Intelligent Study App for Visually Impaired and Blind Users

Prince Dwivedi[1], Disha Shrivastav[2], Dhiraj Manwar[3], *Snehal D'mello

Department of Computer Engineering

St. John College of Engineering and Management, Palghar (East)

University of Mumbai.

Abstract: *The vision in human's life is very important for survival. There are 200+ million blind and impaired people all over the world. Dealing with sight loss, already is a challenge in itself. The lack of emotional support at diagnosis centres, the limited accessibility to activities and data, the societal stigma and also the lack of unemployment, are all factors frequently leading blind or low vision individuals in isolation. This thing illustrates how the problem for the visually impaired is not their blindness or lower vision in itself but their segregation from anyone else. For them it is important to have a help or support to carry out their day-to-day activities. There are lots of applications available for guiding them, detecting obstacles, Recognizing objects, etc. But there are no such applications for students if they want to study. So Intelligent study app will surely help them to continue their education. This proposal would help the visually impaired to learn and understand whatever they want anywhere and at any point of time. In this project TTS for mouse hover read text, Anycontrol.js to make it voice control to help them navigate from one tab to another is used.*

Keywords: Visually Impaired, Voice Control, STT for notes, TTS for mouse hover, Anycontrol.js

1. Introduction

A vision in humans' life is very important for survival. The eye is the most important organ of body. In world 39 million or more peoples are completely blind, from that 15 million are from India and 1.3 Billion peoples are visually impaired in world. Visually impaired or blind people constantly need support of others in daily activities. People who suffer from sight and visual defect don't seem to be capable of reading text in ordinary newsprint, books and magazines clearly. Students with visual impairment do face many challenges and barriers in society. There are lots of applications available for guiding them, detecting obstacles, recognizing objects, etc. But there are no such applications for visually impaired and blind to assist them in pursuing higher education. Education is one of the most important fundamental factors in student's development, but the visually impaired students face lots of barriers due to their disability and hence they cannot do nifty learning. This system will help the visually impaired people to listen to the document, academic textual content, diagrams and any other text-based source which they are not able to read. This system will help the visually impaired students to overcome the barriers of physical disability they face in learning.

2. Related Work

2.1 Speech Automated Examination for visually impaired students.

The vision enables us to envisage the significance of whatever is viewed at. It connects us with the people and the surroundings and enables us to recognize patterns, movements and identify the cause for the movement. Unfortunately, not everyone is blessed with the sense of sight eventually there are about 2.201 billion of people with impairments on the vision of which at least one billion are curable. Here we are providing independence platform for blind students to attempt exam, by automating their exam taking process. Normally students depend on scribes to take their examination. A PIR (passive Infrared) sensor, an ultrasonic sensor and the load cell are used in the application. Speech recognition (speech to text conversion) and speech synthesis (text to speech conversion). It is easy to integrate and user-friendly. Speech automated examination presumes to be an absolute boon for visually impaired students. Although braille transcribes to be in current use, yet there is a lot of scope to improve the support that can be rendered to visually impaired people. This system therefore aims to reduce dependency on scribe while taking up examinations for visually impaired students. The proposed system provides speech recognition and speech synthesis in order to reduce human intervention and enable such students to take up their exams more confidently. With the advent of assistive and adaptive technology, the recent years have seen an ascent in such devices and software applications, which has removed many access barriers for people with vision impairment. This has created an environment that enables independence as routine tasks can be performed with limited assistance. In regard to the examination process, since the blind child and sighted listener may have difficulty understanding each other's referents due to syntactical and grammatical differences, it could possibly result in an unnecessarily compounded situation. An automated system could overcome these disadvantages. Elimination of a third-party scribe may also lead to a feeling of self-sufficiency in these students. The proposed system is also easy to integrate and is user-friendly. It is not only beneficial for both blind students and other physically disabled students.

