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EyeSpeak (An Application for Visually impaired)

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Abstract: *Our project aims to create a mobile app that's like a helpful friend for visually impaired people. Despite the availability of various solutions, visually impaired individuals often face challenges in accessing essential information independently. With functionalities including text-to-speech from images, live location tracking, weather updates, calculator, date and battery percentage information, object recognition, money transfer, and expiry date recognition, the app offers a versatile solution to address various everyday challenges. Users can navigate the app interface through intuitive swipe gestures and voice commands, ensuring ease of use. We're using tech such as OCR, TensorFlow for object recognition, and speech-based interaction, the app delivers both auditory and textual outputs for enhanced accessibility. Our hope is that this app will make life a bit easier for visually impaired folks, helping them be more independent and improving their day-to-day experiences.*

Keywords: Visual impairments, Text-to-Speech, Expiry date Recognition, Tensorflow, OCR, Object Recognition, Location, Api, Weather

I. INTRODUCTION

In a world increasingly reliant on visual information, the visually impaired community encounters unique challenges in accessing and comprehending their surroundings. To address these obstacles and foster accessibility and inclusivity, we present EyeSpeak, a groundbreaking mobile application crafted to empower individuals with visual impairments. EyeSpeak stands as a multifunctional tool meticulously designed to enhance the lives of those facing visual challenges. Tailored to dismantle barriers hindering independent living, it equips visually impaired individuals with the necessary tools to navigate the world confidently and seamlessly.Upon launching the app, users are prompted to explore a comprehensive list of features with a left swipe, while a right swipe activates voice commands for effortless feature selection. EyeSpeak offers transformative capabilities, including "Text toSpeech from Image," enabling users to capture images and convert embedded text into audible information.[1][2][3][4] Real-time live location updates provide geographical awareness[8][9][10], complemented by weather forecasts based on user-specified cities.[11] The app also features a voice- activated calculator,[12] date and time announcements, and a battery percentage checker for streamlined device management. Delving into artificial intelligence, EyeSpeak incorporates an "Object Recognition" feature powered by TensorFlow, facilitating real-time identification of objects through the device's camera.[13][14][15] Additionally, the app explores financial independence with a prototype "Money Transfer" feature, allowing users to execute transactions verbally by providing IFSC codes, account numbers, and transfer amounts. Adding convenience, EyeSpeak includes an "Expiry Date Recognition" feature, enabling effortless capture and deciphering of product expiry details[5][6][7]. Throughout the app, every output, whether weather updates, object descriptions, or financial transactions, is presented audibly and in text, ensuring inclusivity and accessibility for all users. Central to EyeSpeak's design philosophy is its user-centric approach, exemplified by its navigability through voice commands. This feature ensures that users can effortlessly interact with the application, regardless of their technical expertise or familiarity with touch screens. With EyeSpeak, we aspire to transform the lives of visually impaired individuals, empowering them to navigate the world with confidence and ease.technical expertise or familiarity with touch screens

II. LITERATURE SURVEY

The literature review encompasses a diverse array of studies and projects addressing various aspects of accessibility and technology for individuals with visual impairments. Ahmed's paper explores the integration of OCR and Text-to-

