

Advanced Application for Visually Impaired People

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Abstract: In today's digital age, independence is essential for everyone, including those with visual impairments. The World Health Organization (WHO) estimates that around 2.2 billion people worldwide have some form of vision impairment, which greatly affects their ability to carry out everyday activities. Tasks like reading, sending messages, finding their way around, and managing money can be particularly difficult for individuals who are blind or have low vision.

Unfortunately, without the ability to access important information on their own, many visually impaired people must rely on caregivers for assistance. This reliance can restrict their personal freedom and make them less efficient in carrying out tasks.

To tackle these challenges, we introduce "EyeConnect," an innovative mobile app designed to empower visually impaired individuals. EyeConnect offers features such as voice recognition, optical character recognition (OCR), text-to-speech conversion, and real-time navigation to enhance accessibility and usability. The application incorporates artificial intelligence (AI) and machine learning (ML) models to deliver an interactive user experience tailored specifically for visually impaired users. Furthermore, EyeConnect supports multiple languages to ensure inclusivity and user-friendliness.

I. INTRODUCTION

The visually impaired community faces multiple challenges in accessing essential information and navigating their surroundings efficiently. The World Health Organization (WHO) reports that over 285 million individuals worldwide suffer from significant visual impairments, reinforcing the urgent need for inclusive and accessible technological solutions. Everyday tasks such as reading, using smartphones, traveling independently, and handling financial transactions can be difficult without assistive technology. Traditional solutions such as Braille and audiobooks are useful but often limited in scope, accessibility, and real-time usability.

With the rise of AI-driven technologies, assistive solutions have evolved to provide more comprehensive support. However, many of these

solutions remain either expensive or inaccessible to a significant portion of visually impaired individuals. EyeConnect seeks to bridge this gap by integrating speech recognition, OCR reading, voice-enabled communication, and real-time navigation assistance into a single, user-friendly mobile application. Unlike traditional solutions, this application combines multiple features in an all-in-one assistive tool, making it cost-effective and efficient.

This paper discusses the development of EyeConnect, its impact, and how it revolutionizes daily activities for visually impaired individuals by fostering independence and ease of use.

II. LITERATURE REVIEW

In the past ten years, we've seen big steps forward in technology to help people who are visually impaired. Many researchers have been working on different ways to make life easier and more independent for these individuals. For instance, Sriraksha Nayak and Chandrakala C. B. designed a useful mobile app that helps users manage their schedules, check emails, and read SMS messages using voice commands. This means users can simply talk to their devices, and the app works well in multiple languages, which helps more people easily engage with it.

Another example is a team led by Abhishek More, who built an Android app with AI. This app uses speech recognition, object detection, and image processing, especially for English speakers. It's a great tool showing how AI can help visually impaired users gain independence and usability. Also, research by Ranjeet Patil introduced an app using YOLO v3 and TensorFlow. This app can turn images into speech and recognize objects, helping users get verbal feedback about what's around them.

Moreover, Kongarasan and his team introduced an AI system for real-time image descriptions with YOLO v8. This system provides detailed verbal details about the environment, helping users understand their surroundings better. Thanks to advanced deep learning and natural language processing (NLP)

technology, these apps are now more accurate and efficient. Furthermore, recent advancements in AI and the Internet of Things (IoT) have led to the creation of smart wearables and virtual assistants. These are designed to give visually impaired individuals real-time assistance and help them navigate. Despite these impressive developments, there is still a need for an affordable all-in-one solution that combines multiple assistive features into one seamless platform, which would work well in different environments.

III. OBJECTIVE

EyeConnect is an app designed to support people with vision challenges in living more independently. The main aim is to create a tool that's both affordable and effective. It combines several helpful features so that users can easily communicate, navigate their surroundings, and read text.

This app includes voice-based communication, real-time navigation assistance, and smart technology that recognizes objects to make everyday tasks easier. By using advanced AI technologies, EyeConnect allows people with visual impairments to access information, use digital devices, and move around safely and efficiently.

EyeConnect is crafted to offer a simple and user-friendly experience, meeting the varied needs of the visually impaired community. It ensures that affordability and ease of use are maintained. Additionally, EyeConnect is committed to regularly updating and enhancing its features through the latest AI advancements, so it continues to fulfill the changing accessibility needs of its users.

IV. METHODOLOGY

EyeConnect is developed in a clear, step-by-step manner to prioritize the needs of visually impaired users. Here's a detailed look at its creation process:

1. Understanding Needs: The process kicks off by engaging with visually impaired individuals through surveys and interviews. This helps identify their specific challenges and desires, ensuring the app addresses what truly matters to them.

2. Choosing Technology: The next step involves selecting the best AI and machine learning tools for tasks like text reading, speech recognition, and object detection. Popular tools, such as Google's Tesseract OCR and frameworks like TensorFlow and PyTorch, are explored for their capabilities.

3. Creating a Prototype: A basic version of EyeConnect is developed that includes essential features for initial trials. This version boasts a user-friendly design incorporating voice commands and touch feedback to enhance accessibility.

4. Building the App: The AI models are applied to enable voice-guided navigation, convert text to speech, and recognize objects in real-time. Utilizing cloud-based solutions greatly boosts the app's processing speed and overall efficiency.

5. Testing and Improving: In this phase, real-world testing is done with the help of visually impaired users to gather feedback. The app undergoes multiple rounds of refinement to optimize its functionality and ease of use, effectively removing any possible barriers the users might face.

6. Launching and Updating: Once launched, the application is subject to regular updates to improve its performance further. These updates aim to enhance accuracy, expand language options, and integrate the latest AI technologies for increased precision in operation.

V. APPLICATIONS

EyeConnect is a tool that helps people who have trouble seeing. It makes everyday activities easier with features like:

Reading Help: With OCR technology, users can scan printed words and hear them read aloud. This is useful for reading things like books, newspapers, and documents.

