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MOBILE APPLICATION – TO ASSIST PEOPLE WITH READING AND WRITING DIFFICULTIES

NEU
2018

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A THESIS SUBMITTED TO THE GRADUATE
SCHOOL OF APPLIED SCIENCES
OF
NEAR EAST UNIVERSITY

BY

UCHENNA FRANKLIN OKAFOR

In Partial Fulfilment of the Requirements for the
Degree of Master of Science
in
Computer Information Systems

NICOSIA, 2018

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

This mobile application was developed for education purpose and it will only be used within the scope of this thesis, this is to certify that I will not gain any commercial benefits from this application.

Name, Last name:

Signature:

Date:

ACKNOWLEDGEMENTS

I am thankful to my supervisor Prof. Dr. Dogan Ibrahim for his continuous support and guidance to successfully accomplish this project. His extensive knowledge and experience was the best contribution for this study. Special thanks to the Chair Person of the Computer Information Systems department in the person of Prof. Dr. Nadire Cavus.

Many thanks and appreciation to my wife Pham Mrs. Adaugo Cynthia Okafor for her inspiration through this journey. She kept me in her prayers consistently which I am grateful for. My heartiest thanks goes to my parents for their encouragement, my family and friends for their support all through the years of this educational achievements.

To my lovely family…

ABSTRACT

This Thesis is aimed to develop a mobile-based assistive application that either would help people who are not capable enough to communicate verbally or non-verbally, or cannot communicate in English language particularly. This application will help them in communicating their routine tasks such as reading messages and images with sound to greet, to shop and some other tasks. The motivation to develop such application has been taken from previous studies focusing on language based learning issues, communication disabilities and adult age people incapability of writing and reading. Assistive technologies or mobile-based applications are at the great demand in market today. Such applications have big contribution to society, likewise, this application is very useful for people who are unable to read, write, or speak for any reason. This application will not just assist them in their daily conversations but also build their confidents to feel themselves equally in the society. This application is the first application so far in the market as it provides read, write, and speaking all three features together. The application is also useful for future researchers to further enhance this application.

Keywords: Android application; assistive technologies; communication disabilities; communication assistive devices; dyslexia

ÖZET

Bu tezde, herhangibir şekilde özellikle İngilizce dilinde iletişim kurmada zorluk çeken şahıslara yardımcı olmak için geliştirilmiş olan bir mobil uygulama açıklanmaktadır. Geliştirlmiş olan bu mobil uygulama, sorunlu olan bu şahıslara mesaj okuma, başkalarıyla iletişime geçme, alışveriş yapma ve bunun gibi diğer günlük işlerinde yardımcı olacaktır. Bu uygulamayı geliştirmedeki esas motivasyon daha önceki lisan tabanlı eğitim çalışmalarından ve özellikle yetişkinlerin yazma ve okuma yapamama özürlülüğünden dolayı olmuştur. Yardımcı teknolojiler, veya mobil tabanlı uygulamalar günümüzde çok büyük rağbet görmekter ve aranmaktadırlar. Bu tür uygulamaların genel kullanıcılara çok büyük yardımı olmakta, ve ayni zamanda herhangibir sebepten dolayı okuma, yazma, ve konuşma engelli olan şahıslara da yardımcı olmaktadır. Geliştirlmiş olan bu mobil uygulama engelli şahıslara yalnız günlük iletişim kurmalarında değil, toplumdaki güvenlerini artırmalarında da yardımcı olacakır. Bu uygulamanın yeniliği, halen geliştirilmiş olan ve okuma, yazma, ve konuşma gibi önemli üç iletişim unsurunu ihtiva eden tek uygulamadır. Gelşiştirilmiş olan mobil uygulama bu konuda ileride araştırma yapmak isteyen araştırmacılara da ışık tutacaktır.

Anahtar Kelimeler: Android uygulama; yardımcı teknolojiler; iletişim engeli; iletişime yardımcı cihazlar; disleksiya

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LIST OF ABBREVIATIONS

AT:	Assistive Technologies
CALL:	Computer Assisted Language Learning
IDE:	Integrated Development Environment
IT:	Information Technology
LBL:	Language based learning
MAT:	Mobile based Assistive Technologies
MALL:	Mobile Assisted Language Learning
SMS:	Short message service
SDK:	Software Development Kit
SDLC:	System Development Life Cycle
UI:	User Interface

CHAPTER 1

INTRODUCTION

1.1 Overview

Unfortunately, there are some who have reading difficulties despite their education, intelligence and social status. This is the major symptom of dyslexia in a person. It is a condition that one lives with throughout their life as it cannot be cured. Therefore, it is important to provide early intervention. Dyslexia refers to a learning difficulties characterised with problems in spelling, reading and writing. The prevalence of the condition depends on the studies conducted on the condition. However, it is indicated that around 17% of people in the globe have the condition with more men having the condition when compared to women (Jorge et al., 2015).

Language-based learning challenges are known as age appropriate spelling, reading and writing. It is a disorder which does not determine a person's smartness. Many of the people who are diagnosed with learning disabilities are of average to superior intelligence (Asha, 2017). A dyslexic person experiences problems with both written and spoken language. Reading is one of the major skills that a human being possesses. Hence, Dyslexia refers to a learning problem where an individual experiences problem with reading. Using a friendlier term that encompasses both spoken and written language would be more ideal. It may; thus, be referred you as being a language-based learning disability or a learning disability.

Devices such as tablets and smartphones have changed mobile technologies a great deal. Similarly, they have changed how people communicate with each other. Other contributions include transforming the assistive technologies meant for persons with disabilities. The devices have mini computers which people can use because they are cost effective when compared to other assistive technology devices. The apps are specifically developed to address the needs of people with learning disabilities. Some of them include Prologue2Go and a text-to-speech app meant for people with speech problems. The ability to download an app from a smartphone or a PC means that one

has an inbuilt device that stores these apps. This is better off than having many stand-alone devices. In addition, it is cost efficiency; it is easy for people with disabilities because it enables them perform a wide range of tasks with relative ease (Assist Ireland, 2017).

Therefore, due to the nature of mobile based applications easy access and availability, assistive mobile based applications are considered the best way to help people in their communication and that's what this study aims to do so.

1.2 Problem Statement

There are plenty of people including children and adult, who can cannot communicate due to various reasons. For example, some adults are unable to write and read the language they speak this is because they either never learn or they could not learn because of lack of learning capability known as Dyslexia or any disability (Ramya and Madhumathi, 2017). According to Roxani et al., (2014) "Dyslexia" is one of the most common communication disabilities experienced by children and adults. There are numerous study focusing on assistive technologies to help people with their disabilities. These technologies are available in form of a device or application. Therefore, to contribute with potential communication assistive benefits this study is based on developing a mobile application which could help people with communication issues.

1.3 Study Objectives

The purpose of this study is to develop and android based application to help people with reading and writing issues. The application consists on various communication options implanted with interactive audio and visual graphics that individuals with such issues can easily access and assist them to communicate confidently without any issue.

1.4 Significance

Plenty of mobile based applications are available for such needs. However, not all applications cover both reading and writing features together. This application is a prototype that can be used of reading and writing needs, as well as it can further be enhanced in future for more uses.

1.5 Overview of the Project

The study consists of 5 chapters:

- Chapter 1 presents the introduction highlighting communication issues and need of assistive application. A problem statement along with study objectives and significance of the study have also been added here.
- Chapter 2 is based on a detailed literature review containing communication assistive technologies based previous researches.
- Chapter 3 briefly explain the methodology used for this application.
- Chapter 4 demonstrate the developed mobile application and identifies its uses and advantages.
- Chapter 5 concludes the entire study.

CHAPTER 2
RELATED RESEARCH

This section presents detail literature ranging from communication disabilities to mobile based assistive applications.

2.1 Communication Disabilities

Some individual have this issue due to their age factor, they are not capable to learn. Some can't communicate because they never got chance to learn that specific language or got to be going school for education. Some cannot communicate due to their lack of interest and some find it difficult to learn something (ASHA, 2002). Thus, there are some natural and general causes that are discussed below:

2.1.1 General issue – age factor, lack of learning potential or opportunity

Communication impairments or disability refers to some conditions which affect one's ability to comprehend information in an auditory way. Notably, some of the impairments that affect one's ability to communicate are fuelled by some underlying medical conditions that are congenital; that is, occurring from birth. However, many of the communication impairments are secondary (UoL, 2017). Reading skills is one of the primary skills that a human being possesses. Unfortunately, there are some who exhibit challenge with reading despite their social status, level of education and intelligence.

Learning disabilities and learning problems are not the same thing. Learning problems occur as a result of handicaps of the motor, hearing and visual systems. It may also be caused by mental retardation and emotional disturbance due to cultural, economic and cultural factors. Ideally, people with learning disabilities exhibit average and even above average levels of intelligence.

However, there exists a significant gap between one's potential and achievement. This explains why learning disabilities are at times known as "hidden disabilities". The case is attributed to the fact that an individual appears quite normal. They are even intelligent and bright. However, they exhibit difficulties and skills with others of

conventionally the same age and level. It is important to note that it is impossible to cure or even fix a learning disability. It is a chronic problem that lasts a lifetime. It is; thus, recommended that such individuals receive proper intervention as well as support to improve their outcomes and make them more successful in the society. When they receive such support, they can succeed in the society (LDA, 2017).

Augmentative and Alternative Communication (AAC) is a field of educational, research and clinical practices geared towards improving either permanently or temporarily, the ability to communicate among persons whose functional speech and writing skills are quite low (ASHA, 2002). The major aim of AAC is to enhance efficiency in communication. While sharpening the communicative competency of a person with communication general issues (Schlosser & Wendt, 2008). This can be attained through utilizing the modalities that are synonymous with natural speech (Schlosser & Wendt, 2008).

2.1.2 Dyslexia or other medical issues

Dyslexia refers to an impairment which affects one's ability to spell words, read and write. The statistics of the prevalence of the condition depend on the nature of the study that was done. Many studies reveal that 17% of the entire population in the globe is made up of people with dyslexia. There are more men with dyslexia when compared to women (Jorge et al., 2015). This is the major symptom of dyslexia. It is a chronic condition that one ought to live with their entire lives. The outcome can be improved when it is identified and addressed early (Jorge et al., 2015).

The International Dyslexia Association (2000) suggests that educators adopt a multi-sensory re-education in order to overcome various learning difficulties, dyslexia included. Notably, multi-sensory re-education entails multiple use of auditory, visual and kinaesthetic-tactile pathways simultaneously to improve memory as well as learning of written language. This intervention for dyslexia is based on the fact that the people with dyslexia must check letters use their language skills and vocalize sounds to comprehend the meaning of words.

