International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 12 | Dec 2020 www.irjet.net p-ISSN: 2395-0072

Inclusive Video Conferencing Application For Visually Challenged: A Survey

Pranav Nirbhavane[1], Praneeth Kaniti[2], Purnesh Kotian[3], Prof. Deepti Vijay Chandran[4]

[1,2,3,4]*Dept. of Computer Engineering, Smt. Indira Gandhi College of Engineering, Maharashtra, India*

Abstract - *Since the emergence of smartphones and other internet-enabled devices, there has been a drastic change in how we communicate with each other. The ease of access to has subsequently made our life more comfortable, but for people with disabilities, digital exclusion is still a real issue. At present, about sixty-two million people in India are suffering from sight loss. Although the likelihood of an average user to have access to the internet is higher than that of a visually challenged user, the gap is gradually narrowing. Statistics show about 65% of visually challenged consumers had access to a computer in 2012 which has increased to 78% by 2016 whereas in the case of non-disabled users it increased from 79% to 84%. Despite the 13% growth in visually challenged users who access computer in the 4-year tenure from 2012 to 2016, digital exclusion is far from being resolved. Thus, our main objective is to bridge this gap between technology and disabled people via creating an application which can be easily used by visually challenged people as well as general users.*

***Key Words*: Video conferencing, Inclusive applications, Accessibility, Screen readers, Speech to Text.**

1. INTRODUCTION

Companies tend to focus on active users who tend to have greater purchasing power, as well as a higher level of digital learning. Users with disabilities are often not the target consumers in this market-driven and technology-driven approach. We believe that the design should be in line with the needs of the users, rather than just focusing on beauty. The constraint of disabilities is resolute by natural barriers in society, so if we optate to avail visually impaired users to engage with the world around them, digital care is essential.

The utilization of digital devices does not match the calibre of interest in digital technology. The ownership of digital gadgets for a disabled user is comparatively low, and the national average inhibits their online activities.

2. LITERATURE SURVEY

We got to know about the different features which are necessary for the visually challenged users as well as how to design the application in such a manner that they do not have to struggle in using the application.[1]

We learnt about how to develop mobile applications for visually challenged users. Simple, equitable, flexibility, intuitive, perceptible or tolerance for error are the most prevalent adjectives used when referring to universal design. These days accessibility or usability are alternative terms that closely resemble Universal Design. With newly emerging technologies, the term accessibility is broadened to computer accessibility.

Nowadays, most of the operating systems are including software which can help users with disabilities to access internet. Due to a surge in usage of internet, there is a particular section inside computer accessibility which deals with web accessibility. Speech recognition, screen magnification and screen reader software are described as tools or assistive technologies for web browsing by few authors. In the year 1999, the Web Accessibility Initiative (WAI) went forward and took the initiative to publish Web Content Accessibility Guidelines (WCAG) in order to help boost visually challenged individual's interactive experience. This is to improve the accessibility of the web for people with disabilities. Human-computer interaction has transmuted significantly after the appearance of mobile devices, leading to the emergence of new techniques for usability evaluation.

The usability tests are used to evaluate the user interface and navigation issues which occur in different environments. Over the years, innovation in the technology of mobile devices leads to the emergence of touchscreen-based technology like iPhone, iPad and Android devices which became a significant change for visually challenged users on how they interact with devices as gesture-based interaction has become an industry standard. Our reliance on touch screen mobile devices has increased at a drastic rate, so is the research. Despite bringing forth great flexibility and direct access to controls and information, touch screen devices became inconvenient for the visually challenged users as they lose their ability to have physical feedback. The goal of our project work is to facilitate visually challenged users with an inclusive video conferencing platform to communicate with ease.

This paper is about designing a touch-based mobile application usable by visually challenged users. Hardware manufacturers try to incorporate accessibility features, but they still fall short in making a satisfactory user experience for visually challenged customers. Since most applications are geared towards an average consumer, accessibility features

are not on par to a visually challenged individual's necessities to obtain a desirable and reliable usability experience. [2]

We came across applications made keeping visually challenged users in mind and also investigated how they facilitate themselves to use the application since they use avant-garde technology on a routine basis. These modern technologies with adapted equipment are inbuilt with sensors and processors to make intelligent decisions.

