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Read2Me: A Cloud- based Reading Aid for the Visually Impaired

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Abstract— Reading is essential in our daily life. For the visually-impaired segment of the population, the inability to read has a substantive negative impact on their quality of life. Printed text (books, magazines, menus, labels, etc.) still represents a sizable portion of the information this group needs to have unrestricted access to. Hence, developing methods by which text can be retrieved and read out loud to the blind is critical. We use the computational power of resources made available by cloud computing providers for real-time image processing. There are many techniques which are used for navigating the visually challenged people, navigation in real time traffic is the main problem. The extracted text of various fonts and sizes then can be recognized individually and then combined in a word giving its output as audio using Text-to-speech using the SAPI libraries.

Keywords—SONAR,GPS,Navigation,Light Sensing,Pulse Sensing,Cloud,Assistive text reading,Binerization,OCR,Text-to-speech,Mobile cloud computing,pedistrial signal

I. Introduction

Reading is essential in daily life for everyone. Out of 314 million visually impaired people all around the world, 45 Million are blind and new cases being added each year. Visually impaired persons can read only by use of special applications by them like Braille language. There are many assistive systems available today but they have certain issues reducing the feasibility for the visually challenged persons. By integrating augmented reality with obstacle detection the visually impaired person can be given location and orientation information instantly [1]. There are over 21.2 million visually impaired or blind people in the United States today [2] and many more in the world.

The two biggest challenges for independent living of the blind and the visually impaired as stated in [3] are access to printed material and safe and efficient navigation. This research aims at improving the conventional navigation system that is used. A visually impaired person usually relies on feeling floor surfaces with their feet or using footstep echo's [4] to detect obstructions which is not a fool-proof mechanism. The system architecture we propose also has the advantages of being extensible and having minimal infrastructural reliance, thus allowing for wide usability. For open air correspondence, all the blind people trust that the guide route offices can manage them like an ordinary individual, and ensure that they are constantly advantageous and safe out and about. The motivation behind this project is to reduce the troubles confronted by blind person when taking city transports, using interactive wireless communication system. As indicated by the measurements and predicts of the WHO upgraded in 2014, 285 million individuals are assessed to be outwardly disabled around the world: 39 million are visually impaired and 246 have low vision. Here we aims to implement a reading aid that is small in size, lightweight, efficient in using computational resources cost effective and of course user friendly

II.Related Work

From the World Health Organization (WHO) survey, 285 million people are analyzed to be visually impaired: 39 million are blind and 246 million have vision very poor [5]. Moreover, ninety percentage of this population live in a low income countries.

A. *Smart Bus Alert System for Easy Navigation of Blind*

In [6] paper blind people might be unwilling to move easily and freely or, out of anxiety, there are a lot of society limits development of the visually impaired person. Deliberate, self coordinated development is seen as one of the all the more ambitious ranges confronted by visually impaired individuals. While absence of sight is regularly compensate by improving different faculties, social boundaries and systems of over insurance frequently restrict the perceptual advancement and improvement of useful development in the visually impaired individuals. For open air correspondence, all the blind people believes that the guide route offices can manage them like an normal individual, and ensure that they are constantly advantageous and safe out and about. The main aim of this project is to reduce the problems confronted by blind person when taking city transportation facilities, using interactive wireless communication system.

B. *A Mobile-Cloud Pedestrian Crossing Guide for the Blind*

In [7] paper, it proposes a relevant and universally applicable solution for helping the blind safely cross at urban intersections. The proposed solution, based on mobile-cloud computing does not require any changes to existing pedestrian signal infrastructures, while providing guidance in real-time and being highly available. Crossing at urban intersections is possibly dangerous and difficult task for the blind, hindering independent safe navigation. Assistive technology researchers have been working for a solution to this problem for years, many of the proposed solutions is not being widely adopted. The currently broad solution, also known as an Accessible Pedestrian Signal (APS), uses a special sound or speech output to notify the blind people about the status of a pedestrian signal at an intersection.