However, Rello & Yates (2013) conducted a study to analyse various fonts. In their study, they conducted an analysis of 12 fonts with a sample of 48 people who cannot

read or write for some reasons. The findings of the analysis revealed that font types such as Courier, Helvetica, Verdana, Arial, and Computer Modern Unicode had a bigger impact on learning outcomes among persons with dyslexia. X Formatting: it entails use of a minimum of 12 or 14 font size complete with dark colour for the text (colours such as green, pink and red were highly avoided). Inappropriate use of capital letters and lower case letters has to be avoided. Important segments of a text ought to be bolded or coloured instead of using the italics style or underlining it. These make the text appear runny. It is also ideal not to start a sentence at the end of a line as this might cause narrow columns (this is common with newspapers). It is recommended that one use 1.5 line spacing to align the text to the left. It is highly recommended that one does not use any hyphens.

Teles (2004) believe that systematic, multi-sensory and cumulative strategies are the best forms of intervention for people with dyslexia. When implementing these methods, it is important to ensure that instruction is constant with frequent re-enforcement for learners to internalize the concepts with relative ease. The way a text is produced and even written affects a person with dyslexia's ability to read and comprehend. There are some simple recommendations to ensure that materials meant for people with dyslexia are reader-friendly (Ball, 2015; DysVet, 2014; BDA, 2012). X Font Style is more ideal because reading is a challenging task for people with dyslexia. Such a text font has been specifically developed to enhance letter readability among dyslexics. It ensures that printed letters are clear and precise. Some include Dyslexic, Open Dyslexic, Lexie Readable, and Sylexiad e Read Regular.

2.2 Assistive Technologies

Impairments in the communication realm impact on one's content clarity in speech. People, who exhibit communication impairments, need a host of assistive technologies. Ideal devices for such people include low to high tech depending on the severity of one's disabilities. The major determinant of the power of the device is the severity of cognitive and physical impairment. Affordability is another great consideration (UoL, 2017).

Assistive technology (AT) refers to an equipment, device or system that aids a person do something that they could not have been able to do without appropriate support. Adam et al., (2015) is of the opinion that assistive technology is important in a number of fields where users need some help. The fields are different in terms of goals and general scope. However, the key consideration should be human safety.

In the recent years, the adoption of mobile technologies for purposes of communication has gained ground. These technologies have gained much popularity in communication and education. Essentially, Mobile Assisted Language Learning (MALL) allows the learner to access material regardless of the time and physical location. In mobile learning, some gadgets such as smartphones, tablets, iPods, iPads and laptops are used for purposes of scaffold language learning. Many other apps have emerged that target those who experience communication challenges (Ramya and Madhumathi, 2017).

Lizbeth et al (2012) developed MOSOCO. It is a mobile assistive application that utilizes an augmented reality besides visual supports from a validated curriculum system. It is also packed with a social compass that aids children with autism practice important social skills that they face in real life. Authors came up with findings of a seven-week study. The study sought to unearth the efficiency of MOSOCO in a certain public school located in Southern California. The students who were engaged in for the study were autistic while others had neuro-typical conditions. The findings of their study revealed that MOSOCO enhances the practice and learning of important social skills. It also improves the learner's ability to interact with others, and it minimizes instances of social and behavioural flaws. It was also found that eases integration of autistic children in groups made up of neuro-typical children.

Fernandes et al., (2014) is of the opinion that a navigation system that utilizes Radio-Frequency Identification (RFID) would be ideal in guiding persons with visual impairments especially when they are in a strange environment. It is ideal in both outdoor and indoor environment because it complements the traditional white cane besides providing important insights about a user's geographical location.

The following are some of the technologies that aid persons with communication technologies (Berkeley, 2017):

- **Screen readers:** this is special software that people who are blind or visually impaired use to read material displayed on a computer screen. Some of the examples of software readers include but are not limited to NVDA, JAWS for Windows and the voice over for Mac.

Figure 2.1: Screen Reader (Centrum, 2018)

- **Screen magnification software:** this is a software that aids in controlling graphics as well as size of the text on a screen. It is not the same as a feature used to zoom content. These types of software aid the user to be able to view enlarged text on a screen. To do this, one ought to hold a magnifier over a screen.

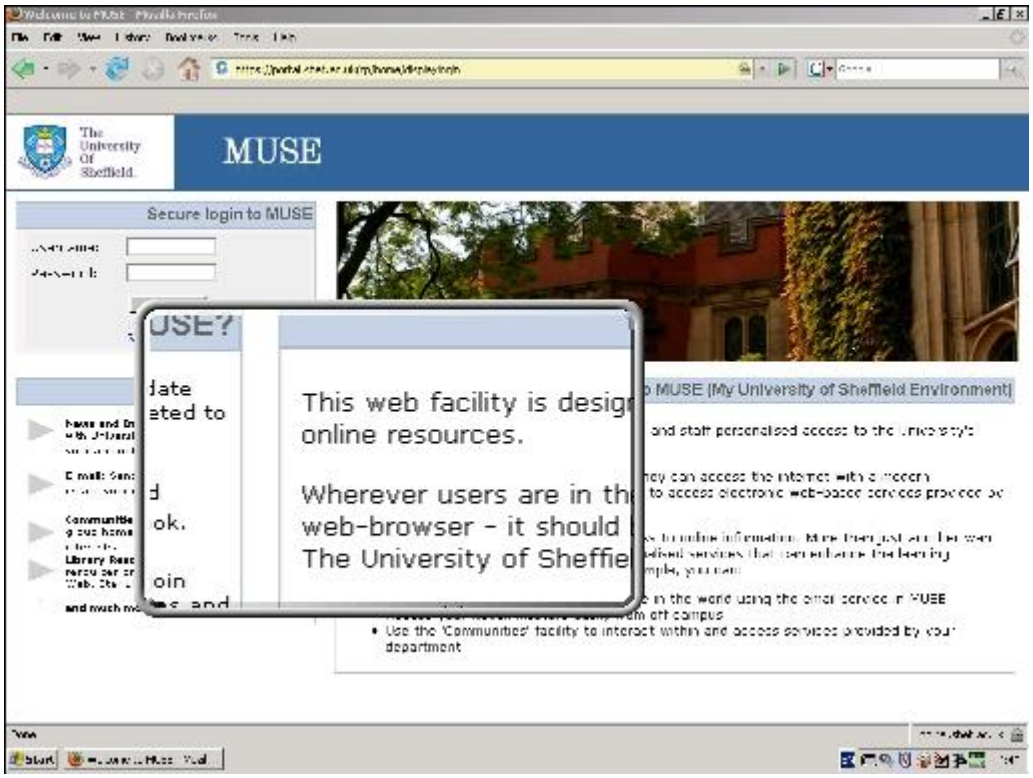


Figure 2.2: Magnifying glass (Sheffield, 2018)

- **Text readers:** This is a software that people with different learning disabilities use to enhance their reading ability. The software reads through a text with a synthesized voice. Additional features of this software include a highlighter which lays emphasis on a certain word. However, text readers do not read items such as different types of elements or menus. They can only help in reading a text.

Figure 2.3: Help readers (Yanko Design, 2018)

- **Speech input software:** this is a software that helps user type text and control a computer. The user keys in some commands for various mouse options. Users may instruct the system to go to a certain link, button or an item in a menu. Some of the examples include a naturally-speaking dragon for Mac or Windows. Notably, both Mac and Windows contain a number of speech recognition features. However, they are not ideal for purposes of browsing across the web.

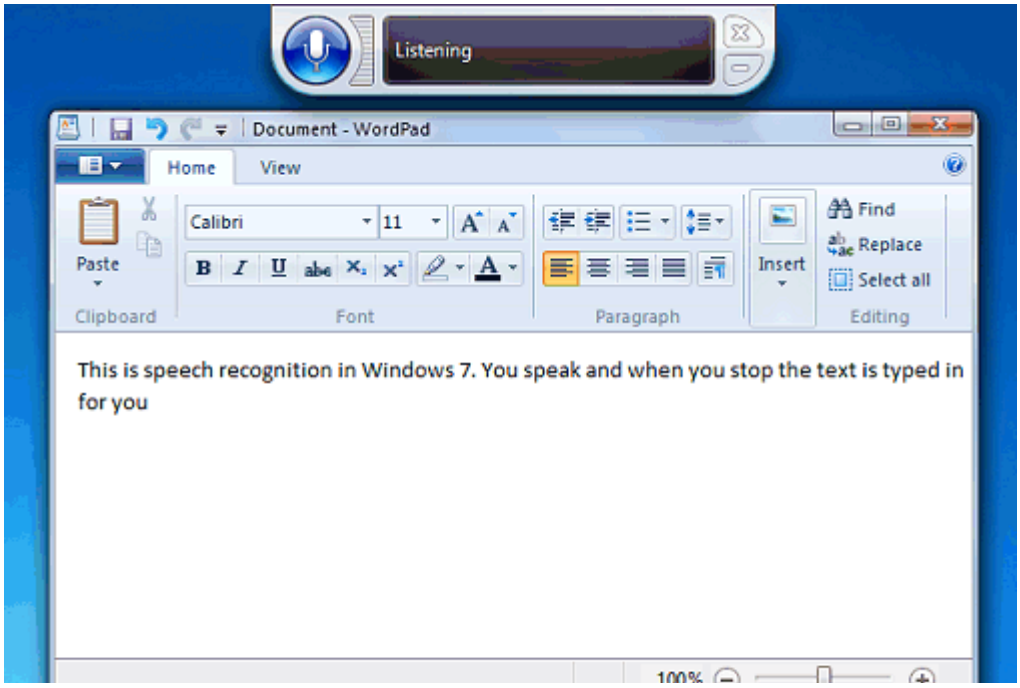


Figure 2.4: Speak recognition (Raw Computing, 2018)

- **Alternative input devices:** these are devices that aid users use input devices such as keyboard or mouse. People who experience difficulties in using input devices may use others such as:
    - **Head pointers**: it is an object that one can mount on their head to input using the keyboards keys. It is ideal for people who do not have hands.

Figure 2.5: Head pointers (Rehabmart, 2018)

- **Motion tracking or eye tracking:** it includes gadgets that trace a target or even the user's eyes to determine where one wishes to place a pointer and directs the users to it.

Figure 2.6: Eye tracking (UBO, 2018).