Speech technology, offering accurate conversion of printed text into speech, albeit requiring optimal image quality for reliable performance [1]. Shastri's project delves into text-to-speechconversion using machine learning and image processing techniques, focusing on language conversion from English to Hindi, albeit noting challenges with real-time extraction of textual information [2]. Similarly, Swami's project utilizes OCR and OpenCV for text extraction from images, aiming to enhance accessibility for visually impaired individuals [3]. Varma and Madari's work employs MSER and OCR for text recognition and conversion, highlighting the effectiveness of the approach despite potential limitations with small text regions or unclear visibility [4]. Afreen and Kausar's system relies on QR codes for product identification, offering voice-based information to blind individuals, although dependency on QR codes may limit its applicability [5]. Gong and Thotha propose a unified deep neural networks methodology for date recognition, showcasing high accuracy even in challenging scenarios, albeit potentially requiring substantial computational resources [6]. Florea and Rebedea leverage OCR and image processing for expiry date recognition, demonstrating versatility across different date formats while acknowledging challenges with crowded or complex images [7]. Chaudhary and Nagpal present a real-time location trackingsystem for Android smartphones, highlighting the use of GPS and network providers for accurate location tracking, which canbe applied in various applications [8]. Vivek et al. Explore location-based services (LBS) and applications, emphasizing the importance of accurate location tracking across different technologies and methodologies [9]. Dalvi et al. propose a weather application using ReactJS and the Open Weather Map API, providing real-time weather data retrieval based on userlocation, enhancing accessibility for users [10].Sharma et al. offer a user-friendly weather web app developed with ReactJS and the OpenWeatherMap API, optimized for minimal memory usage and efficient performance, with live deployment via Heroku [11]. Patil et al. introduce a voice-based calculator integrating NLP with speech recognition engines, enabling users to perform calculations through voice inputs [12]. Devika et al. propose object detection and recognition using TensorFlow for visually impaired individuals, aiming to provide accurate object detection capabilities through real-time image capture [13]. Similarly, Dsouza et al. present a real-time object detection and recognition system leveraging technologies such as ReactJS, TensorFlow, and OpenCV, offering reliable and accurate object detection capabilities with audio and text outputs [14] Lastly, Birambole et al. introduce a Blind Assistance System utilizing real-time object detection, generating voice-basedfeedback to aid visually impaired individuals in navigating their surroundings safely and efficiently, exemplifying the ongoing efforts to enhance accessibility through technology [15]. These studies collectively underscore the importance of advancing technology to empower individuals with visual impairments, promising a future of greater inclusivity and independence.

III. PROPOSED METHOD

The proposed methodology for the EyeSpeak application begins with a comprehensive analysis of the requirements specific to visually impaired individuals. Through user interviews, surveys, and literature review, we aim to understand their challenges and needs in performing daily tasks independently. Following a user-centered design approach, iterative prototyping will be employed to develop intuitive and accessible features. Using Java programming language, the application will be developed to ensure compatibility with Android devices commonly used by visually impaired individuals. Key features such as text-to-speech functionality, live location tracking, real-time weather updates, a voice-activated calculator, object recognition using TensorFlow, and a prototype money transfer feature will be implemented.

Accessibility testing will ensure that the application meets the needs of visually impaired users, including compatibility with screen readers and alternative input methods. Field trials and user evaluations will be conducted to assess usability, effectiveness, and user experience in real-world scenarios.

User Input and Interaction: The app begins by receiving voice commands from users.

Image Capture: It opens the camera to capture an image using OpenCV.

Image Processing: The captured image undergoes image processing and recognition using various algorithms such as CNN, OCR, TensorFlow model.

API's: The app uses api for Location, Weather.

Text-to-Speech Conversion: If text is recognized, it's converted to speech for user feedback.

Output Presentation: Results are presented in both text and speech formats.

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The system design and architecture of our project, "EyeSpeak," are structured to cater to the unique needs of visually impaired individuals, providing a comprehensive suite of features for enhanced independence and accessibility. The architecture compasses frontend and backend components, as well as integration with external APIs and technologies. At the frontend, the user interface is carefully designed to be intuitive and accessible, employing swipe gestures for infrastructure supports the integration of various functionalities, including text-to-speech conversion from images, live location tracking, weather updates, calculator, object recognition, money transfer, and expiry date recognition. Integration with external APIs facilitates fetching weather forecasts based on user-specified cities and enables real-time communication between the frontend and backend components. For text-to-speech conversion from images, Optical Character Recognition technology is employed to extract text, which is then converted into audible information. Live location tracking utilizes the device's GPS and network providers to fetch real-time location updates, enhancing users' geographical awareness and navigation capabilities. Object recognition functionality leverages TensorFlow-based models to identify objects in real-time using the device's camera, providing auditory descriptions of detected objects to enhance users' understanding of their surroundings. The money transfer feature enables users to execute transactions through voice commands, providing a prototype solution for seamless financial transactions. Overall, the system design and architecture of EyeSpeak aim to provide visually impaired individuals with a comprehensive and accessible solution, empowering them to navigate their surroundings independently and improve their overall quality of life. Through careful integration of frontend and backend components and utilization of external APIs and technologies, EyeSpeak offers a user-friendly and inclusive experience for users with visual impairments.