For proper communication, feedback devices are used in conjunction. Creating an interactive user interface that is suitable and convenient for sensory-motor capabilities of visually challenged users is one of the most crucial and exigent tasks. Modern mobile devices are promisingly reliable in combating these challenges. These gadgets provide standardized opportunities for touch predicated input perceptually rich auditory-tactile output despite their primary fixate on incrementing computational capacity and sensor capabilities.

Consequently, as an effect global mobile platform are making it a standard to implement assistive technologies. Whenever a user requires third party assistance, we use a particular term "assistive technology" to describe it in numerous fields. Despite the assortment in fields, user safety is a pivotal issue. Safety and well-being of the consumer are of significant importance apart from augmenting user capabilities. Designing navigational avails for visually challenged people is a perfect case where design decisions must in no way disrupt the user's vigilance of their environment through natural channels and provide proper isolated situational awareness. [3]

2.1 TEXT, SPEECH AND TYPING

Accessibility service provides several features for text to speech. For ease of use for visually challenged user's services such as TalkBack on android VoiceOver on iOS are facilitated by giving audio or physical feedback when interacted with a graphical user interface. They are inbuilt with features such as reading out text, widgets and visual description for images. When in comparison with other screen readers in the market, TalkBack developed by Google is most reliable and provides comparatively better quality in sound output although to achieve the best results we may have to install proper language versions of SVOX which might require a minute monetary transaction. On the flip side, the system might read through excess information that is on the screen, which is redundant for visually challenged and operating vibrational feedback cannot be switched off.

There have been reports by the users while text-messaging there seem to have been some errors when contact is absent in the address book. Future support and updates are provided to the latest available Android versions. We can further enhance the functionality by using accessibility applications which are free of cost. In the case of iOS devices, VoiceOver is the go-to application. Since iOS does not suffer from fragmentation VoiceOver is compatible with Apple's native apps since they are built-in the same environment and to be compatible with each other. VoiceOver also supports third-party applications which are developed for the iOS platform, which can be downloaded from the app store.[3]

2.2 SPEECH-BASED COMMAND INTERFACES

As an alternative, we have a home screen launcher named "Eyes-Free Shell". This launcher is designed for visually challenged and for users who are unable to focus on the screen while driving. The launcher facilitates with the following features: launch applications, quick access to time and battery information, pre-determined message contacts from the address book and shortcuts to most frequently used applications. When the launcher is operational, the physical input buttons are disabled, and input is received via large touch screen where the icons are placed in a 3 X 3 grid format allowing a fair amount of distancing between icons making it easy to navigate.

Another application that is part of the Accessibility Service is JustSpeak. This application uses voice-based commands to perform actions such as launching applications, performing gestures, navigating through UI and activate onscreen controls.[3]

Fig -1: Android Accessibility Suite

We learnt about how to develop apps using accessibility services in Flutter. In order to meet the unique needs of visually challenged users, accessibility services are crucial, which in return leads to a substantial increase in the outreach of the userbase. In order to simulate the working situations of a visually challenged user while testing and developing applications for them, we can turn on the screen reader and start navigating through the application which will give a better outlook at the functionality of the application and the developers can work around any issues that might pop up during implementing of accessibility features.

Developers are tasked to implement additional accessibility features to give a comfortable experience for visually challenged users since Flutter is shipped with inbuilt

accessibility widgets with semantic properties. Integrating and testing features during the development of the application becomes a smooth experience for developers with the features flutter offers.

With available tools at hand that Flutter provides, it is not too difficult to make an application with inbuilt accessibility features. Developers should work towards making applications inclusive as it makes the application stand out from the others and also attracts a new set of users leading to a more extensive user base.[4]

3. METHODOLOGY

In the world of mobile technology, Android and iOS devices provide many accessibility services that help visually challenged users to perform their everyday jobs. These services can also be used by sighted users effectively. In this section after a detailed study of various tools available on both android and iOS platforms, a brief overview is provided of various solutions that would aid in developing a video conferencing app in an inclusive environment.