More often than not, they are used with on-screen keyboards. There is normally a cursor that moves across the on-screen keyboard. The user clicks on the switch when they intend to focus on some certain content. It is also possible to use this feature on the webpage as it is possible for the cursor to move through the webpage. When one wants to use click on a button or a certain link, they simply activate the switch.

2.3 Mobile Based Assistive Applications

Mobile-assisted applications refer to the sub-division of Computer Assisted Language Learning (CALL) and M-learning. According to Beatty, CALL is "a term used for the collection of technologies aimed at enhancing creativity and collaboration, particularly through social networking". In the last few years, mobile devices have become extremely common; thus, breeding the abbreviation, Mobile Assisted Language Learning (MALL) which is different from CALL due to relevance in personal use. Moreover, they are portable devices that have bred completely new ways of learning, spontaneity of access and continuity in many contexts (Kukulska-Hulme &Shields, 2008).

Some studies connote that CALL has some setbacks. These include lack of in-depth communication, probability of false observation, disturbed learning process, too much work, and lack of appropriate computer skills among instructors (Garrett, 2009; Golonka, Bowles, Frank, Richardson, & Freynik, 2012; Warschauer, 2004).

Kukulska-Humle (2009) believes that MALL can address many of the shortcomings of CALL. Some critical traits of mobile devices include:

- Portability & Mobility
- Individuality
- Context sensitivity
- Social connectivity

Desktop computers in CALL cannot satisfactorily offer these features. There have been a number of changes in utility of mobile phones. Some of these changes and particularly in mobile apps in MALL include ability to download ringtones to many

software apps in one cell phone. Although use of mobile phones for purposes of learning is not a new phenomenon, the most recent devices have state of the art features that have arose interests from instructors who opt to use this new technology for purposes of learning. The iPhones, iPods, and iPads are some of the latest hand-held devices have made the fever for mobile apps even more intense (Godwin-jones, 2011).

The term 'apps' is a short version of "application software". They can be downloaded from various stores such as Windows Phone Store, Google Play, App Store and Blackberry App World. Mobile apps refer to software application that runs tablets, and iPhones among many other mobile devices. Many of the apps can be downloaded free of charge while others have to be purchased. Some categories of mobile apps include education, gaming, and entertainment. APP Usage Statistics:

- iOS apps downloaded in 2015– 25 billion
- Android apps downloaded in 2015 – 50 billion
- People in the age bracket (18-24 years) spends an average of "90.6 hrs using various smartphone apps. They also use 34.7 hrs on tablet apps on a monthly basis.

There are many apps that ease communication among people. Some of them include basic communication board type apps. The users can simply point on a picture to stipulate what they want. This is possible and clearer in highly-advanced apps that are used for purposes of communication. These apps can even construct a sentence and have text to speech features as shown in the examples of some apps below (Assist Ireland, 2017).

- **Grace (iOS):** This is a communication app that aids people communicate rather independently. The user highlights a picture to create a sentence. They can share these pictures through pointing context for the listener to receive the words. However, this app cannot use speech. It seeks to encourage users to try their vocalizations. It contains some basic vocabulary pictures. It is even possible to customize it using internet images of even the device's camera.

Figure 2.7: Grace Communication App (Grace, 2018)

- **Autism Speech Diego Says (Android):** an app that helps in basic communication. Through the app, the user can push the action button to make commands.

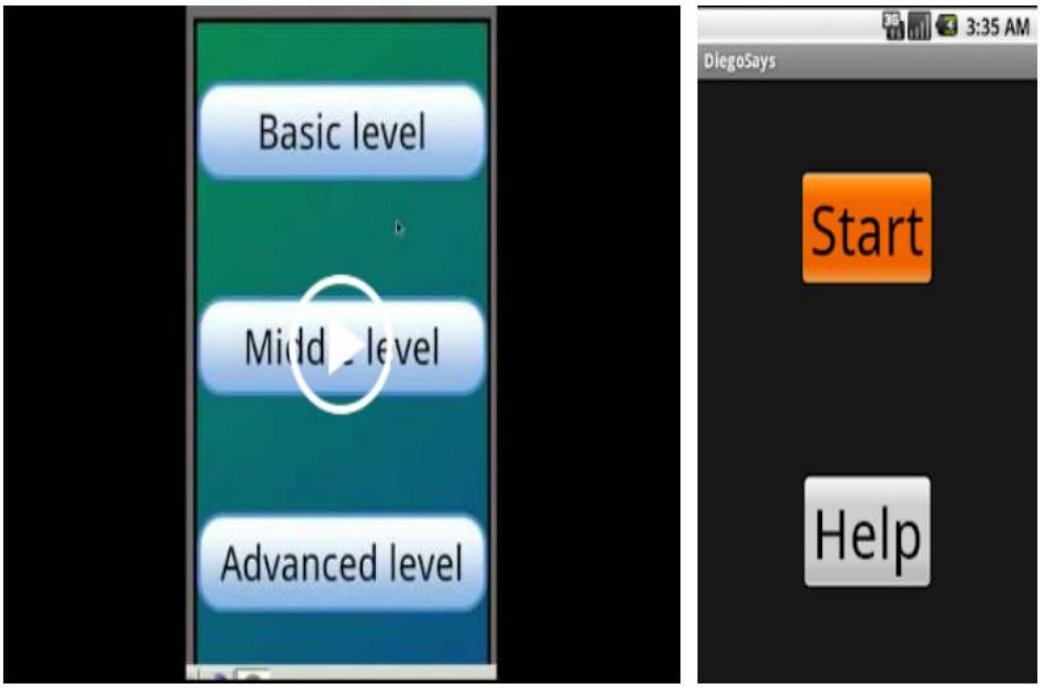


Figure 2.8: Autism Speech Diego Says (Googleplay, 2018).

- **iConverse (iOS):** this is an app that contains six display icons. These icons represent one's basic needs. These are activated to come up with an audio-visual representation of the specific needs of the user.

Figure 2.9: iconverse (Jeanona Dias , 2016).

2.4 How Mobile Applications help in Communication

Dictation refers to an assistive technology (AT) tool that aids people struggling with writing. It is also known as "speech-to-text," "voice-to-text," "voice recognition" or "speech recognition" technology. Users of dictation write with their voices. They do not use a keyboard or hand to write. This aids people with dyslexia, dysgraphia and attention issues that affect writing. Google's operating system, android contains some assistive technologies that are identical to those found in the iOS. One can activate them in for ease of accessibility in the devices settings and specialized apps (Jamie Martin, 2017).

- **For reading issues:** Talk-back refers to a feature of the android operating system that depends on TTS technology to read out loudly from various sources

such as emails, and websites among others. It is possible to change the voices of these tools for purposes of adjusting the speed of reading.

- **For writing issues:** Just like the iOS, Android has an in-built capability to dictate. One can do this through pressing the button in the microphone. It is even possible for children to type with their voices in various apps. Notably, the keyboard has an inbuilt word prediction capability. It can be activated by default. The keyboard can even suggest what the child may be trying to type.

CHAPTER 3
DEVELOPED MOBILE APPLICATION

After a detailed review of existing studies, the next step is to put the goals of this study into planning phase. Developing a mobile application specifically for a sensitive issue like communication disabilities must possess a proper procedure that contain market research, design and development steps.

3.1 Objectives of Application Development

The application needs and relevant data gathering was a fundamental approach. As discussed earlier, the application has been designed based on previous methods and strategies. The study accomplishes the following objectives:

- The need and importance of assistive application.
- Providing adults with communication disabilities an interactive and easy application.
- Make these individuals capable to communicate their routine tasks independently.

3.2 Market Research

Market research is crucial before development of any application. In market research the current trends and needs of market can be identified which can explain the need and the importance of the application. It also helps in creating appropriate application design and functionalities (Reinder de Vries, 2017). Hence, based on research for this study plenty of relevant application have been found, some of the application and their functionalities are mentioned below:

Applications such as TalkBack, KickBack, and SoundBack help blind and visually impaired persons feel and hear their voices on the GUI (AndroLib, 2017). These applications can read out a text aloud. Of all other screen readers, Talk Back has a relatively good quality sound. Unfortunately, SVOX language version ought to be installed to attain a clear sound quality. These versions are not always free.

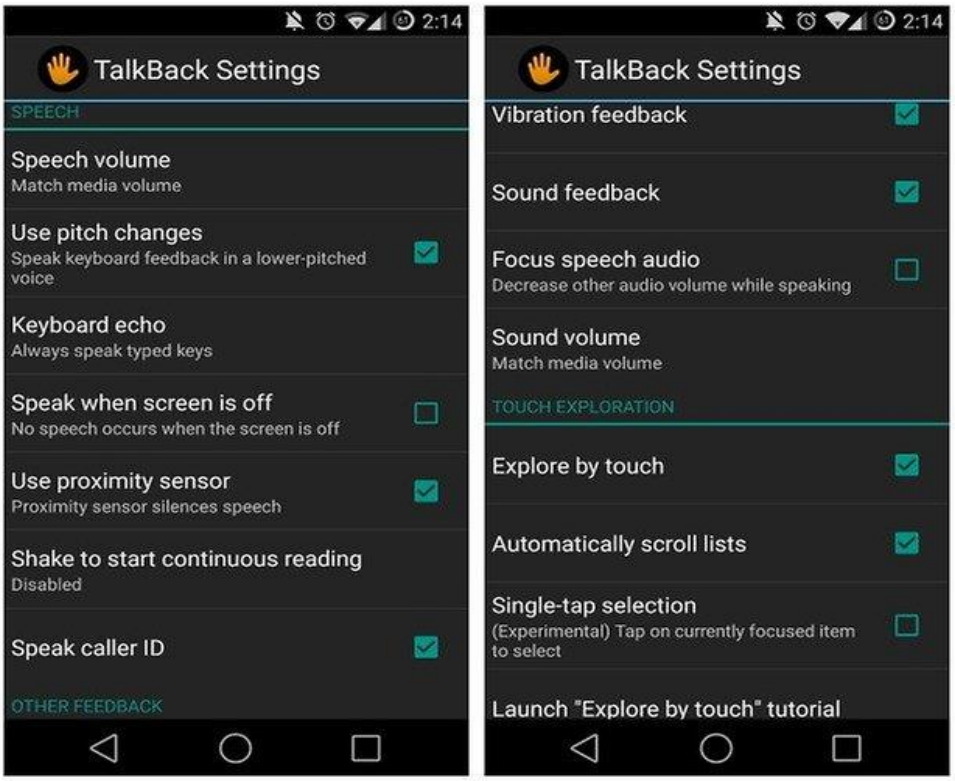


Figure 3.1: Google Talkback (Google Play. 2018).

