bluetooth and Wi-Fi beacons, which would allow for more accurate location tracking. It's significant to note that the decision to favor user privacy and cost effectiveness led to the absence of live location tracking. Another potential difficulty is that the grocery store's adherence to the preset section and product categorization may be a determining factor in how well the app works.

F. Future Directions

Future iterations of the app might look into incorporating cutting-edge location technology, such as indoor positioning systems, to increase accuracy. The usability and accessibility of the app could also be improved by extending its compatibility with a wider selection of stores and taking customer input from direct interviews into account.

In conclusion, the grocery shopping software created for those who are blind or visually impaired is a big step in the right direction for accessibility and independence. It is a useful tool because of its user-friendly interface, administrative control, and emphasis on efficiency. While there are some drawbacks, additional study and development can resolve these problems and improve the app's performance for those who are blind or visually impaired.

VI. CONCLUSION

We introduced an application in this study that is specifically designed to meet the demands of people with visual impairments and enhance their in-store shopping experience. To increase accessibility, this program uses voice input, database-driven navigation, and user-friendly features.

Our app solves the problem of indoor navigation by giving users clear instructions on how to quickly locate things. Users can also use it to find out where a product is located in the store and whether it is available. The freedom of managing store sections and product information is available to administrators.

Practically speaking, this application is an important move in the direction of inclusivity in retail settings. It encourages the independence of those who are blind or visually impaired by enabling them to shop on their own. It also acts as a template for technological solutions that target various user groups.

Its compatibility with more stores might be expanded, and the user interface could be improved in the future. Additional enhancements might be provided by integration with cutting-edge technology like augmented reality and machine learning.

The shopping experience for those who are visually impaired can be improved with the help of our application, which promotes inclusivity and autonomy. It's an advance in the direction of a time when technology enables people of all abilities to enjoy independent, productive shopping.

REFERENCES

- [1] R. K. Megalingam, P. Teja Krishna Sai, A. Ashvin, P. N. Reddy and B. Ram Gamini, "Trineta App: A Companion for the Blind," 2021 IEEE Bombay Section Signature Conference (IBSSC), Gwalior, India, 2021, pp. 1-5, doi: 10.1109/IBSSC53889.2021.9673267.
- [2] Weiss, Thomas C., March 9, 2013. TapTapSee Camera App for Visually Impaired. Retrieved on 4/27/2013 from: <http://www.disabled-world.com/assistivedevices/apps/taptapsee.php>
- [3] Avila, Mauro & Wolf, Katrin & Brock, Anke & Henze, Niels. (2016). Remote Assistance for Blind Users in Daily Life: A Survey about Be My Eyes. 1-2. 10.1145/2910674.2935839.
- [4] McKeown E, McGraw C, Holder P, Shand J, Hirani SP. Acceptability and Impact of an Educational App (iCare) for Informal Carers Looking After People at Risk of Pressure Ulceration: Mixed Methods Pilot Study. JMIR Form Res. 2022 Sep 16;6(9):e36517. doi: 10.2196/36517. PMID: 36112413; PMCID: PMC9526110.
- [5] Belongie, S.. (2010). Project GroZi: Assistive Navigational Technology for the Visually Impaired. Journal of Vision - J VISION. 7. 37-37. 10.1167/7.15.37.
- [6] Nicholson, John & Kulyukin, Vladimir & Coster, Daniel. (2009). Open Access ShopTalk: Independent Blind Shopping Through Verbal Route Directions and Barcode Scans. The Open Rehabilitation Journal. 2. 11-23. 10.2174/1874943700902010011.
- [7] D. I. De Silva, M. R. A. Nashry, S. Varathalingam, R. Murugathas and T. K. Suriyawansa, "iShop — Shopping application for visually challenged," 2017 9th International Conference on Knowledge and Smart Technology (KST), Chonburi, Thailand, 2017, pp. 232-237.
- [8] Ramachandran, Rajesh. (2018). Iot Sensors and Mobile Applications for Life Style Management of Visually Challenged Persons. 10.9790/487X-2005047784.
- [9] Onkoba, N.O., Karimi, P. & Nyangaresi, P.O. Design and implementation of a secure mobile phone-based route navigator (mGuide), adapted for the visually challenged people. Journal of Electrical Systems and Inf Technol 10, 18 (2023). <https://doi.org/10.1186/s43067-023-00087-0>
- [10] Liu, Guanhong & Ding, Xianghua & Yu, Chun & Gao, Lan & Chi, Xingyu & Shi, Yuanchun. (2019). "I Bought This for Me to Look More Ordinary": A Study of Blind People Doing Online Shopping. 1-11. 10.1145/3290605.330