TEXT READER DEVICE FOR VISUALLY IMPAIRED

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Abstract:

Visually impaired people suffer from numerous difficulties with accessing and approaching printed text using existing technologies, including problems with alignment,recognition, focus, accuracy, precision, mobility and efficiency. To conquer these difficulties faced by the visually impaired, here we are proposing a system/technology which will be used to read any printed text from the newspapers, mobiles, posters, signboards, etc and convert the same text into voice. This project includes a mobile phone, which will be used to capture the image containing text. The whole processing is done in the system.The user is able to listen to the speech using the phone speaker as a resultant.The device acts as an artificial eye to visually impaired people.

Keywords*: Android; visually impaired; voice assistant; text recognition.*

I. INTRODUCTION-

Visually impaired people are unable to read handwritten or printed text and thus have to depend on a third person. Although Braille books are available, they are expensive and most of the blind people either cannot afford them or do not know how to read Braille. Using technologies like Text Recognition engine and text to speech (TTS), an advanced system can be developed which will help the visually impaired person to listen to an audio read-back of any text from documents, posters, books or newspapers. Each Module for Image processing and voice processing are present in the device. It has less error rate and less processing time and cost efficiency. This system has three main modules: extracting the text from an image, recognizing it, and converting the text to speech.Text Recognition is the process of detecting text in images and video streams and recognizing the text contained therein. Once detected, the recognizer then determines the actual text in each block and segments it into lines and words.TextRecognizer class is used to detect text in Frames.Once we have the Bitmap image, we can then convert it into a frame and do processing on it. The OCR algorithm tries to infer the text layout and organizes each paragraph into textblock instances.The input image will be processed and the text if present within the image will be detected and recognized by the system. TextToSpeech (TTS) is used to synthesize speech from the extracted text string from the image.

The Recognized text will be read out by the device as the output.The entire Text reader device can be easily accessed and used by the user via voice commands , thus making it easier for the visually impaired to use and operate the device.

II. OBJECTIVES

The objective of this work is as follows:

1. To study the various techniques of Image Processing, Machine learning, different services along with the hardware interaction and various APIs.
2. To build an effective system for the visually impaired, which can assist them to have a convenient and easy text reading.

III. PROPOSEDMETHODOLOGYANDSYSTEM

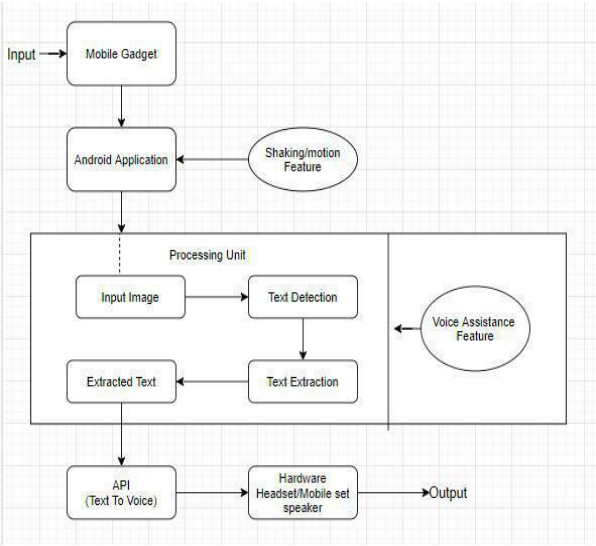


Fig: Proposed System Architecture

1. Start/Launch of the app:

The user can easily start/open the Android application just by shaking the device.
The application has the capability to detect the shake/motion of the device, thus making it easier for the visually impaired to start the application.

2. Capturing the image:

The application allows the image capture by simple voice assistance techniques.The user can just give the voice input to start the camera and capture the image.

3. Text Detection Recognition:

Text Recognition is the process of detecting text in images and video streams and recognizing the text contained therein. Once detected, the recognizer then determines the actual text in each block and segments it into lines and words.The Text Recognizer segments text into blocks, lines, and words.