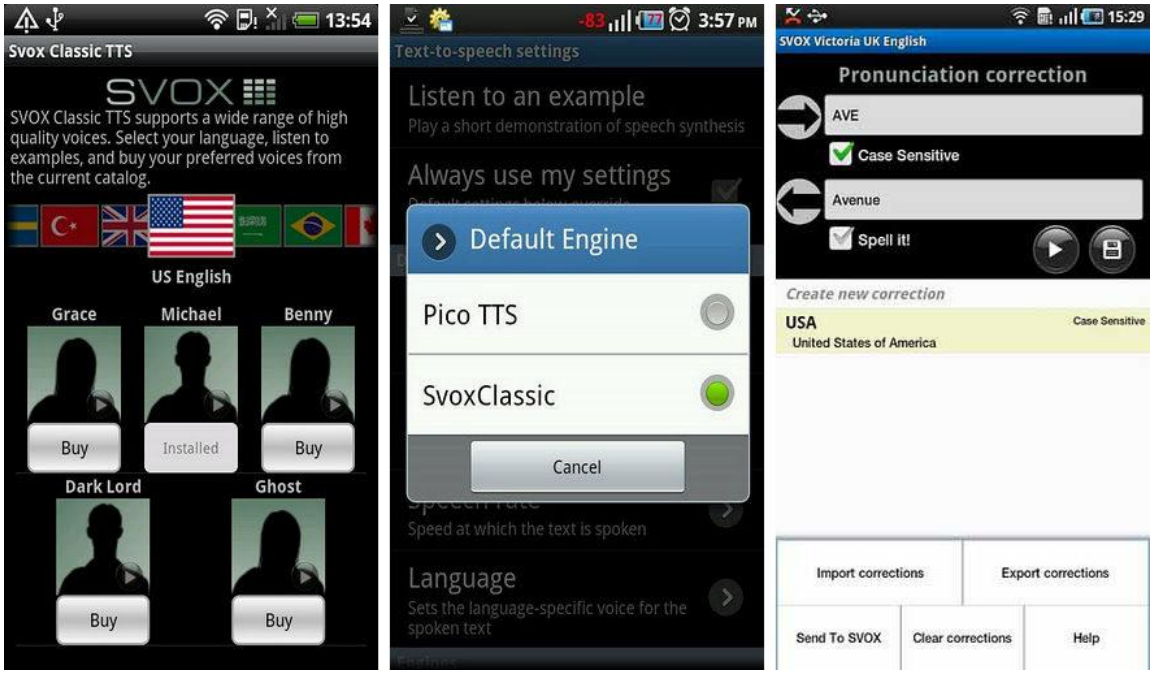


Figure 3.2: SVOX Application (Paul, 2012).

The Classic Text to Speech Engine includes a combination of over 40 male and female voices, and enables users to listen to spoken renderings of e.g. text files, e-books and

translated texts (Paul, 2012). The app also features voice support in key areas like navigation. In contrast to SVOX, this application is free, but with limited language support both for reading and the human-device user interface.

The ScanLife Barcode and QR Reader (Paul, 2012) allows a user to read QR and barcodes. This is mainly ideal in a supermarket including other locations. It can function even with a low resolution camera of 3.2 MP. However, the need for a higher memory can pose a challenge. Apps such as Colour Picker supports ease of colour identification. Other tools such as augmented/virtual magnifying glasses—such as Magnify—support reading for the weak-sighted (Paul, 2012). Magnify can only be effectively when used alongside a high resolution camera.

Figure 3.3: ScanLife BarCode (Raman, 2018)

Some alternative home screen or launchers exist for the visually impaired. One of them is the Eyes-Free Shell. It is ideal for users who experience problems with focusing on the screen. It gives a means of interacting with a touch screen for purposes such as launch applications, checking status information and direct dial or message specific contacts. The other important application is Just Speak. It is an app that controls voices on android devices. It is ideal in activating on screen controls, launch installed applications, and trigger other Android actions (Raman, 2012).

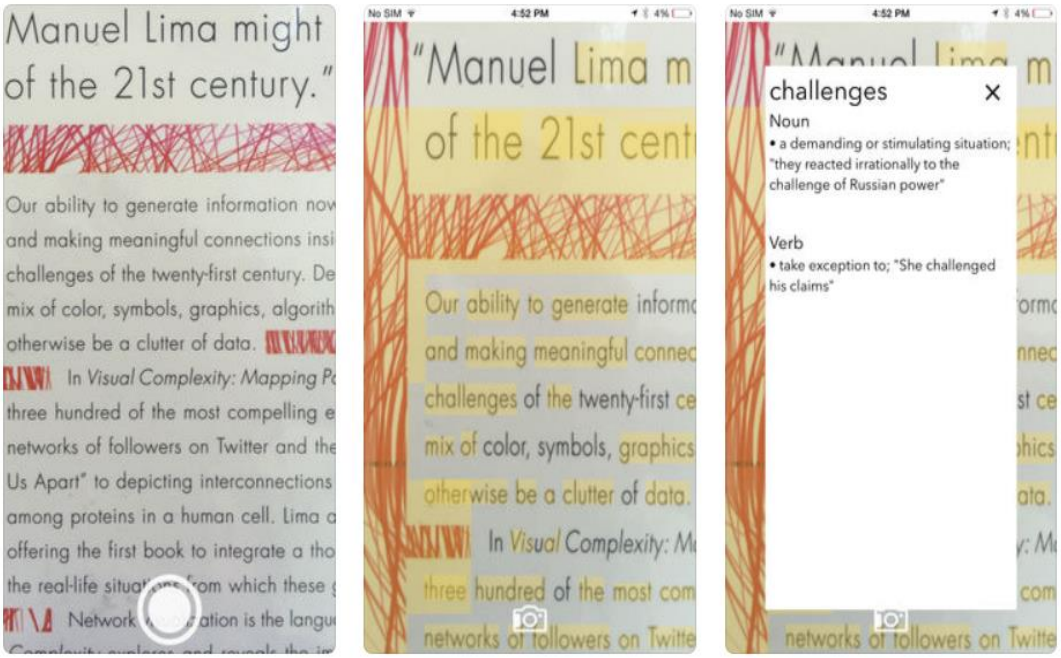


Figure 3.4: Lectio IOS Application (Lectio, 2012).

Lectio refers to an app in an iPhone or iPad that helps the user to snap an image of a text-filled page. It also aids them read aloud some certain word or words. This app is not dependent on the internet. In addition, it helps the user to choose the exact words where they need help. They do not have to read the whole passage. When an image has been taken, all the words that are in the Lectio extensive dictionary and are present in the page with be yellow highlighted for ease of access. Therefore, one can tap the word or words they wish to read loudly. Alternatively, they can hold down their fingers to see the word's definition (Lectio, 2018).

3.3 Application Model and Development Structure

Mobile applications are being developed for deployment in smart phones. Looking at the rising need of mobile applications and the associated development complexity, it is imperative to have a dedicated framework lifecycle for mobile application (Tejas Vithani, 2014). The figure 3.5 below contain the phases adopted to complete the development of application.

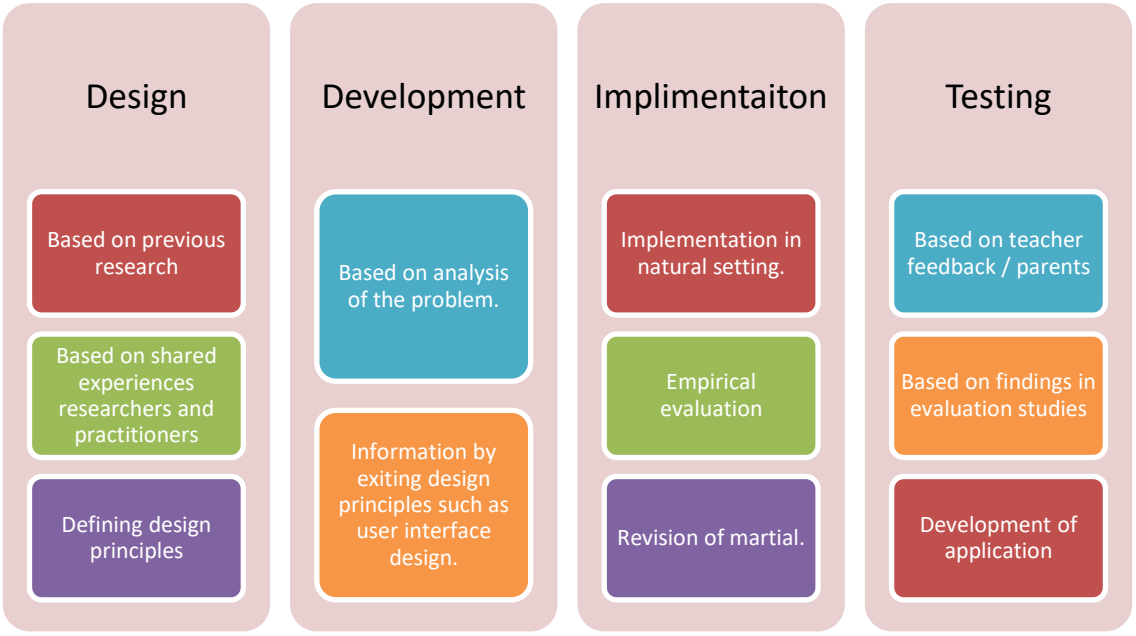


Figure 3.5: Design-based research model of the study

3.3.1 Application design

Design always remains a challenging factor when it comes to of the production of applications as assistive technology. Based on previous studies and market analysis, design is based on following features:

1- **Everyday Conversation** – help individual to communicate for daily tasks
2- **Read My SMS** – help individuals to read SMS
3- **Text Reader** – help them reading newspaper or book etc.
4- **Text to Speech** – You can write text to later play it with sound
5- **Dictionary** – to learn about new words with sound availability

3.3.2 User interface

An easy to navigate and interactive user interface (UI) is an essential part of a successful application to engage the user (Frauenberger et al., 2012). A good user interface enables users to conduct tasks easily, encourages use, and most importantly encourages the user engagement with the device. Moreover, an application especially for a sensitive issue like communication assistance must require less effort to understand and has simple functionality that can be easily adopted by user with communication disabilities symptoms (Muhamad et al., 2016). White (2016) and

Itzkovitch (2012) respectively suggested UI environment for such application that are adopted for this application.

