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Printed Text Assimilator for Visually Impaired : A Survey

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***Abstract* - When we ponder about technology for people with visual disabilities, two broad domains come to our mind: General technology and Assistive technology. General technology is inclusive of computers, smartphones and cell phones whereas Assistive technology consists of devices developed to help people with vision impairment or other visual disabilities. The Assistive technology comprises everything starting from screen readers for visually impaired people or screen enlargers for low vision PCs, to braille watches and braille printers. In most of the system, prototype has been developed which will ease the routine chores performed by the visually impaired individuals. We will provide most of their prototype details in this paper along with some other scenarios. There is some development in the specified field of reading printed as well as digital text. These technologies help visually impaired people to read normal text with the help of audio outputs. We will also focus our attention on those aspects which are still in development phase and are facing some critical problems. The primary motive of this technology is precise scanning and text-to-speech transformations in order to achieve efficient output.**

***Index Terms*: Braille, OCR-Optical Character Recognition, wearable devices, mobile devices and handheld devices, text reading, text-to-speech**

I INTRODUCTION

Technology has removed many barriers to education and employment for visually impaired individuals. Students with visual impairments can complete homework, do research, take tests, and read books along with their clear vision classmates. Adults with visual impairments can continue to work and pursue a better range of careers because of the use of computers and other devices. These include:

A. Assistive technology programs that run on computers can speak the text on the screen or magnify the text in a word processor, web browser, e-mail program or other application
B. Stand-alone products or assistive technology designed specifically for people who are blind or visually impaired, including personal digital assistants (PDAs) and electronic book players provide portable access to books, phone numbers, appointment calendars, and more.
C. Optical character recognition systems scan printed material and speak the text. Braille embossers turn text files into hard-copy braille

Accessing printed text in a digital and real world context is a major challenge for the visually impaired. A primary study with visually impaired people reveals numerous difficulties with existing technologies including problems with bordering, focus, accuracy and efficiency. People with a vision impairment also naturally based on tactile feeling through their fingers to read Braille and retrieve information about the environment. [1]There are few devices that can provide good access to hand-held objects such as product packages, and objects printed with text such as medical prescription bottles. The ability of people who are blind or have significant visual impairments to read printed labels and product will enhance independent living, and social self-sufficiency. [2]Off-the-shelf OCR is used to perform word recognition on the localized text regions and transform into audio output for blind users. They can read the labels on the big product which reveals their system's limitations.

This paper contains all the summarized information about the existing system with their benefits and drawbacks as well. We are more focused on the wearable as it will be more convenient for visual impairments to rely on the device:

A. The first section will provide us with the detailed information about the system which already been developed or in development phases. The section gives an idea about how those systems will be helpful to the target people in order to provide a desired result.
B. Second section will describe about the type of system that are common in those approaches, wearable devices which gives a clear demonstration of the existing system that are explained in the previous section, existing system. It also describes about the devices used while developing such products and how they are helpful to make system efficient.
C. The next section will demonstrate about the other devices that make those approaches common to one another. This section includes all the information about the handheld devices that are actually used in such approaches.
D. Again in the next section we have described about some drawbacks of the existing system with some improvement details in it.

II. EXISTING SYSTEM

Many early so-called "reading machines for the blind" used a sensory substitution approach where the visual signals of words were converted to non-verbal auditory or tactile modalities, which were complicated to learn but accessible. With advances in sensing, computation, and OCR, modern approaches attempt to scan, recognize, and read aloud text in real-time. This transition to OCR and speech synthesis occurred first with specialized devices [2] [3], and now wearable. The earliest evidence we found for a specialized assistive text-reading device for the blind is the Optophone.