2.2 Reader and Object Detector for Blind

In the world, technology is growing too fast. It’s found its way in every field of our life. But this technology is of no use if it couldn’t provide itself to the help of the disabled people. The aspect considered most vital in human life is education. It’s the education that you Simply receive today shapes your tomorrow. But do blind people get an equivalent level of education that we sighted people are privileged for? The solution is not any. Books read by blind people are scripted in Braille, but the value of an easy book on counting shapes in Braille costs around rupees 1300 online. So, imagine what proportion the tutorial textbooks would cost over the whole educational lifetime. Not everyone can afford this. Plus, it takes for much longer to print a Braille textbook than a daily textbook. The time and therefore the money needed definitely fall under the expensive segment of the graph. Not everyone can afford this much time and money. Aside from time and money, the training curve for Braille is additionally steep. Fig. 1 is showing the braille alphabets, it takes more training to find out the language of the blind than it takes to find out regular alphabets. This steep learning curve is one more reason

for Braille not being as efficient. Braille also fails to include many new technological advances and innovations. It hasn't evolved very similar to a language. No new technology has incorporated Braille in its use case action. Education is extremely important in think about human's life. The education receives normal flocks that level of education can't receive blind or visually impaired peoples. Braille language isn't efficient because it takes a while to find out. For that Assistance is developed for blind people. The Reader (Blind people) is sort of a live tutor. It uses the 'Optical Character Recognition' (OCR) technology to read the printed characters captured using USB camera or pi camera. Raspberry pi acts as a microcontroller for processing. Detection and analysis done by TensorFlow. This paper shows the implementation of the project 'Reader and Object Detector for Blind'. It had been developed to assist blind in lifestyle and help them to be independent. The project aimed to hide a broader aspect of life and hence we incorporated both the parts into one. This project aims to help the blind people in reading the printed text on pamphlets, books, magazines and other printed material. One is often assisted in reading their everyday newspaper with the assistance of this device. The feature of Object Detection are often wont to help the blind people know more about their surroundings without having to maneuver round the place. The project faces certain limitations also. The project can only identify words of English. It can read words that have font size greater than or adequate to 14. Only certain objects are often identified. The frame rate for object detection is slow thanks to tiny computation power of Raspberry Pi.

2.3 Eye Assistant – using mobile application to help visually impaired.

It is an android application that recognizes objects using real time object and text detection by scanning them. Voice feedback is employed to inform the user about detected object. System will detect objects using TensorFlow object Detection API. Object detection algorithm and OCR (optical character recognition). Our client targeted is people that are visually impaired and that we have noticed that their life is sort of difficult. We created the app with features, which may help them make their life easier by knowing what's around them by using our app. We've seen that each one the applications almost like ours are made before but those app got to capture image and then return what object its. But our application doesn't get to take an image and it only scan object then tells the user what object its. That way the visually impaired user doesn't need to delete images from memory every now and then.

2.4 Development of GUI for Text-to-Speech Recognition using Natural Language Processing.

Speech is that the first primary mode of communication in Human Intelligent System (HIS) where NLP plays a task with many aspects of the sector affect linguistic natures of computation. NLP may be a way of research and application that explains how a system (mainly a computer) are often wont to understand, identify and manipulates a natural language. TTS is that the automatic conversion which configures the concept of speech recognition, speech analysis, speech synthesis, speech tuning, speech alteration etc. Here TTS use to convert a text into speech that resembles, as closely as possible for a native speaker of the language who trying to read that text. TTS is that the technology by which a computer can speak to user and provide the computed information. TTS system acquires the text as input then a computer algorithm which called TTS engine

analyses the text, pre-processes the text and synthesizes the speech with some mathematical models. The TTS engine usually generates sound data in an audio format as the output. This TTS system also worked upon Natural Language Generator (NLG). TTS synthesis is a flexible robust dynamic growing aspect of recent computer era and its increasingly playing a more significance role within the way we interact with the system and interfaces which is predicated on platform independent concept. We've identified the varied operations and processes involved in text to speech synthesis. We've also developed a really simple and attractive graphical user interface which allows the user to type in his/her text provided within the text field within the application. Our system interfaces with a text to speech engine developed for American English. In future, we decide to make efforts to make engines for conversion of one language to other make text to speech technology more accessible to a wider range. Accuracy of the software is superb within the context of its ability to figure in real-life environment.

3. Methodology

This application has a web interface to interact with visually impaired and blind people. To start the study app you have to click on "Go" tab. It will take you to "My Learning" tab. After that user have the options to select subjects. For selecting subject, user just has to hover the cursor over the tab, it will announce the name of the subjects which will make it easy for impaired people. When user selects subject, the textbook of the same will open and it will start reading the book. It will help user to listen to the audio of the written format of that subject.

The project also has audio controlled feature. If they say "Go to home" it will take you to the Home tab. For Notes tab they simply have to say "Go to notes". For opening particular subject, they have to say "Open English book" or "Open Geography book" or "Open History book" whichever subject you have to open.

