CAMERA BASED TEXT AND PRODUCT LABEL READING FROM HANDHELD OBJECTS FOR BLIND PERSONS

P.VENKATESH, N PRIYANKA, A.ARUN KUMAR,D.SAMPATH KUMAR

Student, Department of ECE, Vaageswari College of Engineering, Karimnagar

Venkateshpunna1@gmail.com

Student, Department of ECE, Vaageswari College of Engineering, Karimnagar

nampellypriyanka@gmail.com

Assistant Professor, Department of ECE, Vaageswari College of Engineering, Karimnagar

Arunraj.akula@gmail.com

Assistant Professor, Department of ECE, Vaageswari College of Engineering, Karimnagar

dskshift1@gmail.com

Abstract— Now a days printed text is one of the prominent communication medium to get product names, sign boards message, Restaurant menu etc. In order to get this information blind people need some assistance. In recent years there is a vast improvement in image processing and embedded systems. In this project we proposed an efficient system for blind people to read printed text by combining image processing and embedded systems. Camera acts as main vision in detecting the label image of the product or board then image is processed internally and separates label from image by using Matlab and finally identifies the product name and by using serial communication transfer this information to ARM 7 microcontroller. Microcontroller processes received information and pronounces product name or message by using voice module APR 9600 and speaker. To isolate the object from complex backgrounds, we first propose an effective motion-based method to define a region of interest (ROI) in the image. In the extracted ROI, text localization and recognition are conducted to acquire text information. An experimental result shows that our system achieves the state-of-the-arts and Self-Dependency for disabled persons increased.

Keywords-- Assistive devices; Blindness; Arm 7; Image processing; Text to voice;

1. INTRODUCTION

The National Census of India has estimated around 21.9 Million disabled people in the country. Out of which more than 15 million people in India are blind. This is considered to be the highest among all other disabilities. Blind

people are an integral part of the society. However, their disabilities have made them to have less access to computers, Internet, and high quality educational software than the people with clear vision. Consequently, they have not been able to improve on their own knowledge, and have significant influence and impact on the economic, commercial, and educational ventures in the society. One way to narrow this widening gap and see a reversal of this trend is to develop a system, within their economic reach, and which will empower them to communicate freely and widely using the information infrastructure.

Reading is obviously essential in today's society. Printed text is everywhere in the form of reports, receipts, bank statements, restaurant menus, classroom handouts, product packages, instructions on medicine bottles, etc. And while optical aids, video magnifiers, and screen readers can help blind users and those with low vision to access documents, there are few devices that can provide good access to common hand-held objects such as product packages, and objects printed with text such as prescription medication bottles.

Blind people always wanted to live independently Like normal People. But most of the times like while reading texts they need to depend on others.

Latest advancements in technology made it possible to provide assistance to these people by designing products that use computer vision and camera with optical character recognition (OCR) system. Reading has become an essential part in the modern world. Texts in printed form are available everywhere in books, bills, cheques, demand Drafts, pamphlets, product labels, newspapers, etc. Recently, many devices have been developed to provide portability in text reading, but the process is a bit tedious and creates inconvenience for blind people. One such product is the Barcode scanner; the basic concept behind this device is that the products or objects need to be stored separately for each barcode and all the data will be held in a database. Any time the user can scan the barcode [9] and get the information about that object. This device has a disadvantage that blind users find it difficult to point to the barcode in an object.

Many software's and mobile applications have been developed to give portability in reading for the blind people. Be My Eyes [10] is a similar application which runs on iPhones assist blind people by connecting them though video call to the volunteers. But it still makes them dependent on other people. All the above mentioned systems are trying to assist the blind people in reading texts but reading texts is not the only problem faced by them in the outside world. Another major problem for blind people is recognizing the different denominations of currencies. For currency recognition, there are many systems available for office usage but no such portable devices are available. It reduces the independency of the blind people to the greater extent. For example while purchasing in shops they have to depend on others to give the right amount of money and also it involves liability of the people. Some steps [6] [7] have been taken to resolve this issue, but it is not helping at major level. Our prototype is mainly focused on addressing these issues for the blind people. To help blind people in reading printable text, we have connected a camera with our processing system, the camera will capture the readable texts and system will perform OCR extraction process to extract the text information. For currency note recognition we are using the efficient SIFT algorithm [11] to extract information

and 0with that information the correct denominations can be identified.