- **Colour Theme:** A very decent colour theme has been adopted for this application.
- **Main Menu:** Home page and other pages contains a full menu as well as easy to use navigation style. For example: touch and swipe features.
- **Navigation Buttons:** Buttons are added on each page to help users to navigate to different pages or back to home page easily.
- **Interactive Elements:** Images and sounds are the most important element of this application. Thus, a very careful approach has been used to employ images and sounds wherever applicable.
- **Instruction:** Becky affirmed that hints and instructions are mandatory features for educational applications. Thus, the application includes text instructions along with audio versions of sound to ensure that there is better guidance for the children.

3.4 Application Development

After detailed review of previous studies and current market trends related to similar application, a structured planning has been put into action, where the entire development process along with used tools are explained. These steps are mentioned below:

3.4.1 Operating system

Android has many features that support text to speech depending on one's interaction. It is an ideal accessibility service of android. Android is a popular technology that enhances the learning process. It is an operating system for mobile phones and tablets. Notably, Android was invested by Google owned Open Handset Alliance. The Android Open Source Project seeks to enhance its users' mobile experience (Android, 2011). Andy Rubin (2010) says that Android is the first open and comprehensive platform that allows a software to run a cell phone without many problems that have bedevilled cell phone invention.

3.4.2 Development platform/software

Android Studio is an official Integrated Development Environment (IDE) that aids in app development. It is founded on the IntelliJ IDEA. IntelliJ contains an extremely powerful code editor and developer tools. The Android Studio has a host of features that are quite ideal in the creation of android apps (Android Studio, 2017).
These include:

- A speedy emulator that contains various features
- A flexible grade-based system
- Environmental unity to ease the development of android devices.
- Instant to allow apps to run without an APK.
- High quality frameworks and testing tools**.**
- Integration of GitHub and code templates to allow developers come up with a common app and important sample codes.
- Lint tools to enhance performance, utility, version and compatibility**.**
- C++ and NDK support**.**
- Built-in support for Google Cloud Platform to allow the functionality of App Engine and Google Cloud Messaging.

3.4.3 Programming language

Java is the most common programming language in many android-**run applications.** In this case, the Android Software Development Kit (SDK) the best. Java language comes from Sun Microsystems. It is an object-oriented language that aids in android development. Therefore, this application is developed in Java language.

3.4.4 Development period

The development duration for the application was between November and December, 2017. It took approximately 45 days to build this application. The majority of this time was dedicated to graphic design, content design and coding.

3.5 Implementation

This section explains each interface of the application along with its need and use. Figure 3.6 below presents a clear picture of the entire application process. It displays how the whole application has been constructed.

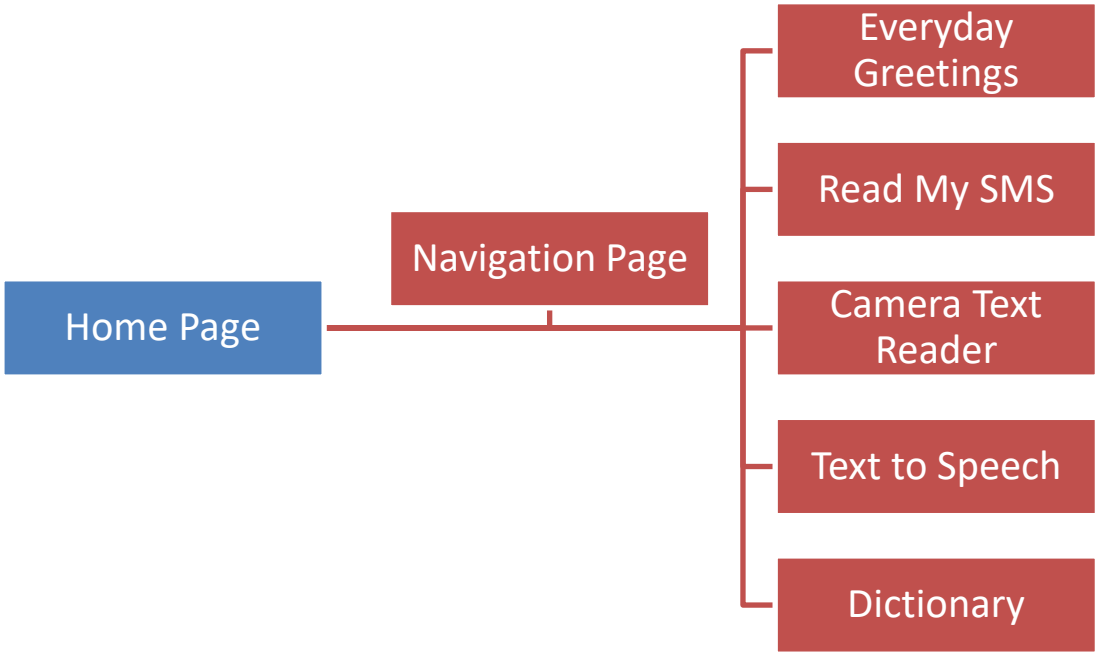


Figure 3.6: Application Flow Chart

3.6 Application Testing

To maintain the quality of the application, the application has been continuously test by different users to make sure all the functions are perfectly running, the application performance is well and good, the features are good enough and most importantly its compatibility with different devices.

CHAPTER 4
IMPLEMENTATION

This section of the project presents the whole application features and options, their process, uses and benefits in detail.

4.1 Home Page

Application home page is shown in Figure 4.1 below. As shown in the figure the home page contains the 5 conversation helper options:

1. Everyday conversation
2. Read my SMS
3. Text to speech
4. Camera text reader
5. And Dictionary

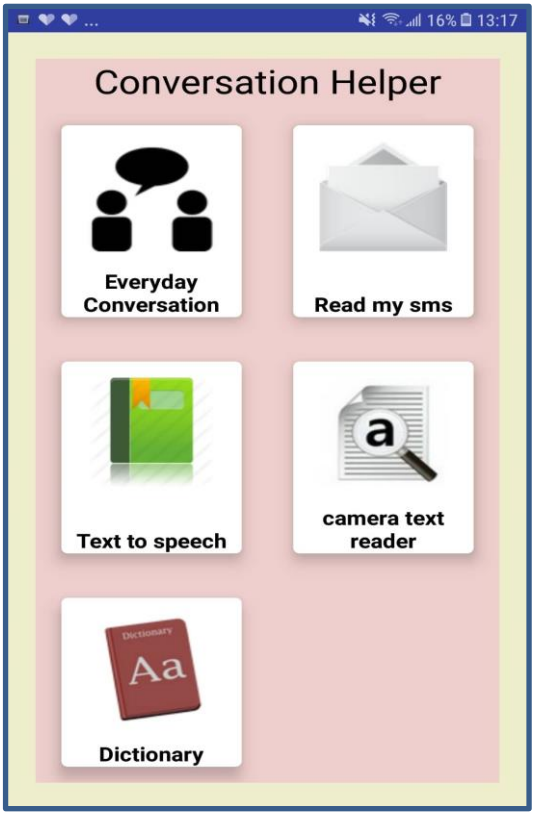


Figure 4.1: Home Page

4.2 Everyday Conversation

This is the first option that helps users to communicate for their routine or daily tasks. This is especially for people who cannot speak but are able to read. After moving to this page an another main menu containing further options such as pleasantries, greetings, objects, places, and feelings. Here user can choose the option they are looking for. For example, if they want to greet someone they can choose greeting option or they want to express their feeling they can choose feeling option.

Figure 4.2: Everyday conversation – main menu

4.2.1 Greetings

In case, the user choses greeting option or willing to greet someone a window as shown in figure 4.3 will appear. As it can be seen by the figure, there is a list of greeting texts along with the images and sound. If the user is unable to read, he/she can see the picture to recognize the given option and press the sound. The application will greet itself. For example, if you click on “good morning” the application sound will be played.

Figure 4.3: Greetings

It is noticed that people with reading disability can work easily with images. Once explained or after frequent use they will remember which image means what. Although, the people who can read but cannot speak can simply understand with written text instructions.

4.2.2 Pleasantries

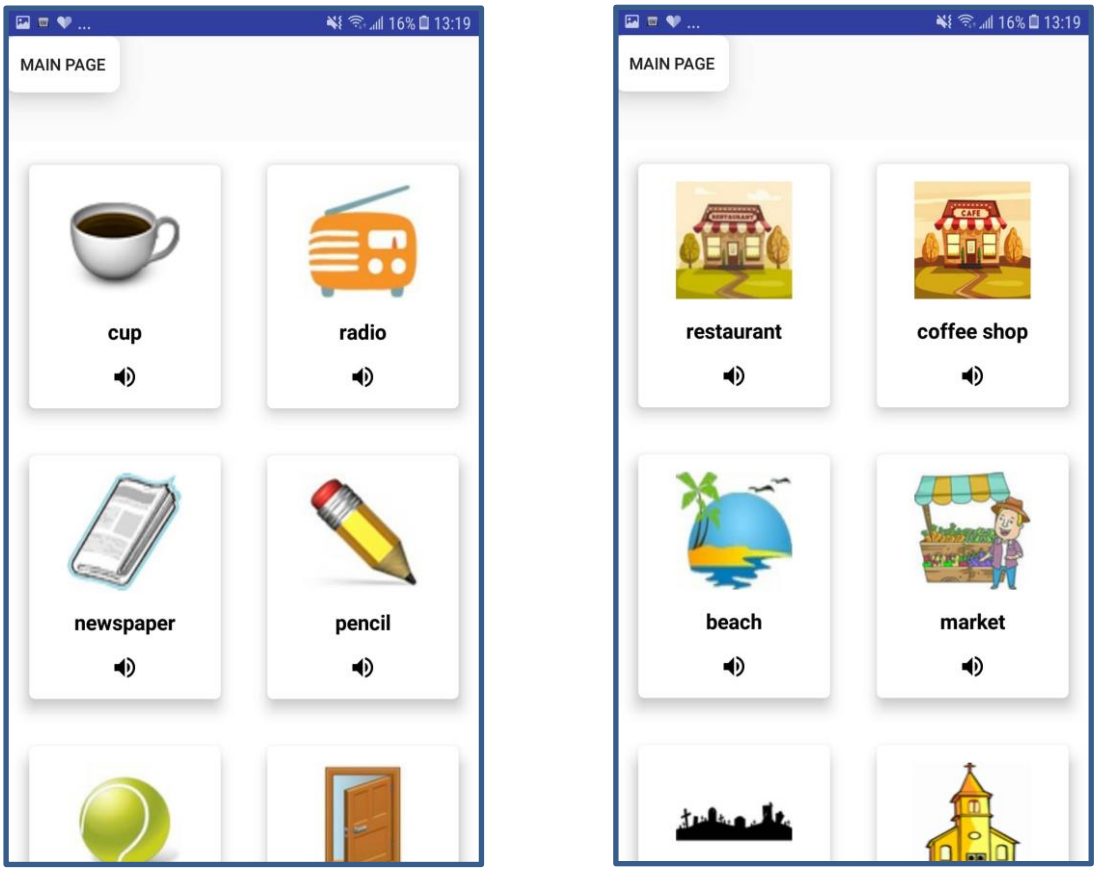
The figure 4.4 below shows the pleasantries or a routine conversation, for example how are you? I am fine, you look great etc. They also consist of an interactive relevant image, text and sound. The user can scroll down for more pleasantry words. In case the user want to get back to the top of the page can scroll up as well as to can choose a different option of the daily conversation by going back. The user can return to the home page by clicking at the main page button given at the left top corner.