The user will also get the option to take a note, if user wants to remember something at some point so they can take a note. User can simply take the note by just clicking on take notes tab. For taking down the notes user just have to speak whatever they want and it will get written, Also it get saved for further reference.

When reading of book is completed then if they want to go to the next page then they simply have press next button and for that you just have to hover the cursor over the button, it will give you a voice command. Now if you want to change subject, you have to click on "My Learning" tab, there you can change your subject. Everything in this project has audio, you just have to hover the cursor on the tab it will announce what tab is it.

There is a tab "Give Test" to grasp the topic better. When you go on give test, again you have to select the subject you want to give test of. It has MCQs which again will speak the question and options for you.

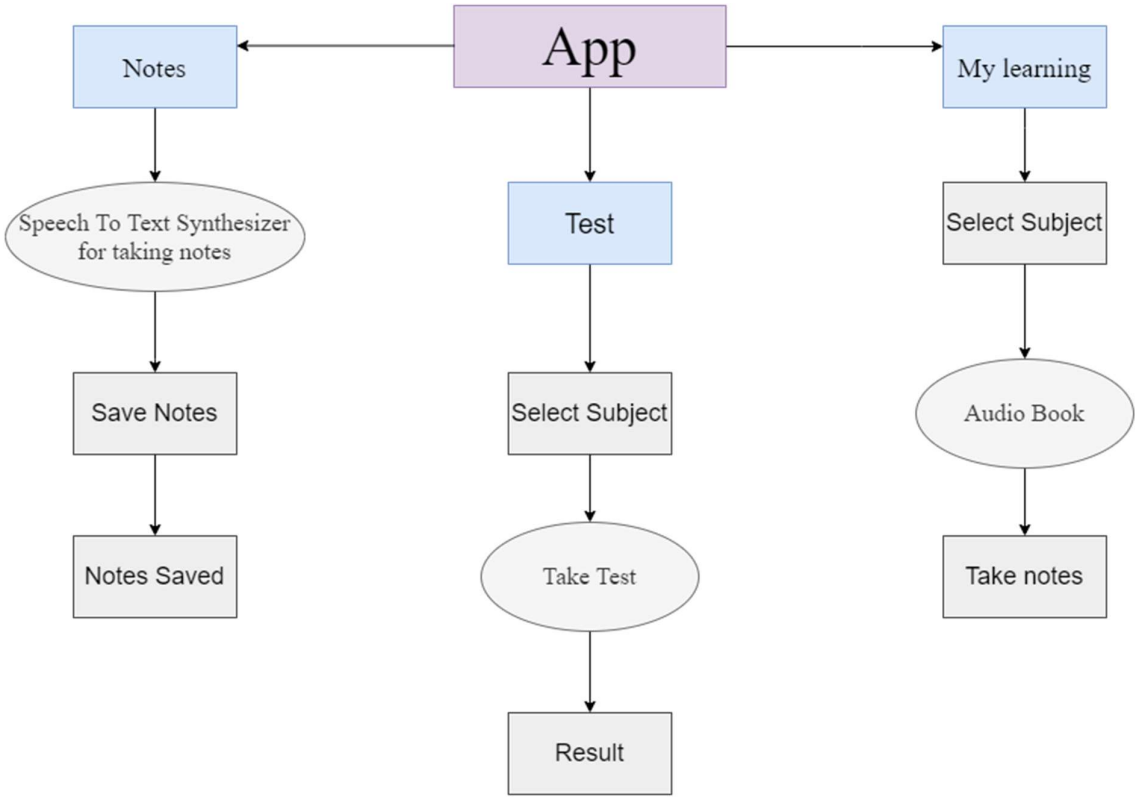

Figure 1. Block Diagram of Proposed System

4. Implementation

When user opens the web application, the first page that appears is homepage where the user will get many options, and he can select the options as per his requirement. There is also Take Notes tab which will help user to take particular notes for further reference.

Homepage: There are many tabs on homepage window such as Home, my learning, About, Go. So, whenever the cursor hovers on any tab it generates a voice and reads whatever is written on that tab.

My Learning: This tab opens when user click on Go or My learning, and the user gets the option to select the subject. When he hovers over any subject tabs then it will generate a voice of which subject is this, like if he hovers on English then it will generate a voice English and so on.

Take Notes: This tab helps the user to take down the notes for further reference.

Home/Smart study: When user click on home/Smart study tab, then it will take the user to the homepage

About: This window just shows the information about the development team.

