

# Portable Reader for the Blind Using Image Processing

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**Abstract:** A prototype to help the visually impaired to read is implemented which converts given text to Braille. The portable reader comprises of a miniature housing which is fitted to the tip of the user's index finger. The housing is connected to an electronic box which comprises of the 8051 Micro controller which is fitted onto the wrist. A micro camera fitted onto the housing captures the image of the text. This image is processed and Optical Character Recognition (OCR) is performed on the captured image and the ASCII value of the detected character is sent to the 8051 Microcontroller which is connected to six solenoids to give the feel of Braille

**Keywords:** Braille, 8051, RS232, MAX232, solenoids.

## I. INTRODUCTION

We come across differently abled people, most often there are reservations kept towards them which may demoralize them and may possibly lead to loss of talent. In order to make life easier for the visually impaired, a device was made to make learning or grasping knowledge much easier for them.

The basic structure of the project consists of a miniature camera which is mounted on the fingertip, a processor and a set of solenoids to imprint the feeling of Braille.

## II. RELATED WORK

Image to text has been implemented before using various algorithms as mentioned below. Our system aims at Using OCR

1. The goal of Optical Character Recognition (OCR) is to classify optical patterns (often contained in a digital image) corresponding to alphanumeric or other characters. The process of OCR involves several steps including segmentation, feature extraction, and classification. Each of these steps is a field unto itself. The character recognition method is divided into roughly two parts including a deterministic method and a syntax method. A deterministic method is comparing an input pattern and a standard pattern by analyzing a literal pattern which is in document image. Then recognizing their patterns by estimating the similarity of each other. On the other hands, a syntax method is following a given syntax rule which is introducing similarity with syntax of language and pattern structure, and then identify the structure of patterns according to a given syntax rule.
2. The Template matching method is that finding the most similar form by comparing with Template pattern, and it classifies a literal pattern according to a arrangement form. This method which is mainly using the character of one fixed form used a lot in the beginning. however frequency of use is less in the present due to the problems. Statistical character recognition method is that recognizing character by extracting a characteristic vector in indicator target .In this method , find the characters of statistical probability distribution of characteristic vector through the learning step, and separate the space of characteristic vector with an each class by using it. This classification model was defined well mathematically and in this method pattern of express, it is a very important issue that how define well of input patterns character and how extract the character. The structure analytic character recognition method is extracting the base element of composed character such as stokes in a Chinese character and its correlation based on a literal composition principle .This method has gotten a fine theoretical array and simple method, but there is a shortcoming that it takes long realization time because the regulation of characteristic character is very various according to the fonts. In order to recognize the character pattern, the study that using Neural Networks Model which is one of artificial intelligence system is getting into the spotlight. Neural networks model is modeling human's structure of brain, and it presupposed that displays good performance through connection of simple calculation element with neuron that is standard unit for composing a brain. Therefore, neural networks model is a suitable model in the problems that require lots of computational complexities and parallelism such as analysis voice, character, image and etc.

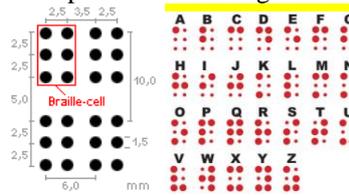
## III. PROBLEM STATEMENT

Capture the image of the text intended to be read and further process the image to obtain the characters of the text. After character recognition, produce the corresponding Braille character on the finger tip using miniature solenoids

## IV. INTRODUCTION TO BRAILLE

This language is made up of 80 characters, which includes upper case, punctuation figures and math operator.

Each character is made up of large and small dots within an array composed of 3 rows and 2 columns. Only the raised large dot represents the character. The smaller dots indicate the position of the larger dots within each group of 6.



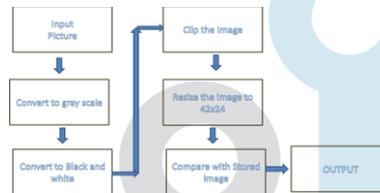
**V. BLOCK DIAGRAM**



**VI. WORKING DESCRIPTION**

The camera captures the image of the text to be read as the person slides his finger over it. This image is then sent to the Processing Unit for image processing. In the project we are using MATLAB 2013B to perform OCR.

Overview of the MATLAB code used for character recognition:



The input RGB image is converted to grey scale and then binary since the colour content of the image is of no importance. Edge detection is performed to ignore the border and any other irrelevant background information. Each letter in the image is segmented by detecting the white space in between two letters. Each letter is then resized to a size of 42x24 to match the size of the stored image templates. The stored image can be chosen to be of any arbitrary size. The output of the code is the character stored in a .txt format.