Different researchers have been worked on Self-Dependency for disabled persons and suggested many methods using different technologies and also research is going on to improve more and more.

2. PROPOSED METHODOLOGY

To help blind persons to read text labels from different patterns with complex backgrounds found on many everyday products of Hand-held objects, have to conceive of a camera-based assistive text reading framework to get the object of interest within the camera view and extract printed text information from the object. The algorithm used in this system can handle clutter background and different patterns. Also this proposed system can extract text information from hand-held objects. By using microcontroller and voice synthesizer the extracted text is pronounced to give audible signal for blind people.

3. BLOCK DIAGRAM DESCRIPTION

The entire system is divided into two parts. First part consists of hardware units and second part consists of software algorithm developed in Matlab. Hardware unit consists of a microcontroller with voice module. Here we used LPC2148 microcontroller and APR 9600 Voice Module. Microcontroller collects the information sent by the software unit and processes that information internally. Based on received information microcontroller trigger the particular pin in the APR 9600. Voice module gives the voice associated with that particular pin.

In Second section we develop an algorithm on Matlab IDE. This algorithm captures the image of the printed text through camera and process that image and extract the text from image and store it in an array. Then send information to microcontroller unit through serial port.
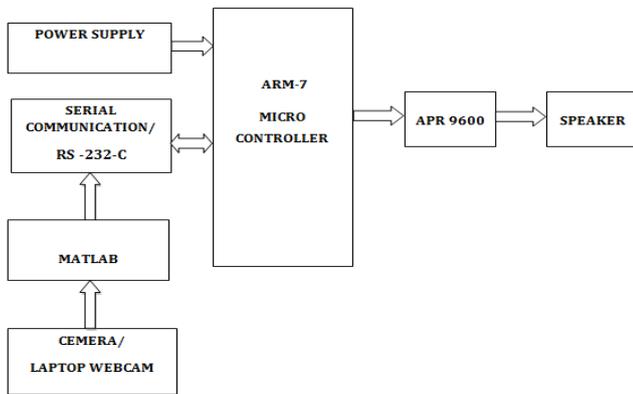
Fig 1. Block Diagram of proposed system

4. SYSTEM DESCRIPTION

### A. Hardware Components

i. ARM7 LPC2148 Microcontroller

ARM7 LPC21487 is a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and one of the most widely used micro-controller. LPC2148 is based on RISC processor that uses very few transistors than other complex processors. Because of few transistors it consumes low power and low cost. LPC2148 has 10-bit inbuilt A/D converter present because of this it's easy to interface analog sensors without the need of external A/D conversion hardware. It has Real Time Clock circuit with 32.768 KHz XTAL and Battery Backup. Support In- System Programming (ISP) and In-Application Programming (IAP) through On-Chip Boot-Loader Software via Port UART-0 (RS232), circuit to connect with standard 20 Pin JTAG ARM for Real Time Debugging. Has standard 2.0 USB as Full Speed inside, has Circuit to connect with Dot-Matrix LCD with circuit to adjust its contrast by using 16 PIN Connector. RS232 Communication Circuit by using 2 Channel. SD/MMC card connector circuit by using SSP. EEPROM interface using I2C. It has PS2 keyboard interface and general purpose I/O pins.

ii. APR 9600 Voice Module

The APR9600 device will offer a true single-chip voice recording, non-volatile storage and playback capability for about 40 to 60 seconds. The device will support both the random and the sequential access for multiple messages. The Sample rates are of user-selectable by allowing designers for customizing their design to unique quality and storage time needs. The Integrated output amplifier, the microphone amplifier and the AGC circuits will greatly simplify system design. The device is ideal for usage in portable voice recorders, toys and in many other consumer and industrial applications.