4. Text to Speech:

TextToSpeech is used to synthesize speech from the extracted text string from the image. The voice output is given to the user ,where the user can get to know the exact text present in the image. Voice assistant techniques are used to make users comfortable to use the application i.e Text Reader System.

IV ALGORITHM

The flow diagram of the text reader is:-

Step 1: The user can easily start/open the Android application just by shaking the device.
Step 2: The user makes use of an android application for clicking images of the text to be read.The application allows the image capture by simple voice assistance techniques.The user can just give the voice input to start the camera and capture the image.After capturing the image, it is sent to the server for further processing .
Step 3: Processing of image is done by the system OCR engines.
Step 4: System detects and recognizes the text present within that image.

Step 5: The recognized text is then passed to gTTS(google Text-to-Speech)API which converts the text into speech.This speech can be heard through the android device or an external earpiece.

V IMPLEMENTATIONANDSYSTEM OPTIMIZATION

1. Start/Launch of the application:-

- The user can easily start/open the Android application just by shaking the device.
- The application has the capability to detect the shake/motion of the device.
- The application uses a background service, which on shake of the device triggers the service and causes the application to launch.
- Detection service will constantly watch out for shake activity and perform the required function of launching the application.

SensorManager class:-

- This class helps to access the device's sensors.

Reading the sensor data:-

- The event listener has two methods, onSensorChanged() and onAccuracyChanged().
- We have used onSensorChanged() to get the data from the sensor.
- In the case of the accelerometer, the data consists of three float numbers, representing the acceleration along the X, Y, and Z axis of the device.

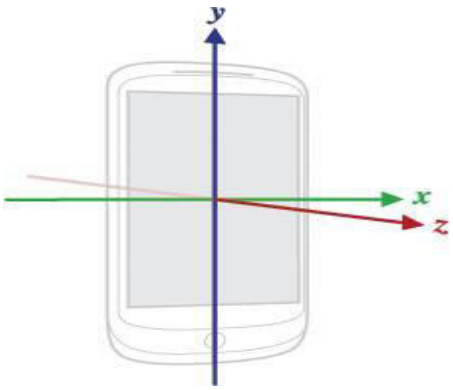


Fig: Represents acceleration along the X, Y, and Z axis of the device.

2.Capturing of the image :-

- The application allows the image capture by simple voice assistance techniques.
- The captured image will be then sent for further processing in the application module for further Detection and Recognition of text present in that image.
- The user can just give the voice input to start the camera and capturing of the image.

3.Recognize the text from the input image:-

Text Recognition is the process of detecting text in images and video streams and recognizing the text contained therein. Once detected, the recognizer then determines the actual text in each block and segments it into lines and words.The Text Recognizer segments text into blocks, lines, and words.

Text Recognizer working :

- Bitmaps are defined as a regular rectangular mesh of cells called pixels, each pixel containing a colour value.
- A frame is constructed via the builder class, specifying the image data, dimensions, and sequencing

information.Bitmap is stored into frames.

- Text Recognizer then finds and recognizes text in a supplied Frame.
- The OCR algorithm tries to infer the text layout and organizes each paragraph into textblock instances. If any text is detected, at least one textblock instance will be returned.
- TextRecognizer class is used to detect text in Frames.
- Once you have the Bitmap image you can then convert it into a frame and do processing on it.

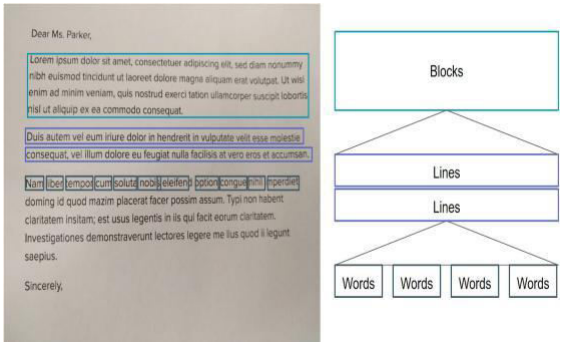


Fig: Represents Text Recognizer segmentation

Google Mobile Services (GMS) is a collection of applications and application programming interfaces (APIs) developed by Google for manufacturers of Android devices, such as smartphones and tablets.