4.1 Technical Feasibility

4.1.1 Hardware Requirement:

- Processor: Minimum 1.5 GHz; Recommended 2.2 GHz or more.
- Ethernet connection (LAN) OR a wireless adapter (Wi-Fi)
- Hard Drive (ROM): Minimum 32 GB; Recommended 64 GB or more.
- Memory (RAM): Minimum 2 GB; Recommended 4 GB or above.
- Sound card w/speakers.
- Some classes require and a microphone.
- Display: Super VGA with a resolution of 1024 x 768 or above

4.1.2 Software Requirement:

- Editor: Visual studio code
- Browser: Chrome or Firefox latest version recommended
- Xampp
- Vs Code Live Server

5. Experimental Results

5.1 Screenshots of the output with description:

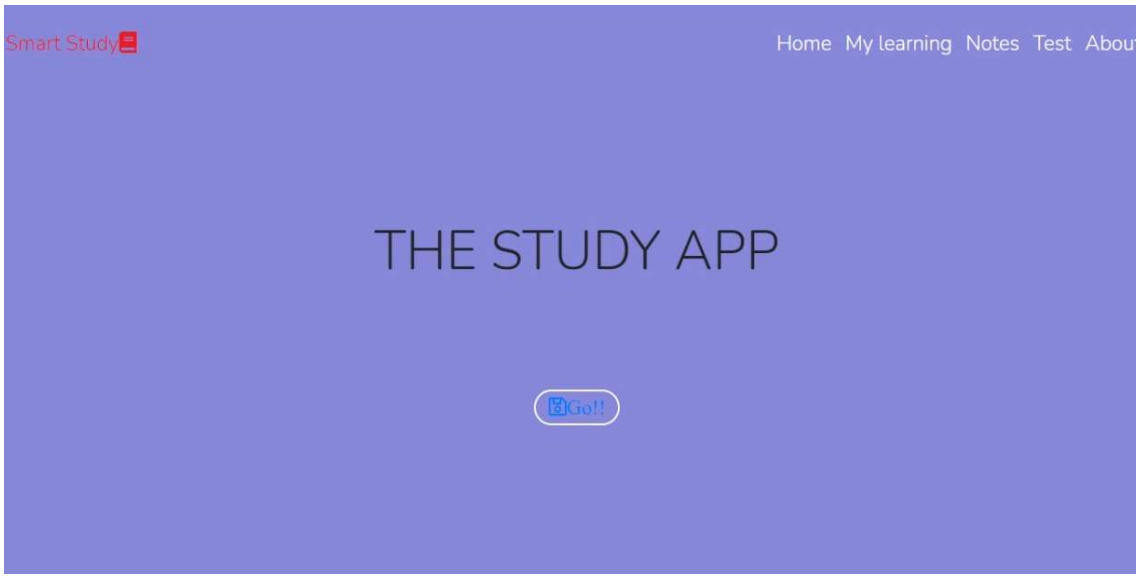

Figure 2: Homepage

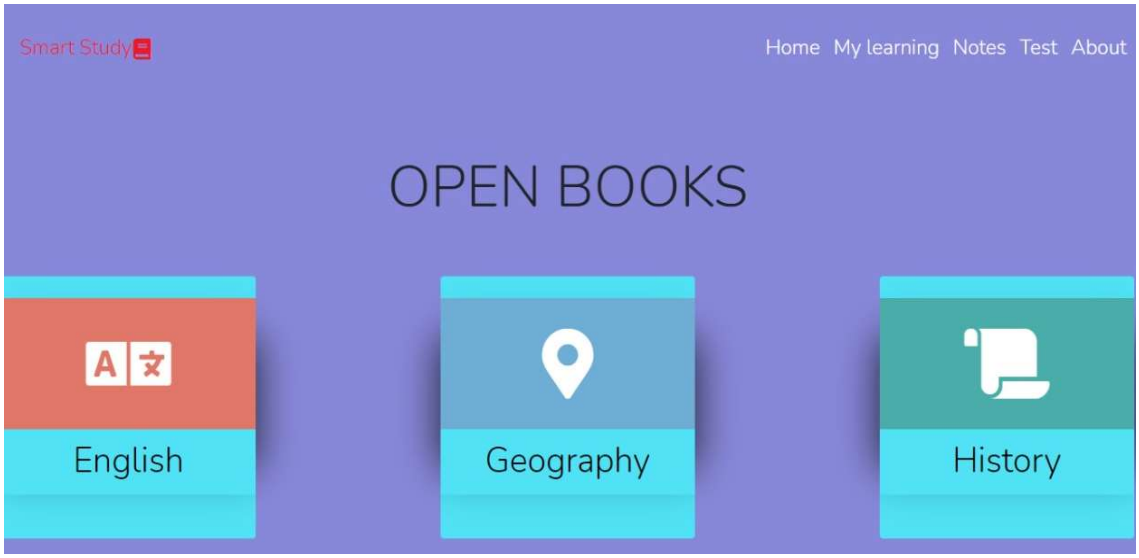

Figure 3: My Learning

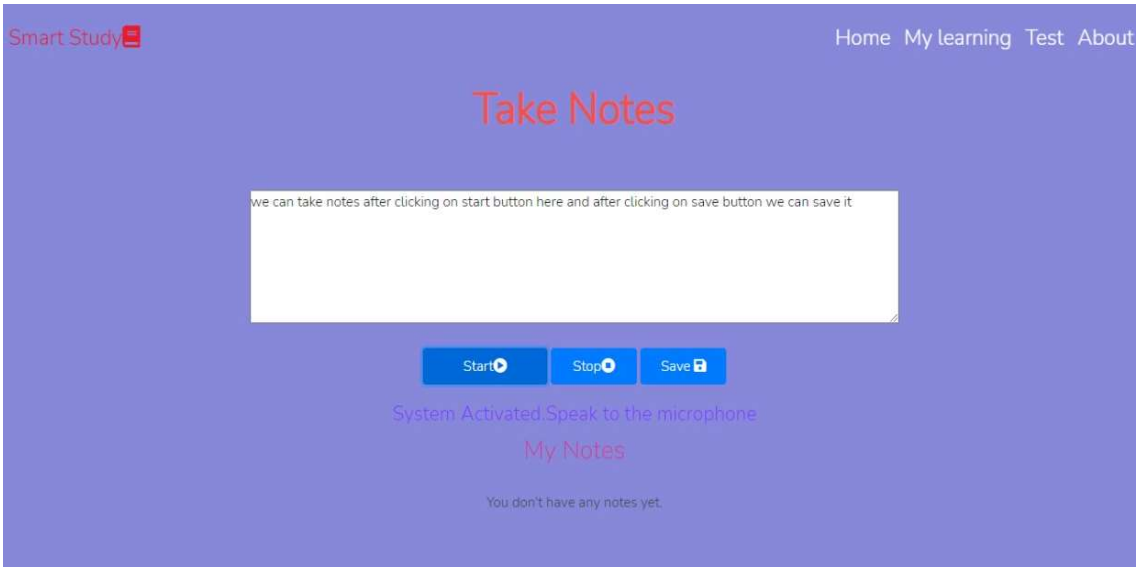

Figure 4: Take Notes

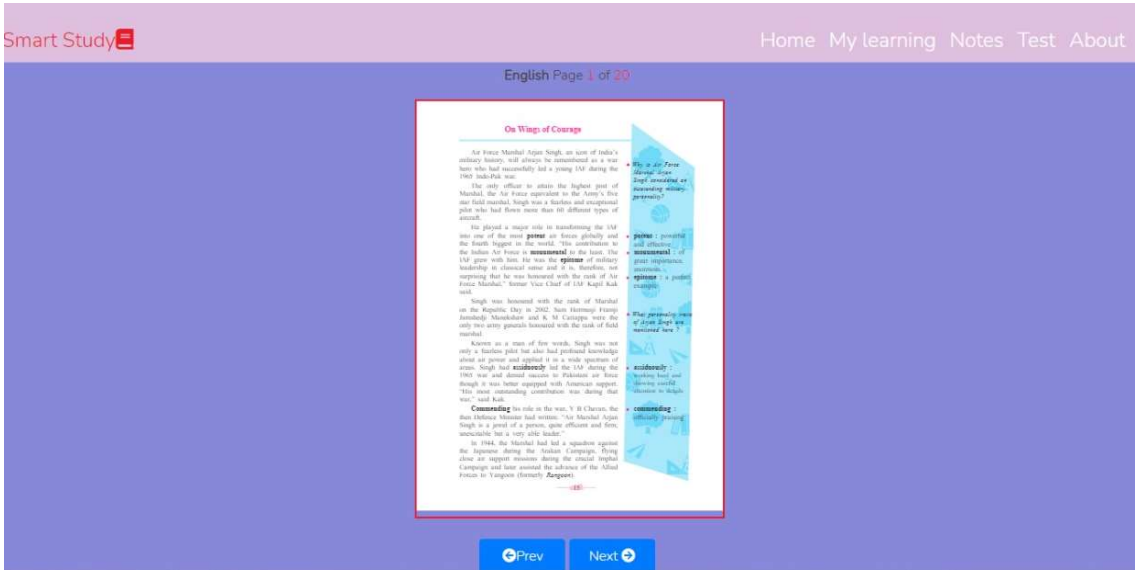

Figure 5: Textbook