Figure 4.4: Pleasantries Page

4.2.3 Objects and locations

The figure 4.5 illustrates another daily conversation options, figure (a) for objects and figure (b) for locations. As shown in figure (a), this can also help some people in learning the name of objects or if they are looking for specific things such as cup, ball, radio, pencil, newspaper etc, they can simply use this option to explain what they are looking for. The figure (b) on other hand help people to either talk about specific location or ask for specific locations such as restaurant, beach, market, coffee shop etc.

The pages contain the main menu button to redirect user to the home page menu. It also have the everyday conversation option to open drop down menu to switch to other options.



(a) Objects (b) Locations

Figure 4.5: Daily conversation sub- categories

4.2.4 Feelings and emotions

The users can also express their feelings, for example:

- I love you
- I don't like you
- I am sad
- I like you
- This is embarrassing

Figure 4.6 here represents most common feelings that can help users to explain how they feeling now, or about someone. The page contain the similar features as mentioned above.

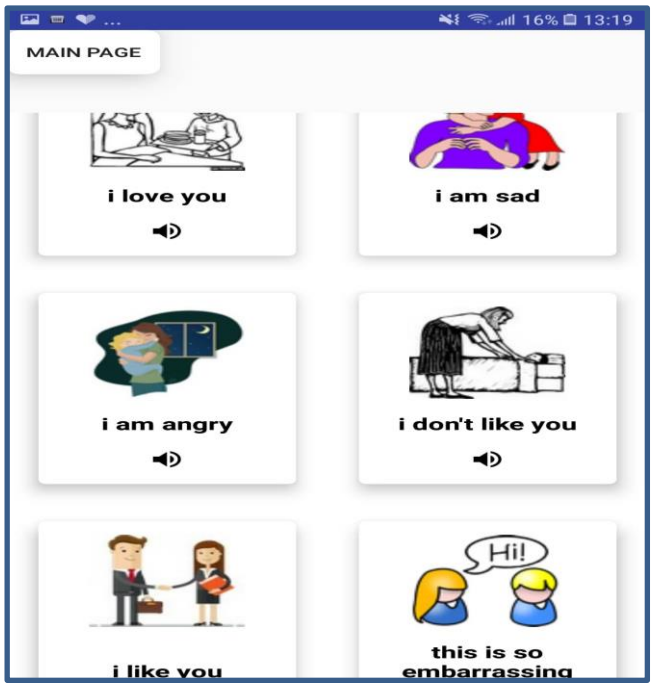


Figure 4.6: Feelings and Emotions

4.3 Read My SMS

This is the part of home page menu shown in figure 4.7. A person with reading issue or disability, or someone for who English is not their first language will find this option very useful. As soon as user will receive any new message or want to read previous messages can use this option. This option will fetch all messages from the original inbox and show here, then user can simply click on speaker icon to read any messages he/she likes.

Figure 4.7: Read my SMS

4.4 Camera Text Reader

This is very useful option for those who cannot read. If a person wants to read a book or any text written anywhere can simply use this option. All they need is to click on this icon and a camera will open (shown in figure 4.8), then they can drag this camera over the text, in few moments the text will appear on the screen and then user can click on play button given at the left top corner of the page. A robot will read entire text for the user.

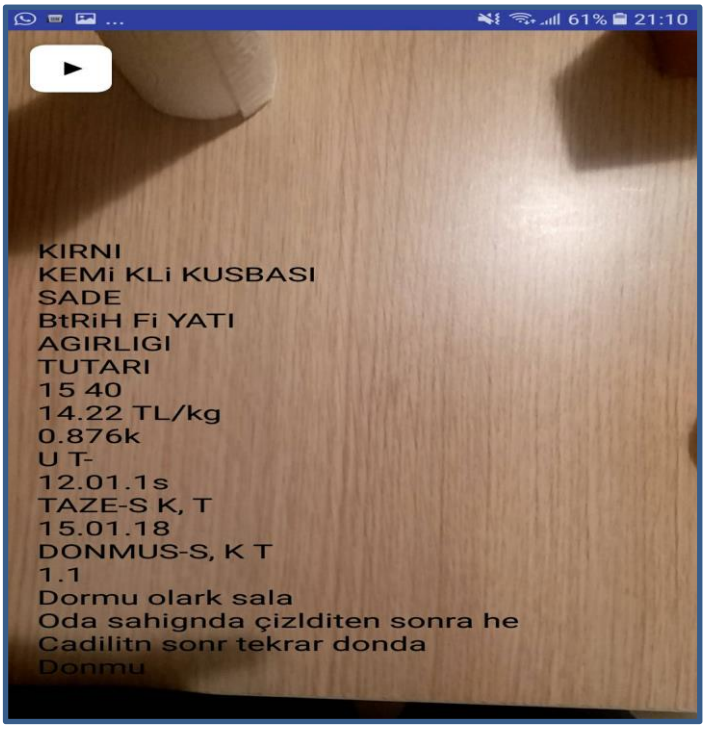


Figure 4.8: Camera Reader

4.5 Dictionary

Figure 4.9 is a general dictionary, the user can search the specific word here, read the meaning with sound option. If the user cannot write he can simply use voice recorder icon to record the word and application will find the relevant word. That can later be learned with sound option.

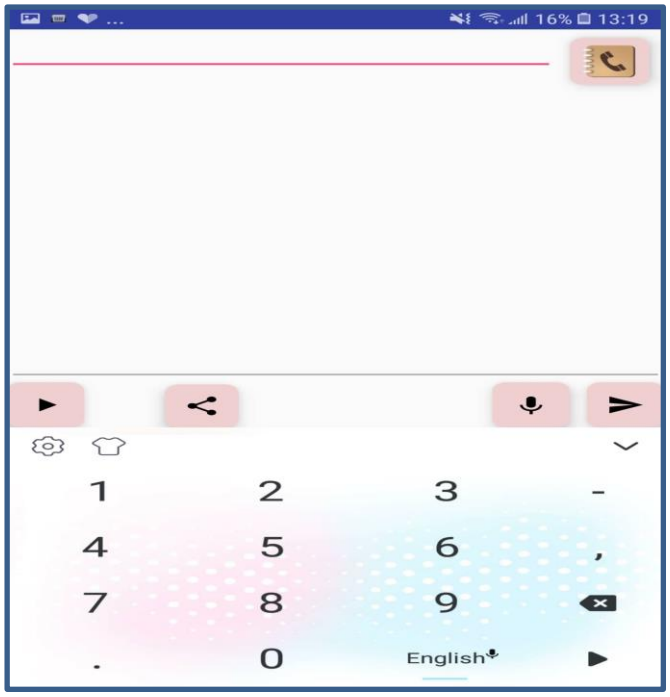


Figure 4.9: Dictionary

4.6 Text to Speech

This option is very useful for learning purpose. User can write any word and many suggestions will appear, the user can select appropriate word and play the sound.

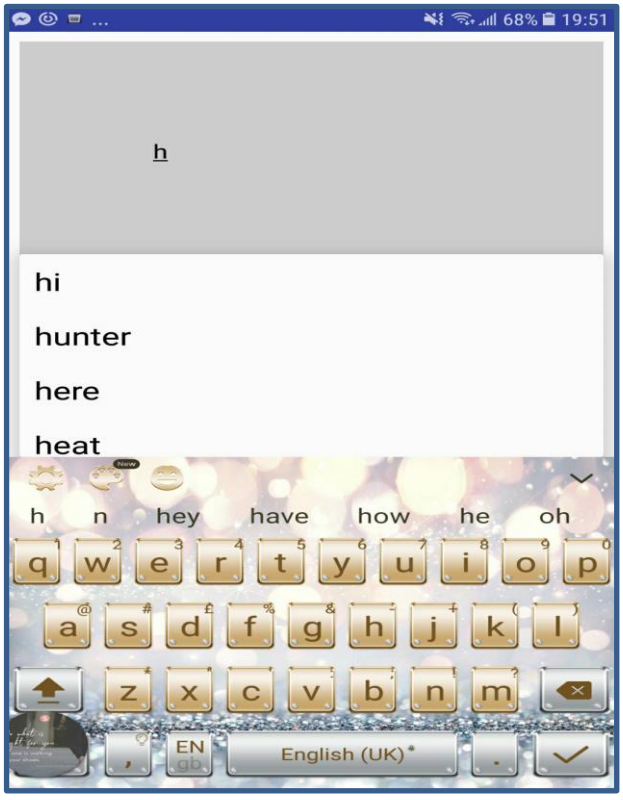


Figure 4.10: Text to Speech

CHAPTER 5

CONCLUSION AND DISCUSSION

Assistive technologies or applications are the most valuable things to be develop to assist people with lack of communication capabilities, who either cannot read, write or speak. As discussed earlier it can be due to the various reasons, by birth, due to a disease, learning disabilities or lack of education or a situational need. This was the main objective of this study to help such people with this application, make their life easy, and make them feel like every other normal person however possible.

To fulfil the aim of the study, firs of all the need of this application have been identified. After, a detailed relevant studies have been reviewed where a very communal issue known as Dyslexia has been discussed by plenty of researcher as a biggest cause of communication disability. Dyslexia also known as language based learning disability which is common among children these days. The literature further discusses the assistive technologies used around the world and some of researchers' references who examined such technologies in their studies. Moreover, existing mobile based applications have been discussed briefly. It discusses the benefits of mobile based applications, the frequent used mobile operating system and how these applications actually helps for reading and writing issues.