4. Text to Speech:-

TextToSpeech is used to synthesize speech from the extracted text string from the image. One can set the language of their choice. You can set the pitch, speed as well your own speech from a custom file.

- It allows you to convert text to voice using the TextToSpeech class of android tts.
- We need to instantiate an object of this class and also specify the initListener.
- TextToSpeech needs to be initialized first. For this, you need to implement the TextToSpeech.OnInitListener interface and override the method: onInit.
- Users just have to give the "speak" command to get the voice output.

Code:

❖ TextToSpeech tts = new TextToSpeech(this, this);

Once this is done the onInit gets triggered.In this method, we check whether the feature is available on our device or not.

- After setting the language, you can call the speak method of the class to speak the text. Its syntax is given below −

Code:

❖ tts.speak(toSpeak, TextToSpeech.QUEUE_FLUSH, null);

Voice Assistant:-

- Speech recognition techniques provide the user the functionality of giving the voice commands as the input to the application and get the corresponding action to be performed.
- The class of android.speech i.e RecognizerIntent provides constants for supporting speech recognition through starting an Intent.
- These constants used are :

❖ ACTION_RECOGNIZE_SPEECH : Starts an activity that will prompt the user for speech and send it through a speech recognizer.

❖ EXTRA_LANGUAGE :

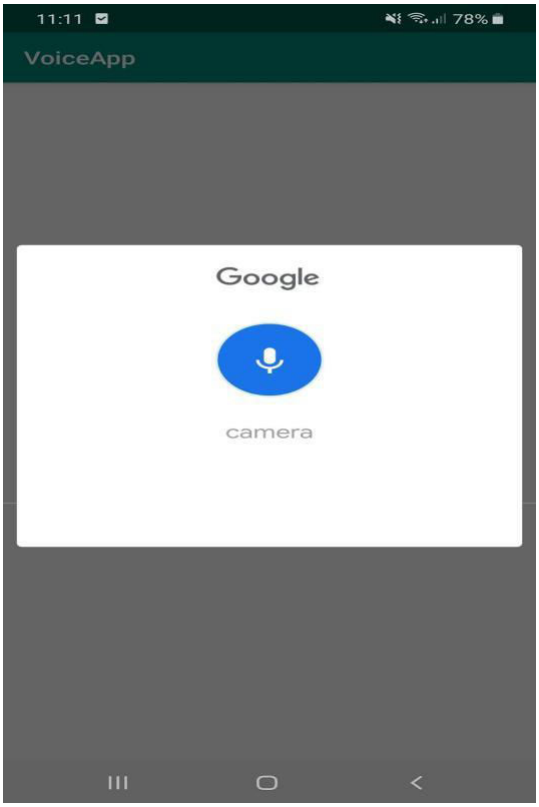
Optional IETF language tag (as defined by BCP 47), for example "en-US".

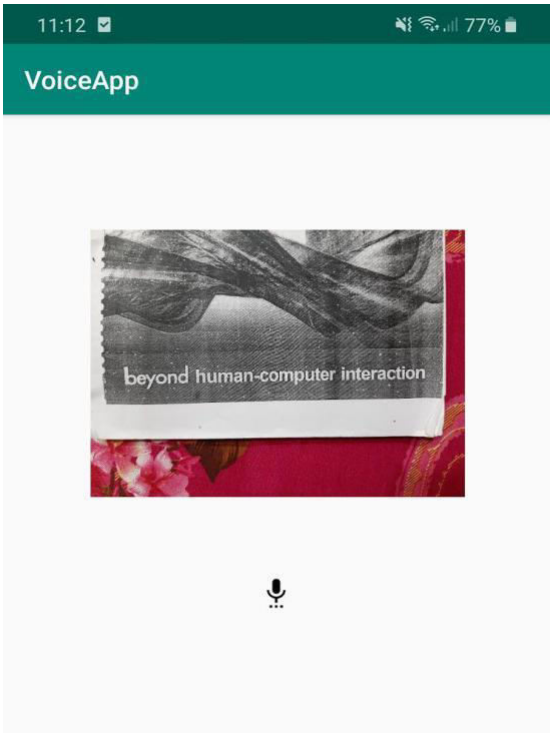
- EXTRA_LANGUAGE_MODEL : Informs the recognizer which speech model to prefer when performing ACTION_RECOGNIZE_SPEECH.
- EXTRA_PROMPT : Optional text prompt to show to the user when asking them to speak.

