

Abstract

There are some technical systems which have emerged nowadays to help the blind persons. To introduce them, the first which can come in our mind is 'Braille'. To print this Braille script, Braille Printer is a kind of embosser which is a technical hardware that can print the hardcopy of braille, which is expensive process. The solution would be a wearable assistive device for the blind which converts the text into acoustic output enabling the user to read any sort of text for that a standalone Raspberry Pi based system with finger mounted camera that can help the visually impaired people in word based reading of the textual data pointed to by the finger. The system consists of a webcam that captures images which are enhanced. Following this the word pointed by the finger is extracted using a novel methodology and given to an Optical Character Recognition (OCR) engine. Subsequently, the textual output is given to a Text to Speech (TTS) converter to obtain audio via an audio output device such as earphones.

Keyword : Word based text extraction, Assistive wearable device, Finger mounted camera, Text to speech.

Introduction

Image Processing

Image processing is a way to convert an image to a digital aspect and perform certain functions on it, in order to get an enhanced image or extract other useful information from it. It is a type of signal time when the input is an image, such as a video frame or image and output can be an image or features associated with that image.

Advantages

- It helps to improve images for human interpretation.
- Information can be processed, extracted from images for machine interpretation.
- The pixels in the image can be manipulated to any desired density and contrast.
- Images can be stored and retrieved easily.

Application:

- Image Enhancement
- X-Ray Imaging
- Medical CT
- UV imaging

Image Enhancement:

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. The image captured through sensor may contain the shadows that will be removed, The result is inverted to get black text on white image.

Exponential transform:

In order to obtain images with distinct edges of the letters, an anti logarithmic transform is applied. The result of the above process is inverted to get white text on black image. The text file is removed and then given to the TTS converter.

AI Enabled IoT

IoT is about sensors implanted into machines, which offer streams of data through internet connectivity. All IoT related services inevitably follow five basic steps called create, communicate, aggregate, analyse, and act.

While IoT provides data, artificial intelligence acquires the power to unlock responses, offering both creativity and context to drive smart actions. As the data delivered from the sensor can be analyzed with AI, businesses can make informed decisions.

Benefits of AI Enabled IoT

- Boosting Operational Efficiency
- Better Risks Management
- Triggering New and Enhanced Products & Services
- Increase IoT Scalability
- Eliminates Costly Unplanned Downtime

Applications of AI Enabled IOT

- Manufacturing Robots
- Autonomous Vehicles
- Retail Analytic
- Smart Thermostat

Text to speech

eSpeak is a compact open source software speech synthesizer for English and other languages, and is used to convert the text file to audio output which is heard via an audio output device such as earphones. Python 3 wrapper for eSpeak is utilized to implement the algorithm.

Assistance to blind

In our world information is generally available in the form of books and documents. It is fully usable for the sighted people. When an era has come of printing it facilitates the sighted people partially to acquire knowledge. A major problem for a blind or visually impaired person (BVI) to interact with the world to share knowledge. For them information has to be in a special tactile language or in voice format. They are affected in every works of their daily life. Nowadays technology helps them to overcome this difficulty to some extent. The most difficult task for them is reading text from the books or documents.

For the blind or visual impaired (BVI) person, it is a very difficult job to acquire information from the world. One feasible way in order to perform that job is that someone will help him to read aloud the context. Another way to get the information is by giving a feelings of the information. The later technique is built through a representation of the information on a paper or a substantial surface so that a blind person can feel and recognise the information. But it is a very difficult work to make all the books or documents available for the blind people. An application is developed that read aloud the context of the document which is represented virtually. This later technique reduces the resources to help the blind to acquire knowledge but in this manner he can be assisted only audibly.

Techniques

- The camera is set up in a wearable hand device in such a way that it can capture the image.
- The device consists of an index mounted webcam connected with Raspberry Pi 3 model A+. The image captured by the camera is processed by the computer.
- Then the captured image is enhanced and shadows are removed.
- After enhancement, exponential transform is done on the image.
- The words are distinctly visible in the resulting image. Once the clear image is obtained, it is de-skewed so that it can be accurately converted by the OCR Engine.
- Once the corrected image is obtained the individual words have to be located. Thus contours are found on the image after dilation.
- Bounding boxes are drawn on each of the words. The fingertip is detected by converting the image into HSV model and extracting the extreme point on the isolated contour of the finger. The line from the fingertip to the end of the image is drawn.

