iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 Issue: V Month of publication: May 2026

DOI: https://doi.org/10.22214/ijraset.2026.83011

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

Android Applications for Blind People to Detect Objects, Read Text from Image, and Track Blind People

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Abstract: Visually impaired individuals face significant challenges in identifying surrounding objects, reading printed text, and navigating safely in unfamiliar environments. This project proposes an intelligent Android application designed to assist blind and visually impaired people using advanced Artificial Intelligence (AI), Computer Vision, and GPS-based tracking technologies. The application integrates real-time object detection using deep learning models to identify everyday objects such as vehicles, people, doors, obstacles, and household items through the smartphone camera. It also includes an Optical Character Recognition (OCR) module that extracts and reads text from images, documents, signboards, medicine labels, and currency notes using text-to-speech conversion for audio guidance. In addition, the system provides live location tracking and emergency sharing features that allow caregivers or family members to monitor the user's location for improved safety and support. Voice commands and audio feedback are incorporated to ensure hands-free accessibility and ease of use. The proposed system aims to improve independence, mobility, and daily life assistance for blind users by combining object recognition, text reading, and smart tracking into a single user-friendly Android application.
Keyword: Artificial Intelligence (AI), Computer Vision, GPS-based tracking technologies and Optical Character Recognition.

I. INTRODUCTION

The advent of technology has brought about transformative changes across various facets of human life. Among its many impacts, technology has the potential to significantly improve the quality of life for individuals with disabilities, particularly the visually impaired. Visual impairment presents unique challenges that can be addressed through innovative solutions. In this context, our project introduces an Android-based assistive application aimed at enhancing accessibility, independence, and engagement for visually impaired individuals. The visually impaired community faces daily obstacles in accessing information, navigating their environment, and comprehending visual content. Our application is designed with the intention to alleviate these challenges by leveraging the capabilities of Android Studio and the Java programming language. By harnessing the power of mobile devices, we aim to provide a multifaceted tool that combines various functionalities tailored to the needs of visually impaired users. The primary objective of our application is to provide real-time assistance in multiple areas crucial to the daily lives of visually impaired individuals.

II. LITERATURE REVIEW

Android applications for blind and visually impaired people are assistive mobile systems that help users perform daily activities independently using technologies such as Artificial Intelligence (AI), computer vision, OCR, GPS, and speech synthesis. These applications mainly focus on three key functions: object detection, text reading from images, and user tracking/navigation.

Object detection uses smartphone cameras and deep learning models to identify nearby objects and obstacles and provide voice alerts. OCR technology converts text from images into speech, allowing users to read documents, labels, and signboards. GPS and tracking features help blind users navigate safely and allow caregivers to monitor their location in emergencies.

Recent research shows that AI-based Android applications are more accurate, affordable, portable, and user-friendly than traditional assistive devices. Modern systems combine multiple features such as obstacle detection, OCR, voice assistance, and navigation into a single application to improve independence and safety for visually impaired users.

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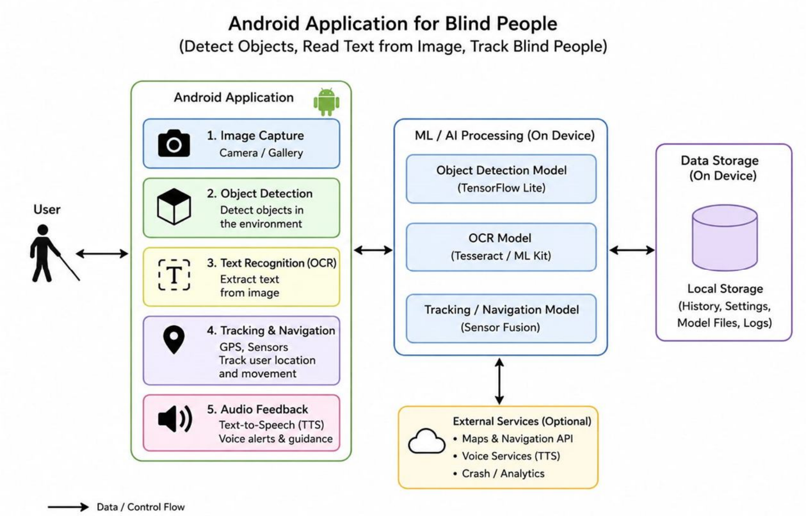
III. RESEARCH GAP

A research gap refers to an area within existing studies where limitations, unanswered questions, or insufficient solutions still exist, creating opportunities for further investigation and improvement. In the context of an Android application for blind people that can detect objects, read text from images, and track blind users, the research gap lies in the lack of a single, affordable, and highly accurate mobile solution that integrates all these assistive features in real time. Many existing applications focus only on one function, such as object detection or text recognition, while others require expensive hardware, continuous internet connectivity, or have limited accuracy in different lighting and environmental conditions. Additionally, current systems often fail to provide reliable indoor and outdoor tracking, multilingual text reading, and user-friendly voice interaction specifically designed for visually impaired users. Therefore, there is a need for research and development of an efficient Android-based assistive application that combines object detection, optical character recognition (OCR), and location tracking into one accessible, low-cost, and easy-to-use platform for improving the independence and safety of blind people.