VI. Result

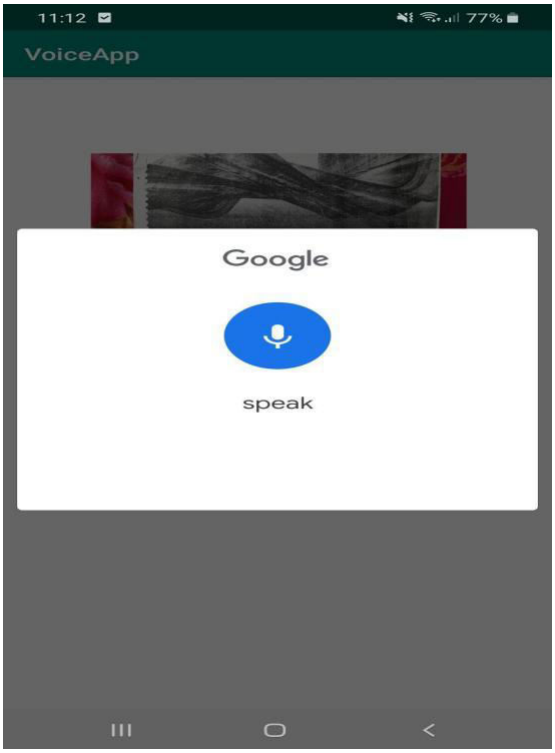
The screenshots of the application working flow is shown below:

1. Voice command to capture image:



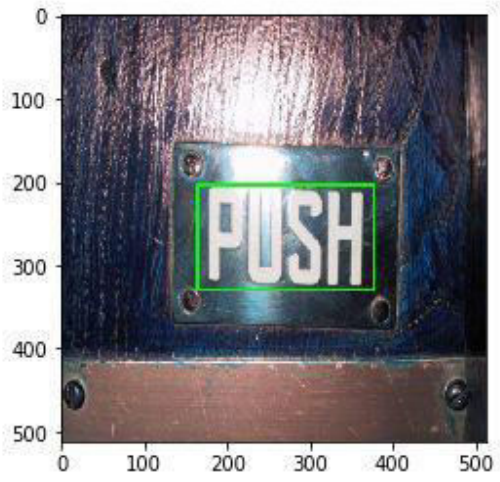


2. Voice command by user to listen to speech:



3. Text read out and displayed on the app:

- **Text detection in sample image:**



VII. Conclusion

This paper presents the working methodology and development of the project “Text Reader Device For Visually Impaired".

The Project consists of an android application which serves as an interface, used for capturing the image and integrating it with the preprocessing model for filtration and backend processing, which in turn is used by an Text Recognition engine for recognition of the text and finally verbal output is synthesized through an TTS application programming interface.

Thus, the final application represents a fully usable and totally reliable solution for the blind people.

VIII. FutureScope

The position and linear arrangement of the image clicked is a critical aspect that needs future research work. If the blind user uploads an image with partially visible text (cropped words in the image), the resultant will not be correct and useful. Hence, in future the application should have an alignment assistance feature for the user to place the device in front of the text to be read. Recognition in the end can be done through a process of reading the image pixels, seeking to find the limits between blur patterns, where possibly no text is present, such as the border/outlines of a page, and slightly darker patterns, where potentially the text is present.

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