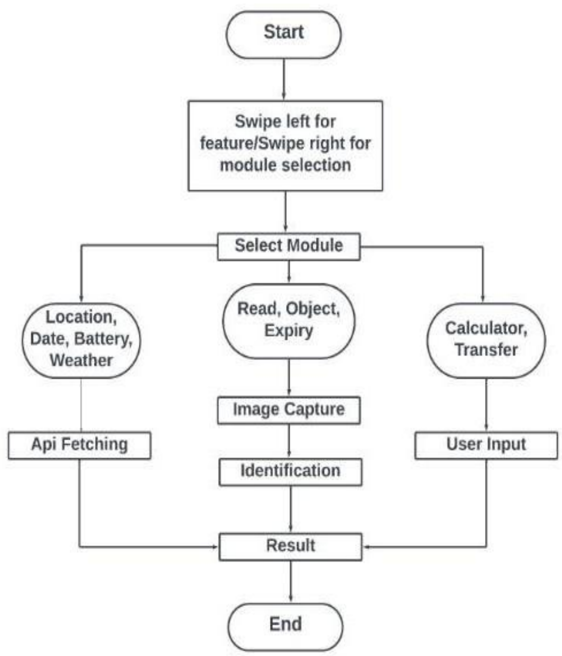

Fig 1 Flow Chart

IV. IMPLEMENTATION

System Requirements:

Software Requirement:

- **Operating System:** Android
- **Development Environment:** Android Studio
- **Programming Language:** Java
- **Libraries/Frameworks:** OpenCV, TensorFlow

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Hardware Requirement:

- **Desktop/Laptop Specifications:**
- **Processor:** Intel Core i5 and above
- **RAM:** 8GB recommended
- **Storage:** 10GB

Mobile Requirements:

- Camera
- Microphone

We have done implementation of our proposed system as shown in the below figures wherever user open the application the Figure 2 shows the home screen of the proposed system. After that, the user will swipe left to see feature list and right to select feature.

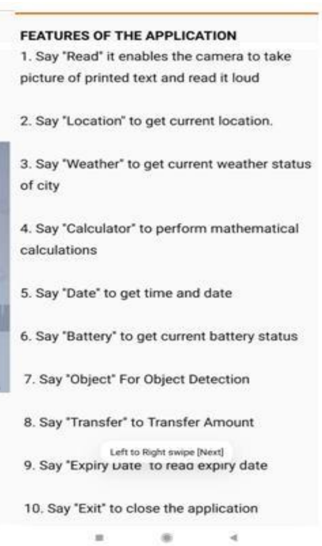
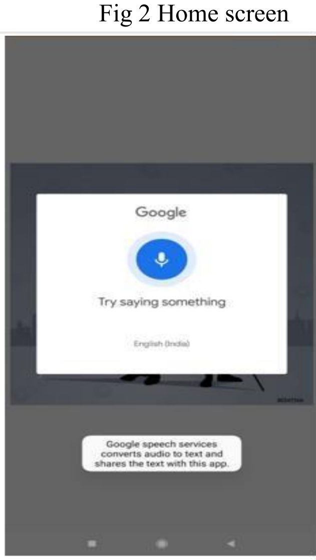


Fig 2 Home screen Fig 3 Feature List



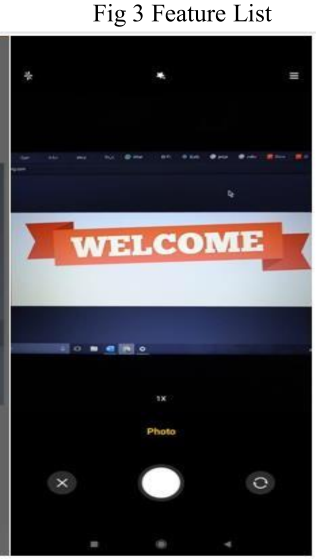


Fig 4 Module Selection Fig 5 Image capture for Read

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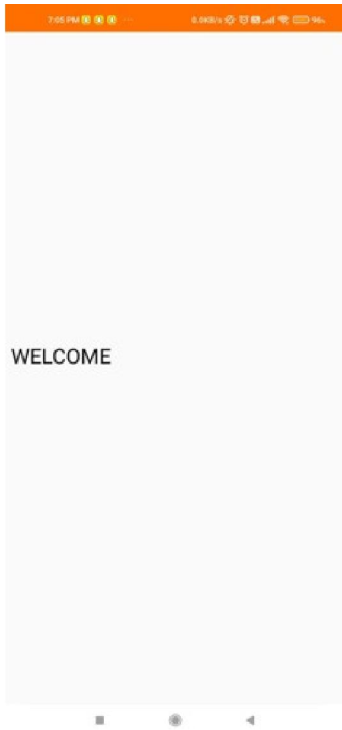
Figure 4 in which the user select module using voice commands. Fig 6 camera is opened to capture image for Read feature.