C. *A Wireless Navigation System For the Visually Impaired*

In [8] paper, presented by a team working on Development of the navigation system for the visually impaired by using a white cane, presented at an IEEE conference, the authors stated two important ideas [9]. Firstly, the visually impaired use the White Cane to identify objects and navigate in areas known to them but the cane only serves as an object detection mechanism in unfamiliar areas. Secondly, the inability of the cane to help the visually impaired person in an unknown location could be solved by using color coded lines for navigation. This system could allow the cane to follow the lines with the help of vibration and color coding mechanism. This further helped solidify our plan to use tactual feedback in our system. The color coded line navigation concept was implemented in Japan, but it would not be a practicable option for us to set up sensor based lines in many indoor environments because of logistical constraints. It is speculate that, people with a visual impairment respond better to tactual feedback to assist them in navigating and understanding the surrounding environment easily.

D. *Product Reading For Visually Impaired Persons*

In [10] paper we propose an assistive system to read printed text of an objects for assisting blind persons. To solve the common problems of blind people we have proposed a method in which the blind people will take the image or click image. This method can effectively separate the objects of an interest from composite background and other objects in the camera view as an OCR that is used to perform word recognition of the localized text areas and transform into audio as output for the blind people. There are many assistive systems are available today but they have certain issues such as reducing the feasibility for the visually challenged persons. For example, portable bar code readers designed to help the blind people to identify different product's, it enables the users who are blind to access all of these.

III. PROPOSED SYSTEM

The proposed system helps blind persons to read product labels. Users capture the image and then system read out the text from image .It will be very useful for each person those are going through optical surgery. It can be useful for road side text detection so that all the blind person can travel independently and confidentially. The following are the main modules of our project, Read2Me: A Cloud- based Reading Aid for the Visually Impaired

A. Image capture module

This module detect the image that captured by the camera that are attached to the goggles. This will be easy for a visually impaired person to capture the image and the camera will be situated on the goggles. The image captured will converted into grayscale and then binarization the cameras attached to the side, earphones, and to a microphone. Voice commands can be used to guide the user and it will be direct the platform. Some commands include "move paper closer," "move paper up," "move paper up, right" from the device to the user, and "rewind paragraph," "forward paragraph," and "volume up" from the user to their device. The user only needs to point at the text that they would like to read, and the Finger Reader will use local sequential text scanning in order to read each line of the text progressively. In the fig.1 shows the pages to be read are placed directly beneath a mobile holder. The mobile is placed on a holder directly above the page tray. The user sits comfortably with his hands on the mobile phone touch screen and captures images followed by the page flipping to advance to the next page guided by audio instructions.

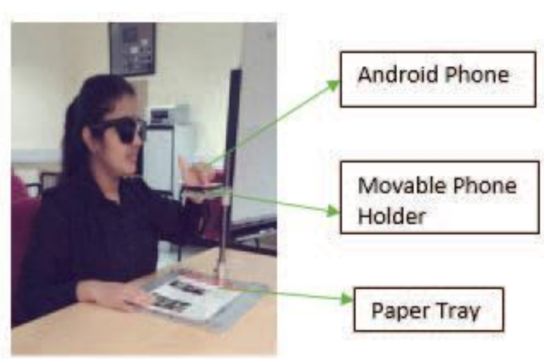

Fig. 1: The Stand for Read2Me

B. OCR cloud processing

The concept of cloud computing is quickly achieving popularity amongst the business world due to its easy to use and the flexibility it provides to business. Using Optical Character Recognition technology OCR, PDF cloud computing is the one of the many services that is being widely adopted by most of the organizations. Through OCR for distributed capture, multiple users can simultaneously scan the physical documents, convert the images into useful PDF formats, and save the resulting file on the storage space available through cloud computing. OCR will be converts the text to grayscale. The Abbyy is a Cloud OCR software uses image processing technology to detect and recognize characters in digital text documents with different qualities, including low-light, low-quality documents. It uses preprocessing techniques to detect the text orientation, correct the image's resolution, and remove texture from the image.