A market research has been done to find out relevant existing applications, their features and purposes more importantly. This was helpful to identify elements that would differentiate our application and help to make a distinct contribution in the market. The data collected from this market research was also useful in designing major elements of our application such as different features and functionalities. Android studio has been used to develop this application, which work with Java language. Android studio is the best platform to develop android based application. The entire development process have been done in 45 days by following a structured development model.

Furthermore, a comprehensive flow chart demonstrating the entire structure of the application, its features, process and use have also been discussed. This can be used as a user guide or user reference purpose in future.

5.1 Conclusion

So far as, it has been concluded this communication assistive application was worth developing. As it has been noticed there was a high potential of research in similar domain and market does need such application. This application is a prototype and can further be enhanced and improved as it is developed on android platform which is considered more development friendly platform.

5.2 Limitation and Future Research

Due to the limited time the study was based on qualitative approach. Thus, it is recommended for future researchers to adopt a quantitative or experimental research approach, where they can get this application tested or used by a large number of population. They can gather their views to perform statistical analysis to retrieve different results.

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APPENDICES

APPLICATION CODE

```
package com.example.titanium.convo_help;

import android.app.FragmentManager;
import android.app.FragmentTransaction;
import android.content.Context;
import android.content.Intent;
import android.net.Uri;
import android.os.Bundle;
import android.app.Fragment;
import android.speech.tts.TextToSpeech;
import android.support.v7.widget.CardView;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.BaseAdapter;
import android.widget.Button;
import android.widget.GridView;
import android.widget.ImageView;
import android.widget.LinearLayout;
import android.widget.TextView;

import java.util.Locale;


public class BlankFragment extends Fragment {

    GridView gd1;
    String []alphabbets={"pleasantries","greetings","objects","places","feelings"};
    int
[]color={R.drawable.pmetu,R.drawable.hi,R.drawable.newpap,R.drawable.schlate,R.
drawable.feels};
```

```
public BlankFragment() {
   // Required empty public constructor
}


@Override
public View onCreateView(LayoutInflater inflater, ViewGroup container,
                         Bundle savedInstanceState) {
   View v=inflater.inflate(R.layout.fragment_blank2, container, false);
      gd1=(GridView)v.findViewById(R.id.gd);
     baseadap b=new baseadap(getActivity(),alphabbets,color);
      gd1.setAdapter(b);
   // Inflate the layout for this fragment

   return v;



}
class baseadap extends BaseAdapter {
   Context conn;
   String st1[];
   int []color;
   Fragment fragment;
   LayoutInflater lf;
   LinearLayout ln;
   baseadap(Context con,String st[],int col[]){
      conn=con;
      color=col;
      st1=st;
      lf=(LayoutInflater.from(con));
   }
   @Override
   public int getCount() {
      return alphabbets.length;
```

```
}

@Override
public Object getItem(int i) {
   return null;
}

@Override
public long getItemId(int i) {
   return 0;
}

@Override
public View getView(int i, View view, ViewGroup viewGroup) {
   View v;
   v=lf.inflate(R.layout.cadbase,null);
   final CardView cardView=v.findViewById(R.id.cad);


   switch (i) {
      case 0:
         cardView.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
               fragment = new pleasantries();
               FragmentManager fm = getFragmentManager();
               FragmentTransaction ft = fm.beginTransaction();
               ft.replace(R.id.fragg, fragment);
               ft.commit();
            }
         });
         break;
      case 1:
         cardView.setOnClickListener(new View.OnClickListener() {
```

```
        @Override
        public void onClick(View view) {
            fragment = new greetings();
            FragmentManager fm = getFragmentManager();
            FragmentTransaction ft = fm.beginTransaction();
            ft.replace(R.id.fragg, fragment);
            ft.commit();
        }
    });
    break;
case 2:
    cardView.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View view) {
            fragment = new objects();
            FragmentManager fm = getFragmentManager();
            FragmentTransaction ft = fm.beginTransaction();
            ft.replace(R.id.fragg, fragment);
            ft.commit();
        }
    });
    break;
case 3:
    cardView.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View view) {
            // tv.setText("place");
            fragment = new place();
            FragmentManager fm = getFragmentManager();
            FragmentTransaction ft = fm.beginTransaction();
            ft.replace(R.id.fragg, fragment);
            ft.commit();
        }
    });
```

```
                break;
            case 4:
                cardView.setOnClickListener(new View.OnClickListener() {
                    @Override
                    public void onClick(View view) {
                        // tv.setText("place");
                        fragment = new affection();
                        FragmentManager fm = getFragmentManager();
                        FragmentTransaction ft = fm.beginTransaction();
                        ft.replace(R.id.fragg, fragment);
                        ft.commit();
                    }
                });
                break;
        }

        TextView tv=v.findViewById(R.id.tv);
        tv.setText(st1[i]);

        ImageView im=v.findViewById(R.id.im);
        im.setBackgroundResource(color[i]);

        return v;
    }
  }
}
package com.example.titanium.convo_help;

import android.content.Context;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;

import com.readystatesoftware.sqliteasset.SQLiteAssetHelper;
```

```
import java.util.ArrayList;

/**
 * Created by Titanium on 2/26/2018.
 */

public class dbbackend extends dbobject{

    public dbbackend(Context context) {
        super(context);
    }

    public String[] dictionaryWords(){
        String query = "Select * from words";
        Cursor cursor = this.getDbConnection().rawQuery(query, null);
        ArrayList<String> wordTerms = new ArrayList<String>();
        if(cursor.moveToFirst()){
            do{
                String word = cursor.getString(cursor.getColumnIndexOrThrow("word"));
                String w = cursor.getString(cursor.getColumnIndexOrThrow("defn"));
                wordTerms.add(word.toUpperCase()+"\n\n"+w);
            }while(cursor.moveToNext());
        }
        cursor.close();
        String[] dictionaryWords = new String[wordTerms.size()];
        dictionaryWords = wordTerms.toArray(dictionaryWords);
        return dictionaryWords;
    }

    public QuizObject getQuizById(int quizId){

        QuizObject quizObject = null;
        String query = "select * from words where id = " + quizId;
        Cursor cursor = this.getDbConnection().rawQuery(query, null);
```

```
        if(cursor.moveToFirst()){
            do{
                String word = cursor.getString(cursor.getColumnIndexOrThrow("word"));
                String meaning =
cursor.getString(cursor.getColumnIndexOrThrow("defn"));
                quizObject = new QuizObject(word, meaning);
            }while(cursor.moveToNext());
        }
        cursor.close();
        return quizObject;
    }
}
class dbobject {

    private static dictionarydatabase dbHelper;
    private SQLiteDatabase db;

    public dbobject(Context context) {
        dbHelper = new dictionarydatabase(context);
        this.db = dbHelper.getReadableDatabase();
    }

    public SQLiteDatabase getDbConnection(){
        return this.db;
    }

    public void closeDbConnection(){
        if(this.db != null){
            this.db.close();
        }
    }
}
class dictionarydatabase  extends SQLiteAssetHelper {
```

```
    private static final String DATABASE_NAMES = "Dictionary";
    private static final int DATABASE_VERSION = 5;

    public dictionarydatabase(Context context) {
        super(context, DATABASE_NAMES, null, DATABASE_VERSION);
        // TODO Auto-generated constructor stub
    }

    @Override
    public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
        super.onUpgrade(db, oldVersion, newVersion);

        db.execSQL("ALTER TABLE DICTIONARY ADD COLUMN ID INTEGER
NOT NULL PRIMARY KEY");

    }
}
class QuizObject {

    private String word;
    private String definition;

    public QuizObject(String word, String definition) {
        this.word = word;
        this.definition = definition;
    }

    public String getWord() {
        return word;
    }

    public void setWord(String word) {
        this.word = word;
    }
```

```
    public String getDefinition() {
        return definition;
    }

    public void setDefinition(String definition) {
        this.definition = definition;
    }
}
package com.example.titanium.convo_help;

import android.app.Activity;
import android.app.Dialog;
import android.app.Fragment;
import android.app.FragmentManager;
import android.app.FragmentTransaction;
import android.content.Intent;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.Button;
import android.widget.ListView;
import android.widget.SlidingDrawer;
import android.widget.TextView;
import android.widget.Toast;

public class econversation extends Activity {
Button b,b2,b3,b4;
Fragment fragment;
String str[]={"pleasantries","greetings","object","places"};
ArrayAdapter ad;
ListView lis;
```

```
TextView tv;
   @Override
   protected void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.activity_econversation);
      Button btn=findViewById(R.id.play1);
      Button btn1=findViewById(R.id.play);
      btn.setOnClickListener(new View.OnClickListener() {
         @Override
         public void onClick(View view) {
            BlankFragment fragment = new BlankFragment();
            FragmentManager fm = getFragmentManager();
            FragmentTransaction ft = fm.beginTransaction();
            ft.replace(R.id.fragg, fragment);
            ft.commit();
         }
      });
      btn1.setOnClickListener(new View.OnClickListener() {
         @Override
         public void onClick(View view) {
            Intent intent = new Intent(getApplicationContext(), MainActivity.class);

intent.addFlags(Intent.FLAG_ACTIVITY_NEW_TASK|Intent.FLAG_ACTIVITY_
CLEAR_TASK);
            startActivity(intent);
         }
      });
         }


}
package com.example.titanium.convo_help;
```

```
import android.app.FragmentManager;
import android.app.FragmentTransaction;
import android.content.Context;
import android.content.Intent;
import android.os.Bundle;
import android.app.Fragment;
import android.speech.tts.TextToSpeech;
import android.support.v7.widget.CardView;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.BaseAdapter;
import android.widget.GridLayout;
import android.widget.GridView;
import android.widget.ImageView;
import android.widget.LinearLayout;
import android.widget.TextView;
import android.widget.Toast;

import java.util.Locale;



/**
 * A simple {@link Fragment} subclass.
 */
public class greetings extends Fragment {
    TextToSpeech spch;
    String str[]={"good morning","good afternoon","good evening","good night","good
day","hi",
        "hello","hey"};
GridLayout gridLayout;
    GridView gd1;
    //String
[]alphabbets={"cup","radio","newspaper","pencil","ball","door","paper","pen"};
```

```
    int
[]color={R.drawable.gm,R.drawable.goodaft,R.drawable.geven,R.drawable.gdnit,
          R.drawable.ggd,R.drawable.hi,R.drawable.hello,R.drawable.hreu};