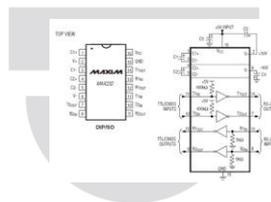
The processing unit is connected to the 8051 microcontroller through RS232 and MAX232.

**VII. RS232**

In this case, only three pins of RS232 are of use to our purpose, i.e. TXD, RXD and the clock pins. This will help us to generate the transmitted data at the receiver portion.

**VIII. MAX232**

The signals which are obtained from the laptop are high voltage signals. The use of these high voltage signals has the potential of damaging the microcontroller. In order to bring these voltage levels to that compatible with 8051, these signals are first passed through the MAX-232.

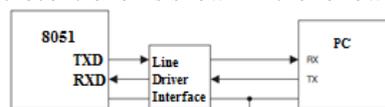


**IX. 8051 MICROCONTROLLER**

This microcontroller controls the working of the solenoids. Pins TXD and RXD are used for serial communication. Pin TXD is used for transmitting the serial data whereas pin RXD is used for receiving the serial data.

The pin out of the microcontroller is shown below:

The connection between the laptop and the microcontroller is shown in the following figure:

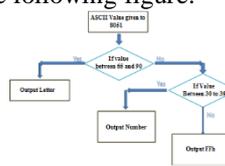


The USB cable along with the MAX-232 forms part of the line interface unit.

The signals received are in ASCII form. The microcontroller has been programmed for serial communication. It assembles the group of 8-bits. Accordingly, based on the recognized characters, the desired six outputs will be activated to drive the solenoids.

**X. FLOWCHART IN 8051 PROGRAMMING**

The flowchart of the 8051 code used is depicted in the following figure:



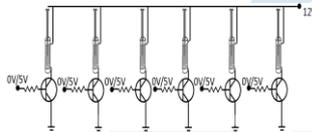
**XI. OUTPUT USING SOLENOIDS**

The recognized character has to be interpreted properly by the visually impaired person. This is accomplished with the help of the solenoids.

There are six solenoids arranged so as to give the feel of Braille characters. The output solenoids are driven by a simple +12V circuit.

When the voltage of +5V is supplied by the microcontroller to a particular pin driving a solenoid, that particular solenoid is turned off i.e. the core of the solenoid is depressed. But when the voltage supplied by the microcontroller is absent, the core returns to its normal position under spring action thus giving the feel of BRAILLE.

The circuit diagram for connection of solenoids:



**XII. EXPERIMENTAL RESULTS**

The OCR Algorithm was successfully implemented. The character recognised was obtained as a text file.

A camera compatible with the ARM board is being used.

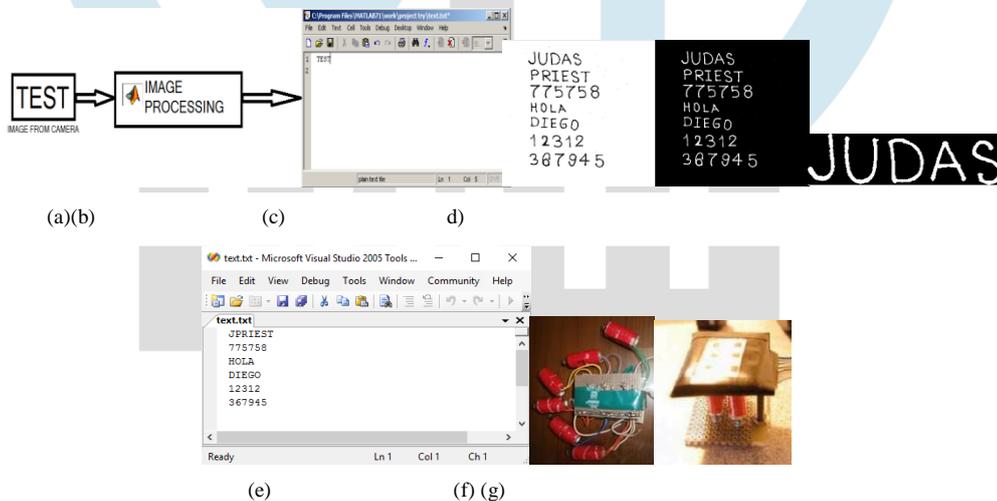


Fig. 2.(a) Algorithm flow(b) Original Image (c) Inverted Image (d) Word Segmentation (e) Output in text (f) Output using solenoids (g) prototype

For the output in the Braille form we have designed solenoids as shown in the figure below:

**XIV. CONCLUSION**

We have implemented an automatic text detection technique from an image. Our algorithm successfully detects the text region from the image which consists of mixed text-picture-graphic regions. We have applied our algorithm on many images and found that it successfully detect the text region.

## REFERENCES

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