Fig.2: OCR cloud computing

C. Text to speech conversion

A Text-To-Speech (TTS) synthesizer is a computer-based system that should allows to read any text loudly, whether it was directly introduced in the computer by an operator or scanned and submitted to an Optical Character. A TTS system (or "engine") is composed of two parts: a front-end and a back-end. The front-end has two major tasks. First, it converts raw text that contains symbols like numbers and abbreviations into the equivalent of written words. This process is often called text normalization, pre-processing, or tokenization [11]. The front-end is then assigns a phonetic transcriptions to each word, and that divides and marks the text then into prosodic units, like phrases, clauses, and sentences. The process of assigning phonetic transcriptions to each words is called text-to-phoneme conversion. The back-end often referred as the synthesizer—then converts the symbolic linguistic representation into sound. Here the text fonts used for testing are Times New Roman in 12pt, 14pt, and 16pt sizes. The application was installed on a Samsung Galaxy S4 for testing purposes and so on, but we also been tried with the HTC One M8 model. The images in the Fig.3 had been captured using the Samsung phone.

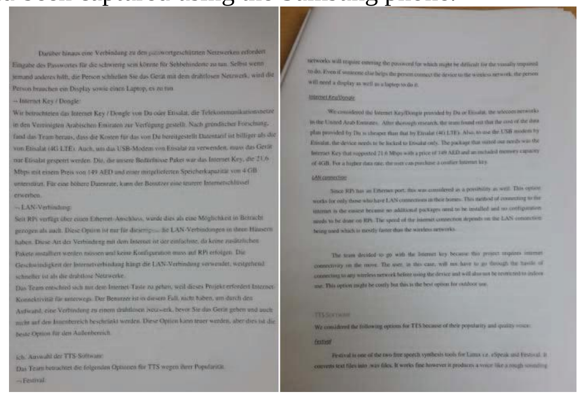

Fig.3: Text image captured by Android smart phones

C. *Playback audio*

The downloaded text is at last converted into audio. Using the Android phone's local TTS engine it will be read aloud to the user. To control the audio being played out needed to rewind, pause, play, and fast forward capabilities are added on the taskbar**.**Figure 1 illustrates an overall view of the system design flow for the Read2Me mobile application. The Read2Me application has been deployed for text recognition in two languages; English and German. Mobile phones are one of the most commonly used electronic gadgets today.A camera capture a video of the product then the captured video is split into frames. A text detection algorithm is then used to separate the text from sequence of frames. The OCR and TTS techniques are used to read the label back to the user.

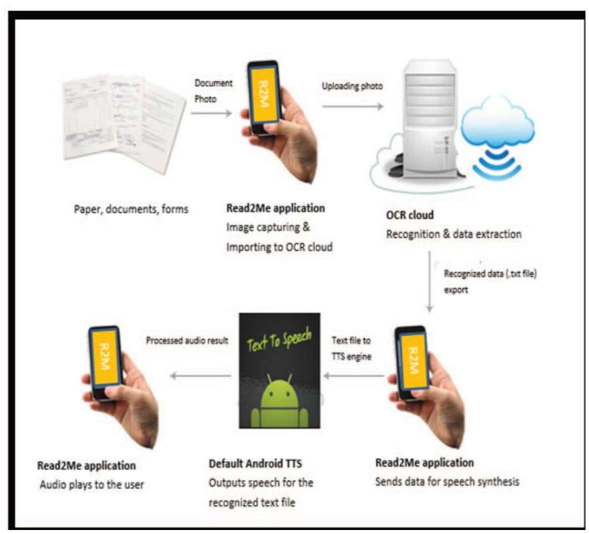

Fig.4: System Architecture of Read2Me Application

IV .BLIND AUTHENTICATION

We define *Blind Authentication* as a biometric authentication protocol that does not reveal any information about the biometric samples to the authenticating server [12]. It also does not reveal any information regarding the classifier, employed by the server, to the user or client." Blind authentication, proposed in our paper, is able to achieve both strong encryption-based security as well as accuracy of a powerful classifier. While the proposed approach has similarities to the blind vision scheme for image retrieval, it is far more efficient for the verification task. Blind Authentication addresses all the concerns mentioned before

1) The ability to use strong encryption addresses template protection issues as well as privacy concerns.
2) Non-reputable authentication can be carried out even between no trusting client and server using a trusted third party solution.
3) It provides provable protection against replay and client side attacks even if the keys of the user are compromised.
4) As the enrolled templates are encrypted using a key, one can replace any compromised template, providing revocability, while allaying concerns of being tracked. In addition, the framework is generic in the sense that it can classify any feature vector, making it applicable to multiple biometrics. Moreover, as the authentication process requires someone to send an encrypted version of the biometric, the nonrepudiable nature of the authentication is fully preserved, assuming that spoof attacks are prevented.