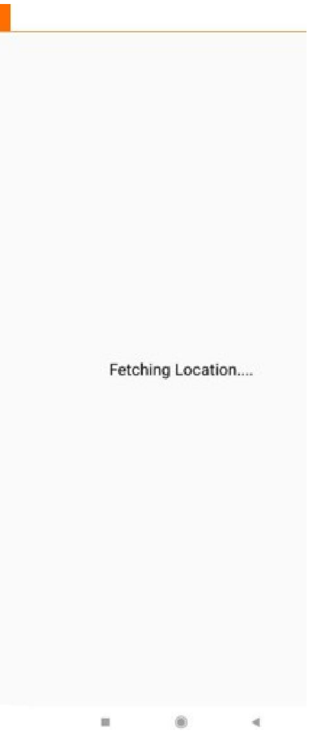


Fig 6 Read output Fig 7 Fetching Location

Figure 6 shows output of read that is text from previous fig. Fig 7 shows app fetching live location of user using GPS.

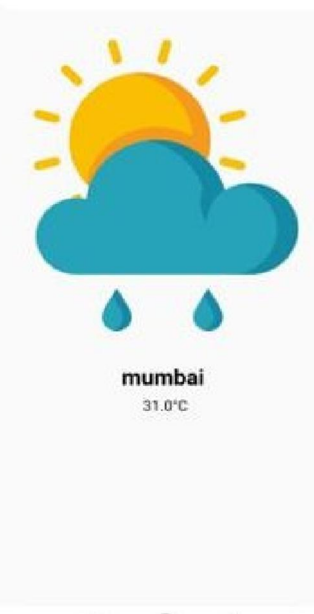


Fig 8 Live location Fig 9 Weather Info

Figure 8 Show that user live location is fetched. Fig 9 shows theoutput of weather feature which shows weather of city.

Fig 10 Calculator Fig 11 Date

Fig 10 show user inputs for calculator feature to do calculations.Fig 11 shows result of Date feature.

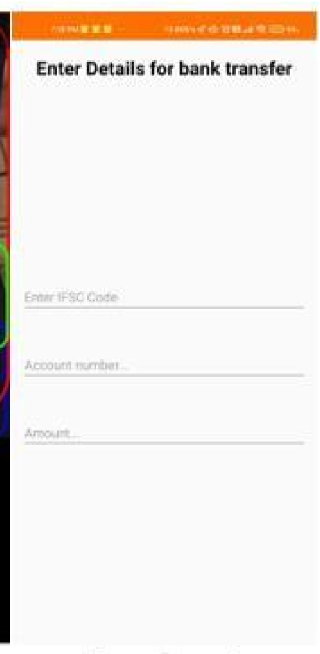


Fig 12 Object Recognition Fig 13 Money Transfer

Fig 12 show the output of Object recognition using tensorflow which tells object seen using camera. Fig 13 is the money transfer window which input data from user through speech.

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V. FUTURE SCOPE

The proposed enhancements for the EyeSpeak app include integrating multilingual support for users from diverse linguistic backgrounds, exploring IoT device integration for controlling smart home devices, adding more payment featureswith robust security measures, ensuring user privacy and data protection compliance, developing collaborative features for user interaction, and continuously improving the user interfaceand experience based on feedback..

VI. CONCLUSION

The EyeSpeak project offers a comprehensive mobile application tailored for visually impaired individuals, addressing their challenges in accessing visual information. Through a user-centric approach, EyeSpeak integrates features like text-to-speech, live location tracking, weather updates,calculator functionality, and object recognition, ensuring ease of use with its intuitive interface. Leveraging image processing techniques such as OCR, EyeSpeak facilitates effective interaction with the environment. Real-time location and weather data retrieval, alongside a prototype money transfer feature, further empower user autonomy. By delivering outputsin both audio and text formats, EyeSpeak accommodates varieduser preferences, promising a more accessible digital future forvisually impaired individuals.

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