- The coordinates of the boxes obtained and the fingertip are compared. The contour closer to the fingertip is extracted. This is provided to the OCR Engine for converting it to text.
- The final image that is given to OCR Engine, and the word isolated is of the same size as that in the input image.
- The algorithm is implemented in Raspberry Pi 3 Model A+. The entire process from capturing the image, processing to extract the intended word and final audio output via device such as earphones.

Problem Statement:

“Wearable Assistive Device for the Blind using Word Based Text Extraction Algorithm ”

Flow Diagram

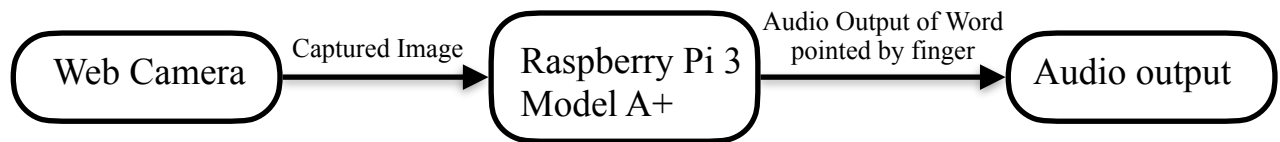


Fig 3.1 Over view of device

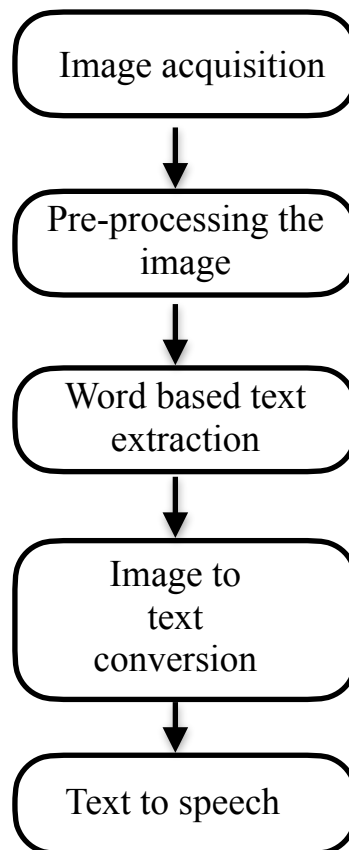


Fig 3.2 Preprocessing Flow Chart

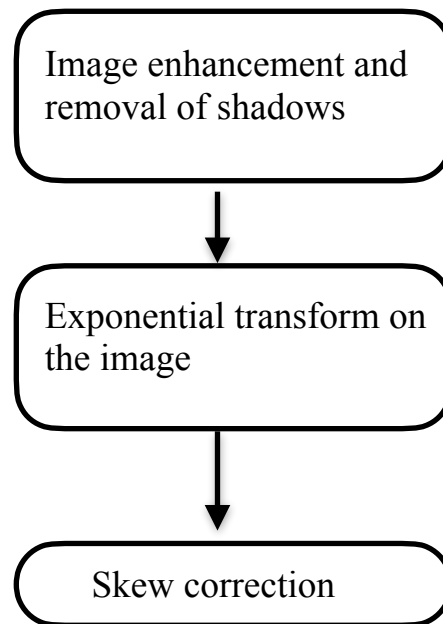


Fig 3.2.1 Flow Chart of the Word Extraction Algorithm

Objectives

- 1) To build a wearable device
- 2) To Check Ambient Light Conditions
- 3) To finger Tip Detection and Word Extraction:
- 4) Image To Text conversion

References:

- [1] Visual impairment and blindness 2010," 2013.
- [2] Trupti Shah; Sangeeta Parshionikar -Efficient Portable Camera Based Text to Speech Converter for Blind Person
- [3] Arunima B Krishna; Meghana Hari; Dr. Sudheer A.P -Word Based Text Extraction Algorithm Implementation in Wearable Assistive Device for the Blind
- [4] Shalini Sonth, Jagadish S. Kallimani -OCR based facilitator for the visually challenged
- [5] Prabhakar Manage,Veeresh Ambe,Prayag Gokhale,Vaishnavi Patil,Rajamani M.Kulkarni,Preetam R. Kalburgimath -An Intelligent Text Reader based on Python
- [6] M. A. Hersh and M. A. Johnson -D. Keating, Assistive technology for visually impaired and blind people,, Eds. Berlin: Springer London, 2008.