We assume that authentication is done through a generic *linear classifier*. One could use any biometric in this framework as long as each test sample is represented using a feature vector of length n . Note that even for biometrics such as fingerprints, one can define fixed length feature representations. Let ω be the parameters of the linear classifier (perception). The server accepts the claimed identity of a user, if , $\omega.x < \tau$ where τ is a threshold. As we do not want to reveal the template feature vector (ω) or the test sample (x) to the server, we need to carry out the perceptron function computation directly in the encrypted domain. Computing ω.x involves both multiplication and addition operations, thus computing it in the encrypted domain requires the usage of a doubly homomorphism encryption scheme. In the absence of a practical doubly homomorphism encryption scheme (both additive and multiplicative homomorphism), our protocol uses a class of encryption that are multiplicative homomorphism, and we simulate addition using a clever randomization scheme over one-round of interaction between the server and the client. An encryption scheme E(x) is said to be multiplicative homomorphism, if $E(x).E(y)=E(xy)$ for any two numbers x and y . We use the popular MD5 encryption scheme, which satisfies this property. We assume that the server has the parameter vector ω in the encrypted form, ie E(ω) , which it receives during the enrollment phase. The authentication happens over two rounds of communication between the client and the server. To perform authentication, the client locks the biometric test sample using her public key and sends the *locked ID* to the server. The server computes the products of the locked ID with the locked classifier parameters and randomizes the results. These *randomized products* are sent back to the client. During the second round, the client unlocks the randomized results and computes the sum of the products. The resulting *randomized sum* is sent to the server. The server derandomizes the sum to obtain the final result, which is compared with a threshold for authentication. As we described before, both the user (or client) and the server do not trust each other with the biometric and the claimed identity. While the enrollment is done by a trusted third party, the authentications can be done between the client and the server directly. The client has a biometric sensor and some amount of computing power. The client also possesses an MD5 private- public key pair, and . We will now describe the authentication and enrollment protocols in detail.

A Authentication

We note that the computation of requires a set of scalar multiplications, followed by a set of additions. As the encryption used is homomorphism to multiplication, we can computer at the server side. However, we cannot add the results to compute the authentication function. Unfortunately, sending the products to the client for addition will reveal the classifier parameters to the user, which is not desirable. We use a clever randomization mechanism that achieves this computation without revealing any information to the user. The randomization makes sure that the client can do the summation, while not being able to decipher any information from the products. The randomization is done in such a way that the server can compute the final sum to be compared with the threshold. The overall algorithm of the authentication process is given in Algorithm 1. Note that all the arithmetic operations that we mention in the encrypted domain will be -operations, i.e., all the computations such as *(a op b)* will be done as *(a op b) mod q*, where q is defined by the encryption scheme employed.

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V. CONCLUSION

We propose an assistive system to read the printed text on objects for assisting blind persons. For solving the common problems of blind people we have proposed a method in which the blind people will click the image. This method can effectively separate the objects of interest from complex background and other objects in the camera view OCR is used to perform word recognition of the localised text regions and transform into audio output for blind people. A mobile-cloud based pedestrian signal detector integrated into an outdoor navigation application for the blind and visually impaired using the Android platform for the mobile component and the Amazon EC2 platform as the cloud component. There are some products available to assist them with navigation, but lack efficiency in terms of cost and performance. In our current version of the system we do not consider the targets to be approaching faster than walking speed. A visually impaired person can successfully travel from his location to his desired destination using a bus independently without any hassle.

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Authors Profile

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