As this paper is based on the wearable then we will are considering only those aspects of the development in early

days of the technology. There was a prototype system to read printed text on hand-held objects for assisting blind persons. [1]They have proposed a motion-based method to detect the object of interest while the blind user simply shakes the object for a couple of seconds. Off-the-shelf OCR is used to perform word recognition on the localized text regions and transform into audio output for blind users. They can read the labels on the big product which reveals their system's limitations. [2] [3] the current system with some modification use external processor as Microprocessors which usually refer to Laptop, Computers. These systems are unable to make the device comfortable as user need to carry his/her laptop/computer along with the device wherever he/she is going. [3] Preliminary algorithms are efficient and reasonably accurate since they provide more intuitive and precise control over scanning and text-to-speech; increased spatial understanding of the text layout; reduced camera framing, focus, and lighting issues.

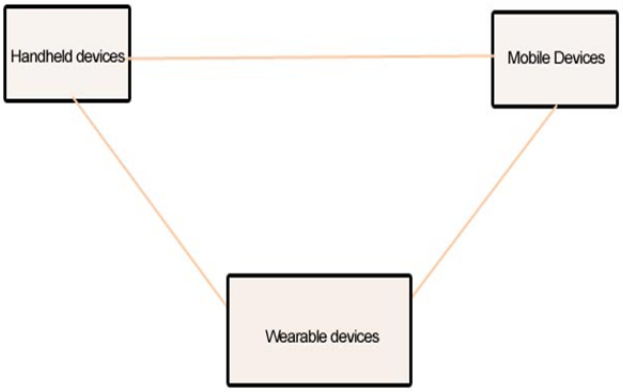

Figure 1. Resemblance of all three approaches

III. WEARABLE DEVICES

In a wearable form-factor, it is possible to use the body as a directing and focusing mechanism, relying on process of sensing ability of the body to location or the sense of touch, which are of more importance for people with visual impairment. Product Labeling [1] placed a camera on shade-glasses to recognize and synthesize text written on objects in front of them, Yi and Tian [4] did the same while adding a handheld device for product labeling. Finger Reader [3] is using a head-worn camera.

These devices help to overcome the bulkiness of the system to be developed.

IV. HANDHELD AND MOBILE DEVICES

One of the systems proposed focused on Emerging Input Technologies for Always-Available Mobile Interaction surveys and characterizes the properties of sensors and input systems that may enable this shift to always-available computing [5]. It briefly described about the mobile computing may turn the desktop computer's ability into more tremendous generation.

Handheld devices make the usage of the system to be developed more compact and mobile.

V. DRAWBACKS OF EXISTING SYSTEM

The systems are well proposed for the large font text in real world and that is the reason it cannot read below that threshold font size [1]. The system is also capable of reading any type of font style just by shaking the product held in their hand. The main drawback that revealed is that user needs to pick the product in hand and shake it well so that it can trigger the input system to grab the text on the product label and then send it to processor. This may result in manual triggering of the input system they have used.

[1]The camera is placed at the top of head so that user needs to hold their object and shake up and down in order to detect that object and read the letters on that. [2] In current development there are some issues with the processor as they want it to be automated and microprocessors are the best option they have chosen in order to make the read text processed and make it available at output system. The only haptic thing they have is the portability of the device; it may increase cost as well as bulkiness of product to be used. [3]Prototype relies on only local information gleaned from the on-finger camera. However, in the future, they would like to combine camera streams from both a body-mounted camera and a finger-mounted camera

[6]The focus of the author's method is on large text found in outdoor environments, such as shop signs, street names, billboards and so on. [6] They propose to use a set of unscented Kalman filters to maintain each text region's identity and to continuously track the homography transformation of the text into a fronto-parallel view. It operates autonomously and in real-time, automatically detecting and recognizing new text regions and discarding the old ones. Their method is focused on larger text and is not suited to deal with smaller document texts.

VI. CONCLUSION

Hence we have analyzed about contribution of a novel concept for text reading for the blind, utilizing a sequential scan that enables continuous feedback and non-linear text reading. Many of them provide methods which propose a solution to a limitation of most existing technologies: reading blocks of text at a time, large size text only. The system includes a text tracker that extracts words from a tiny low resolution camera view, integrated with a wearable device. As they were tried to overcome many issues but still there will be some cumbersome with the multi-colored text, more small text may be below 10 may create complexity in the algorithms. There may be some chances that these issues be further resolved and will develop a more compact and precise device.

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