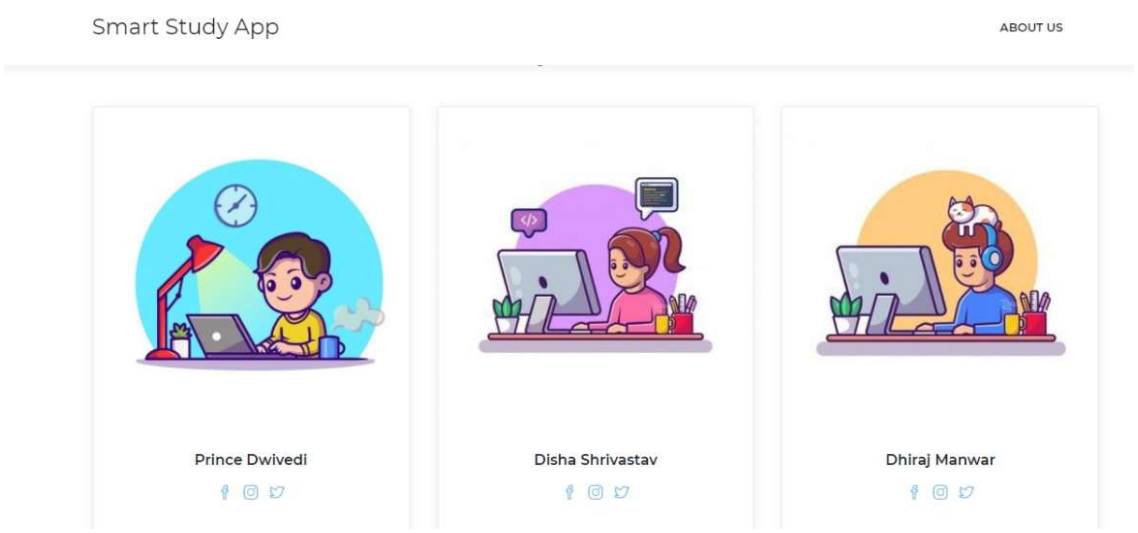

Figure 6: About

6. Conclusion and Future Work:

The system would help the visually impaired to learn and understand whatever they want at anywhere and at any point of time. They do not need any mentor or a guide always to help them

study. Thus, this system is developed increase interest in studies of visually impaired students by making the knowledge extraction process simple.

Projects Future scope is we can add multi languages support so it will become easier and more efficient for some people. Multiple subjects of different fields can be also be added

7. References:

[1] A. Badave and R. Kaovasia, "Android Based Object Detection System for Visually Impaired", *2020 International Conference on Industry 4.0 Technology*, *I4Tech 2020 IC I4Tech, 2020*, p 5 DOI: 10.1109/I4Tech48345.2020.9102694

[2] M. Murali and S. Sharma, "Reader and Object Detector for Blind", IEEE, 2020, *Proceedings of the 2020 IEEE International Conference on Communication and Signal Processing, ICCSP, 2020*, p4. DOI:10.1109/ICCSP48568.2020.9182201

[3] S. Fahim and F.Habib, "EYE ASSISTANT using mobile application to help the visually impaired", *1st International Conference on Advances in Science, Engineering and Robotics Technology 2019, ICASERT, 2019*, p4. DOI:10.1109/ICASERT.2019.8934448

[4] K. Bharadwaj and M. Joshi, "Speech Automated Examination for Visually Impaired Students", *Proceedings of the 2020 IEEE International Conference on Communication and Signal Processing, ICCSP, 2020*, p 4. DOI: 10.1109/ICCSP48568.2020.9182201

[5] P. Mukherjee and S. Santra, "Development of GUI for text-to-speech recognition using natural language processing" *2018 2nd International Conference on Electronics, Materials Engineering and Nano-Technologies, IEMENTech, 2018* p 4. DOI: 10.1109/IEMENTECH.2018.8465238