3.1. TALKBACK

TalkBack is an accessibility service for android users which helps visually challenged users to use their devices easily. The services will scan the widgets present on the screen and will provide vibrational as well as spoken feedback to the visually challenged users. Due to the spoken feedback system, users can easily navigate through their devices. These services also provide notifications to the user about the activity they are performing on their devices. In today's date, all the android devices come preinstalled with TalkBack services which receive regular updates making the services convenient for visually challenged users.

Fig -2: TalkBack

3.2. VOICEOVER

VoiceOver is a screen reader service provided in iOS devices which helps the visually challenged users in navigating and performing tasks on their devices. These services were designed to increase accessibility as to reach the larger market of users, and the services are helpful for the users who are suffering from the problem of dyslexia. The VoiceOver service will scan the user interface and will provide audio output, as well as the services, have a set of gestures which help the visually challenged in navigating through their devices. For example, if a user wants to input in a textbox, the services convert the speech to text, and after completion, the services cross-check with the users by providing an audio output of the text which has been entered in the field. The VoiceOver service also has support for braille displays and keyboards, which not only help the blind users in interacting with devices but also deaf users. The visually challenged users have braille keyboards in which the services will provide output to the keyboard and convert the output of the devices in the form braille script.

Fig -3: VoiceOver

3.3. SPEECH TO TEXT

For visually challenged users, it is difficult to use input keyboard, unlike sighted users for which we are using the Speech to text API. The user has to speak in the device mic, which is being used by the application then the Google API will convert it into text. The Speech to text Google API works with cloud storage and machine learning, thus increasing the accuracy of output text. So, in the application, wherever there is input information to be provided, this option will be accessible. The users can also input pre-recorded audio files which are processed by API and convert it into text for the users.

Developers can pre-determine and include most of the standard terms, rare terms and also domain-specific terms leading to a better transcription accuracy. By specifying classes, it is possible to convert numerical inputs into categories such as years, addresses and currency. Speech to Text is capable of differentiating multiple audio sources and keep the order of the transcript in scenarios like video conferencing. Even if the device lacks active noise suppression, Text to Speech can handle and isolate any unintended noises from the user's input. Text to Speech also supports 125 languages allowing a broad and diversified audience.

Fig -4: Google Speech to Text

3.4. ACCESSIBILITY SCANNER

For testing the application after implementing the accessibility services, we came across the Accessibility scanner. An accessibility scanner is a tool which can be used by any developer for checking the compatibility of the application with the accessibility services provided. The scanner checks for contrast ratios, patterns as well as the widgets present on the screen tagged with the correct information or checks any widget which is not defined and to check all the clickable items present on the screen. The scanner will scan through the entire applications and after completion will provide suggestions to developers to increase the accessibility of their applications by making adjustments to the user interface.[5]

Fig -5: Accessibility Scanner

4. CONCLUSION

The enhancement in technology is beyond reach, but most of the developers overlook the users with disabilities, and it is essential for the developers to develop inclusive applications. A portion of developers have tried to develop applications that support accessibility services. The accessibility services act as new layer on the existing applications but yet the developers fall short in designing and developing inclusive applications which are convenient for both general users and visually challenged users. There are no dedicated video conferencing mobile applications designed for visually challenged users for which we tasked ourselves to develop an inclusive mobile application for video conferencing which can be used by sighted users as well as visually challenged users.

REFERENCES

[1] Srivastav, S. (2019, February 28). How to Design Accessibility App for Visually Impaired? appinventiv.com/blog/design-accessibility-app-for-visually-impaired/

[2] Dobosz, Krzystof. (, 2017). Designing Mobile Applications For Visually Impaired People, www.researchgate.net/publication/321319458_Designing_Mobile_Applications_For_Visually_Impaired_People

[3] Csapó, Á., Wersényi, G., Nagy, H. et al. "A survey of assistive technologies and applications for blind users on mobile platforms: a review and foundation for research". J Multimodal User Interfaces 9, 275–286 (2015).

[4] Accessibility, flutter.dev/docs/development/accessibility-and-localization/accessibility

[5] Darshan, K. (2019, October 1). Developing and testing accessible apps in Flutter, medium.com/flutter-community/developing-and-testing-accessible-app-in-flutter-1dc1d33c7eea