B. MATLAB Algorithm Development

In order to read image from hand held objects we develop an algorithm in Matlab. The steps involved in extraction of text shown below.
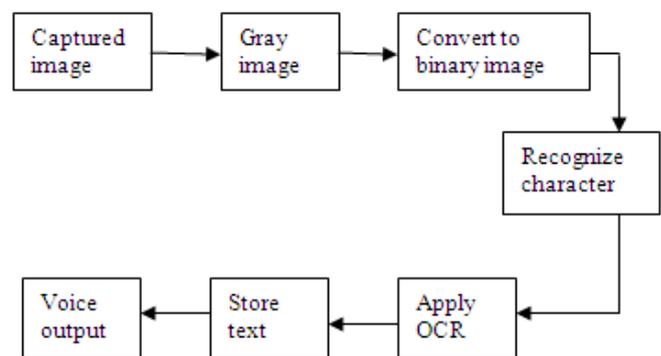
1. Image Acquisition:

The Image acquisition component collects scenes containing objects of interest in the form of images.Here, a generally available and low cost webcam is used for image acquisition.

2. Preprocessing and Gray Scale Conversion:

To make the system more robust i.e. work for noisy conditions, image pre-processing methods like noise filtering are applied. For the purpose of reducing the processing time of the overall process, the input is converted into Gray Scale. Preprocessing of document images is the way of using mature image processing techniques to improve the qualityof images. Its purpose is to

enhance and extract useful information of images for later processing purposes. Two pre-processing tasks, thresholding and noise removal, are performed here.

3. Edge detection:

Edge detection is a set of mathematical method which aim at identifying point in a image at which image brightness changes sharply are typically organized into a setup for the line segment turned are edges.The Canny Edge Detection Algorithm is used in edge detection.

The algorithm runs in 4 separate steps:

1. Smoothing: Blurring of the image to remove noise.

2.Finding gradients: The edges should be marked where the gradients of the image haslarge magnitudes.

3. Non-maximum suppression: Only local maxima should be marked as edges.

4.Double Thresholding: Potential edges are determined by thresholding.

4. Thresholding:

It is a simplest method of image segmentation from a gray scale image. Thresholding can be used to create binary image. It does not depend on modeling the probability density functions, however, it assumes a bimodal distribution of gray-level values (i.e., if the image approximately fits this constraint, it will do a good job).

5. Automatic Text Extraction:

Then, an automatic text extraction algorithm is implemented to detect the region containing the label text. In order to handle complex backgrounds, two novel feature maps to extracts text features based on stroke orientations and edge distributions, respectively are used. Maximally stable ertremal region is used in automatic text extraction.

5. RESULTS AND DISCUSSIONS

To test the proposed system, we take some objects names and printed them on the paper. Now the algorithm in matlab opens a camera and capture the image of the text and recognizes the text. Now

recognized text is transmitted to the hard ware kit using serial communication. Arm 7 receives this information based on that it gives the voice output. The entire Hardware setup of the proposed system is shown in in below figure.

Fig. 2. Hardware Setup.

6. CONCLUSION

This paper has presented a method to assist the blind people to read the printed text. The proposed prototype reads out the printable text from handheld objects to them and also helps them to identify objects with ease. This method can effectively distinguish the object of interest from background or other objects in the camera vision. ARM 7 microcontroller effectively collects the information and processed that information. APR 9600 gives the effective and noiseless audio output.

7. FUTURE ENHANCEMENT

The future development will be an obstacle detection process, using haar cascade classifier for recognizing the obstacle from the object. A novel camera based computer vision technology to automatically recognize currency to assist visually impaired people will be enhanced.

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