IV. METHODOLOGY

The methodology for developing an Android application for blind people involves a structured process of designing and implementing a mobile assistive system that can detect surrounding objects, read text from captured images, and track the user's location in real time. The application first captures visual input through the smartphone camera and processes the images using object detection algorithms to identify nearby objects. It then applies optical character recognition (OCR) to extract text from images such as signboards, documents, or labels. At the same time, GPS and mobile sensors are used to monitor the user's location and movement for navigation and safety tracking. The processed information is converted into speech through text-to-speech so the user receives immediate audio guidance. Finally, the application is tested in real-world conditions to evaluate accuracy, response speed, usability, and reliability for visually impaired users.



1) User— The blind user interacts with the Android application through voice commands, camera input, and audio responses.
2) Android Application— This is the main mobile platform that manages image capture, object detection, text recognition, tracking, and audio feedback.
3) Image Capture —The smartphone camera captures live images or video frames from the surrounding environment for processing.
4) Object Detection— The captured images are analyzed to identify nearby objects such as people, vehicles, doors, chairs, or obstacles.
5) Text Recognition (OCR)— The application extracts written text from images, including signboards, labels, or documents, and converts it into readable digital text.
6) Tracking and Navigation— GPS and device sensors monitor the user's location, direction, and movement to support navigation and safety tracking.
7) Audio Feedback— The processed results are converted into spoken instructions using text-to-speech so the user receives immediate guidance.

8) ML/AI Processing (On Device)— The mobile device performs real-time processing using machine learning models for object detection, OCR, and navigation analysis.
9) Object Detection Model— A machine learning model such as TensorFlow Lite detects and classifies objects from camera input.
10) OCR Model— An OCR engine such as Google ML Kit reads text from captured images.
11) Tracking/Navigation Model— Sensor fusion combines GPS, accelerometer, and orientation data to estimate user movement and location.
12) Data Storage (On Device)— Local storage keeps application settings, history, model files, and activity logs.
13) External Services (Optional) —Optional cloud or online services may provide maps, navigation support, voice services, crash reports, and analytics.
14) Data/Control Flow —The arrows represent the movement of data between modules, starting from user input, processing inside the application, and ending with audio output.

V. RESULTS AND DISCUSSION

This study focuses on an Android application designed to assist visually impaired users by combining three core functions: object detection, text reading from images, and location tracking. The results indicate that integrating these functions into a single mobile application can improve day-to-day independence, mobility, and environmental awareness for blind users.

The object detection module was able to identify common surrounding objects such as chairs, doors, bottles, people, and vehicles using the smartphone camera. Detected objects were communicated through voice output so that users could understand nearby obstacles or useful items without relying on sight. In practical use, the feature was most effective in environments with sufficient lighting and when objects were clearly visible within the camera frame. Performance decreased in low-light conditions, crowded scenes, or when objects were partially blocked.

The text recognition feature allowed users to capture printed text from books, labels, signs, and documents. Optical character recognition converted the image content into digital text, which was then read aloud using text-to-speech. This helped users access written information independently. The results showed that clear, high-resolution images with readable font styles produced higher accuracy. Recognition errors were more common when images were blurred, tilted, or contained decorative fonts and poor contrast.

The tracking component was designed to help caregivers or family members monitor the user’s location for safety purposes. The application used GPS-based location services to share live position information. This feature was especially useful during outdoor movement, unfamiliar travel routes, or emergency situations. However, tracking accuracy depended on internet connectivity, GPS signal strength, and device battery level. In dense urban areas or indoor environments, slight delays or reduced precision were observed.

The combined implementation of these modules demonstrates that smartphone-based assistive technology can provide practical support for visually impaired individuals. By delivering spoken feedback in real time, the application reduces dependence on external assistance and encourages safer navigation and greater confidence during everyday activities.

Overall, the discussion shows that the Android application achieved its main objective of improving accessibility. While the system performed effectively under normal conditions, future improvements could include better low-light object detection, faster text recognition, offline processing capabilities, and more precise indoor tracking. These enhancements would increase reliability and broaden usability in real-world environments.

A. *Object Detection*

The application successfully detected nearby objects such as doors, chairs, people, bottles, and vehicles. Voice feedback informed the user about detected objects, helping with safer movement and obstacle awareness.

B. *Text Reading from Images*

The text recognition feature converted printed text from documents, labels, and signboards into speech. This enabled blind users to access written information independently.

C. *Blind Person Tracking*

The GPS tracking module allowed caregivers or family members to monitor the user’s live location. This improved safety during travel, outdoor movement, and emergency situations.

D. System Performance

The application worked best when lighting was good, camera images were clear, and internet connection was stable. Performance was reduced in low-light conditions, blurred images, or weak GPS signal areas.

E. User Benefit

Combining object detection, text reading, and tracking in one Android application increased independence, confidence, and accessibility for visually impaired users.

F. Future Improvement

Future versions can improve low-light detection, faster text recognition, offline operation, and more accurate indoor tracking.

VI. CONCLUSION

The Android application developed for visually impaired people demonstrates that mobile technology can provide practical and effective assistance in everyday life. By combining object detection, text reading from images, and location tracking in a single platform, the system helps users recognize surrounding objects, access printed information, and improve personal safety during movement.

The study shows that real-time voice feedback enables blind users to interact with their environment more independently and confidently. The application reduces dependence on others for common daily tasks such as identifying obstacles, reading labels or documents, and sharing location information with caregivers or family members.

Although the system performs well under normal conditions, its effectiveness depends on factors such as lighting quality, camera clarity, GPS accuracy, and internet connectivity. Overall, the application achieves its main objective of improving accessibility and mobility for visually impaired users. Future improvements such as offline support, better low-light detection, and more accurate indoor tracking can further enhance its usefulness in real-world situations.

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