    public greetings() {
        // Required empty public constructor
    }


    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup container,
                             Bundle savedInstanceState) {
        View v=inflater.inflate(R.layout.fragment_objects, container, false);
        gd1=(GridView)v.findViewById(R.id.gd);
        baseadap b=new baseadap(getActivity(),str,color);
        gd1.setAdapter(b);
        // Inflate the layout for this fragment

        return v;


    }


    class baseadap extends BaseAdapter {
        Context conn;
        String st1[];
       // LinearLayout ln;

        int []color;
        Fragment fragment;
        LayoutInflater lf;
        LinearLayout ln;
        baseadap(Context con,String st[],int col[]){
            conn=con;
```

```
        color=col;
        st1=st;
        lf=(LayoutInflater.from(con));
    }
    @Override
    public int getCount() {
        return str.length;
    }

    @Override
    public Object getItem(int i) {
        return null;
    }

    @Override
    public long getItemId(int i) {
        return 0;
    }

    @Override
    public View getView(final int i, View view, ViewGroup viewGroup) {
        View v;
        v=lf.inflate(R.layout.base1,null);
       //  final CardView cardView=v.findViewById(R.id.cad);
        spch = new TextToSpeech(getActivity(), new TextToSpeech.OnInitListener()
{
            @Override
            public void onInit(int i) {
                if (i != TextToSpeech.ERROR) {
                    spch.setLanguage(Locale.getDefault());
                }
            }
        });
        ln=(LinearLayout)v.findViewById(R.id.rn);
```

```
        for (int j=0;j<ln.getChildCount();j++){
            final int fin = j;
            try {
                final CardView cardView[]=new CardView[ln.getChildCount()];
                cardView[j]=(CardView) ln.getChildAt(j);
                cardView[j].setOnClickListener(new View.OnClickListener() {
                    @Override
                    public void onClick(View view) {
                     //
cardView[fin].setCardBackgroundColor(getResources().getColor(R.color.orange));
                        spch.setSpeechRate(0.9f);
                        spch.setPitch(1.0f);
                        spch.speak(st1[i], TextToSpeech.QUEUE_FLUSH, null);

                    }
                });
            }catch (Exception e){
                Toast.makeText(conn, "lguil.fuol", Toast.LENGTH_SHORT).show();
            }
        }

        TextView tv=v.findViewById(R.id.tv);
        tv.setText(st1[i]);

        ImageView im=v.findViewById(R.id.im);
        im.setBackgroundResource(color[i]);



        return v;
    }
  }

  @Override
```

```
    public void onDestroy() {
        super.onDestroy();
        spch.shutdown();
        spch.stop();
    }

}


package com.example.titanium.convo_help;

import android.app.Activity;
import android.content.Intent;
import android.os.Bundle;
//import android.support.v7.app.ActionBarActivity;
import android.text.Editable;
import android.text.TextWatcher;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.EditText;
import android.widget.ListView;
import android.widget.Toast;



public class Main4Activity extends Activity {

    private EditText filterText;
    private ArrayAdapter<String> listAdapter;

    @Override
```

```
   protected void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.activity_main4);

      filterText = (EditText)findViewById(R.id.editText);
      ListView itemList = (ListView)findViewById(R.id.listView);

      dbbackend dbBackend = new dbbackend(Main4Activity.this);
      final String[] terms = dbBackend.dictionaryWords();
      // String[]op=dbBackend.dictionarymean();

      listAdapter = new ArrayAdapter<String>(this,
android.R.layout.simple_list_item_1, android.R.id.text1, terms);

      itemList.setAdapter(listAdapter);
      itemList.setOnItemClickListener(new AdapterView.OnItemClickListener() {
         @Override
         public void onItemClick(AdapterView<?> parent, View view, int position,
long id) {
            // make Toast when click
            Toast.makeText(getApplicationContext(), "Position " + position,
Toast.LENGTH_LONG).show();
            //Intent intent = new Intent(Main4Activity.this, dictionaryactivity.class);
           //  intent.putExtra("DICTIONARY_ID", position);
            // startActivity(intent);
         }
      });

      filterText.addTextChangedListener(new TextWatcher() {
         @Override
         public void beforeTextChanged(CharSequence s, int start, int count, int after)
{
            Main4Activity.this.listAdapter.getFilter().filter(s);
         }
```

```
        @Override
        public void onTextChanged(CharSequence s, int start, int before, int count) {
            Main4Activity.this.listAdapter.getFilter().filter(s);
        }
        @Override
        public void afterTextChanged(Editable s) {
            Main4Activity.this.listAdapter.getFilter().filter(s);
        }
    });
  }
  @Override
  public boolean onCreateOptionsMenu(Menu menu) {
    // Inflate the menu; this adds items to the action bar if it is present.
    getMenuInflater().inflate(R.menu.menu_main, menu);
    return true;
  }
  @Override
  public boolean onOptionsItemSelected(MenuItem item) {
    // Handle action bar item clicks here. The action bar will
    // automatically handle clicks on the Home/Up button, so long
    // as you specify a parent activity in AndroidManifest.xml.
    int id = item.getItemId();

    //noinspection SimplifiableIfStatement
    if (id == R.id.action_settings) {
      return true;
    }

    return super.onOptionsItemSelected(item);
  }
}
package com.example.titanium.convo_help;

import android.app.Activity;
```

```
import android.content.Context;
import android.content.Intent;
import android.graphics.Color;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.support.v7.widget.CardView;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.BaseAdapter;
import android.widget.GridLayout;
import android.widget.GridView;
import android.widget.ImageView;
import android.widget.LinearLayout;
import android.widget.TextView;
import android.widget.Toast;

public class MainActivity extends Activity {


   GridView gd1;
   String []alphabbets={"Everyday Conversation","\nRead my sms","\nText to speech","camera text reader","Dictionary"};
   int []color={R.drawable.convo1,R.drawable.messs,R.drawable.ac1,R.drawable.ocr,R.drawable.dictionary};
   @Override
   protected void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.activity_main);
      gd1=(GridView)findViewById(R.id.gd);
      baseadap b=new baseadap(this,alphabbets,color);
      gd1.setAdapter(b);
   }
   class baseadap extends BaseAdapter {
```

```
Context conn;
String st1[];
int []color;
LayoutInflater lf;
LinearLayout ln;
baseadap(Context con,String st[],int col[]){
   conn=con;
      color=col;
   st1=st;
   lf=(LayoutInflater.from(con));
}
@Override
public int getCount() {
   return color.length;
}

@Override
public Object getItem(int i) {
   return null;
}

@Override
public long getItemId(int i) {
   return 0;
}

@Override
public View getView(int i, View view, ViewGroup viewGroup) {
   View v;
   v=lf.inflate(R.layout.cadbase,null);
      final CardView cardView=v.findViewById(R.id.cad);
         switch (i) {
            case 0:
               cardView.setOnClickListener(new View.OnClickListener() {
```

```
                @Override
                public void onClick(View view) {
                    Intent intent = new Intent(getApplicationContext(),
econversation.class);
                    intent.addFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
                    startActivity(intent);
                }
            });
            break;
        case 1:
            cardView.setOnClickListener(new View.OnClickListener() {
                @Override
                public void onClick(View view) {
                    Intent intent = new Intent(getApplicationContext(),
readsendsms.class);
                    intent.addFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
                    startActivity(intent);
                }
            });
            break;
        case 2:
            cardView.setOnClickListener(new View.OnClickListener() {
                @Override
                public void onClick(View view) {
                    Intent intent = new Intent(getApplicationContext(),
spellchecker.class);
                    intent.addFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
                    startActivity(intent);
                }
            });
            break;
        case 3:
            cardView.setOnClickListener(new View.OnClickListener() {
                @Override
```

```
                    public void onClick(View view) {
                        Intent intent = new Intent(getApplicationContext(),
colorball1.class);
                        intent.addFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
                        startActivity(intent);
                    }
                });
                break;
            case 4:
                cardView.setOnClickListener(new View.OnClickListener() {
                    @Override
                    public void onClick(View view) {
                        Intent intent = new Intent(getApplicationContext(),
Main4Activity.class);
                        intent.addFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
                        startActivity(intent);
                    }
                });
                break;



        }

        TextView tv=v.findViewById(R.id.tv);
        tv.setText(st1[i]);

        ImageView im=v.findViewById(R.id.im);
        im.setBackgroundResource(color[i]);



        return v;
    }
```

```
    }
}
package com.example.titanium.convo_help;

import android.app.FragmentManager;
import android.app.FragmentTransaction;
import android.content.Context;
import android.net.Uri;
import android.os.Bundle;
import android.app.Fragment;
import android.speech.tts.TextToSpeech;
import android.support.v7.widget.CardView;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.BaseAdapter;
import android.widget.GridLayout;
import android.widget.GridView;
import android.widget.ImageView;
import android.widget.LinearLayout;
import android.widget.TextView;
import android.widget.Toast;

import java.util.Locale;


public class objects extends Fragment {
TextToSpeech spch;
        GridView gd1;
        String []alphabbets={"cup","radio","newspaper","pencil","ball","door",

"paper","pen","box","bag","glass","car","scissors","table","window","shelf"};
        int
[]color={R.drawable.cup1,R.drawable.rad1,R.drawable.newpap,R.drawable.penil,
```

```
        R.drawable.ball,R.drawable.ddr,R.drawable.papeer,R.drawable.ppn,
        R.drawable.bx1,R.drawable.bg,R.drawable.glas,R.drawable.car,
        R.drawable.siss,R.drawable.table,R.drawable.wind,R.drawable.shelf};
public objects() {
        // Required empty public constructor
}


@Override
public View onCreateView(LayoutInflater inflater, ViewGroup container,
                        Bundle savedInstanceState) {
        View v=inflater.inflate(R.layout.fragment_objects, container, false);
        gd1=(GridView)v.findViewById(R.id.gd);
       baseadap b=new baseadap(getActivity(),alphabbets,color);
        gd1.setAdapter(b);
        // Inflate the layout for this fragment

        return v;


}


class baseadap extends BaseAdapter {
        Context conn;
        String st1[];
        //TextToSpeech spch;
        int []color;
        Fragment fragment;
        LayoutInflater lf;
        LinearLayout ln;
        baseadap(Context con,String st[],int col[]){
                conn=con;
                color=col;
```

```
        st1=st;
        lf=(LayoutInflater.from(con));
}
@Override
public int getCount() {
        return alphabbets.length;
}

@Override
public Object getItem(int i) {
        return null;
}

@Override
public long getItemId(int i) {
        return 0;
}
```