Voice Messaging: Users can talk to send and receive messages. This makes it easier to keep in touch with others using digital devices.

Object Recognition: The app uses AI to help users know what objects are around them. This makes moving around safer and more comfortable.

Navigation: With GPS, the app gives spoken directions, helping users get around outside and inside buildings.

Banking: By using their voice, users can securely make payments and handle their money, letting them be more independent in managing their finances.

VI. LIMITATIONS

EyeConnect is a very innovative tool, but it does have some limitations:

Dependence on Internet: For features like real-time navigation and AI processing to work, EyeConnect needs an active internet connection. Without it, these features won't function properly.

Language Challenges: Although the app supports many languages, it might not recognize or understand certain local dialects fully yet. This could affect users who speak these dialects.

Object Recognition Issues: The AI might find it difficult to correctly identify objects in areas that don't have good lighting or if the objects are not clearly visible. This can lead to some inaccuracies in recognizing what it sees.

Smartphone Requirements: To use EyeConnect properly, a smartphone with a good camera and strong processing power is necessary. Unfortunately, not everyone might have access to such a device, which can limit the app's usability for some users.

VII. CONCLUSION

EyeConnect provides a powerful solution for people with vision impairments, using advanced technologies like AI, machine learning, and speech recognition. It brings together many helpful features in one platform to make everyday tasks easier. This reduces the need for caregivers, allowing users to access information independently. As a result, EyeConnect greatly enhances the quality of life for visually impaired individuals by promoting self-reliance.

VII. REFERENCES

- [1] Akhilesh A. Panchal, Shrugal Varde, M.S. Panse: "Character Detection and Recognition System for Visually Impaired People," IEEE International Conference on Recent Trends in Electronics Information Communication Technology, May 20-21, 2016, India. Electronic copy available at SSRN Link.
- [2] Shubham Melvin Felix, Sumer Kumar, and A. Veeramuthu: "A Smart Personal AI Assistant for Visually Impaired People," IEEE International Conference on Recent Trends in Electronics Information Communication Technology, May 20-21, 2019, India.
- [3] Dr. K. Srinivasan, V.R. Azhaguramya: "Internet of Things (IoT) based Object Recognition Technologies," IEEE International Conference on Recent Trends in Electronics Information Communication Technology, 2018, India.
- [4] S. Kavya, M. Khanum, K. Madhu, P. Gowda, and A.S. Manek: "Recognizant: An Android Application for Visually Impaired People," Vol. 4, No. 2, 2019.
- [5] Shahed Anzarus Sabab, Md. Hamjajul Ashmafee: "Blind Reader: An Intelligent Assistant for Blind," 19th International Conference on Computer and Information Technology, December 18-20, 2016, North South University, Dhaka, Bangladesh.
- [6] S. Shadi, S. Hadi, M.A. Nazari, and W. Hardt: "Outdoor Navigation for Visually Impaired Based on Deep Learning," CEUR Workshop Proceedings, Vol. 2514, 2019.
- [7] Lee, S. Jung, and H. Song: "CNN-Based Drug Recognition and Braille Embosser System for the Blind," Journal of Computer Science and Engineering, Vol. 12, No. 4, pp. 149–156, 2018.
- [8] N. Mohapatra: "13 Things You May Not Know About Blind People," 2019.
- [9] Bitao Jiang, Xiaobin Li, Lu Yin, Wenzhen Yun, Shengjin Wang: "Object Recognition in Remote Sensing Images Using Combined Deep Features," IEEE, 2019.
- [10] A. G. Karkar, J.M. AlJaam, and A. Mahmood: "Illustrate it! An Arabic Multimedia Text-to-Picture M-Learning System," IEEE Access, Vol. 5, pp. 12,777–12,787, 2017.
- [11] Z. Liu, W. Dai, M.Z. Win: "Mercury: An Infrastructure-Free System for Network Localization and Navigation," IEEE Transactions on Mobile Computing, Vol. 17, No. 5, pp. 1119-1133, May 2018.
- [12] Rucha Doiphode, Mayuri Ganore, Ashwini Garud, Tejaswini Ghuge, and Parminder Kaur (Guide): "Be My Eyes: Android Voice Application for Visually Impaired People" (Unpublished).
- [13] Vision Impairment and Blindness: Fact Sheet, World Health Organization, 2017.
- [14] A. Krizhevsky, I. Sutskever, and G.E. Hinton: "ImageNet Classification with Deep Convolutional Neural Networks," Proceedings of NIPS, 2012, pp. 1106–1114.
- [15] K. Simonyan and A. Zisserman: "Very Deep Convolutional Networks for Large-Scale Image Recognition," Proceedings of ICLR, 2015.

- [16] M. Cimpoi, S. Maji, and A. Vedaldi: “Deep Filter Banks for Texture Recognition and Segmentation,” Proceedings of CVPR, 2015.
- [17] F. Perronnin, J. Sanchez, and T. Mensink: “Improving the Fisher Kernel for Large-Scale Image Classification,” Proceedings of ECCV, 2010.
- [18] K. Rainey, S. Parameswaran, J. Harguess, and J. Stastny: “Vessel Classification in Overhead Satellite Imagery Using Learned Dictionaries,” Proceedings of SPIE, 2012.
- [19] U. Kanjir, H. Greidanus, and K. Ostir: “Vessel Detection and Classification from Spaceborne Optical Images: A Literature Survey,” Remote Sensing of Environment, Vol. 207, pp. 1-26, 2018.
- [20] O. Penatti, K. Nogueira, and J. Santos: “Do Deep Features Generalize from Everyday Objects to Remote Sensing and Aerial Scenes Domains,” Proceedings of