

EXPIRY DATE AND COST TRACKING IN MEDICINE FOR VISUALLY IMPAIRED

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Abstract - Visual impairment is one of a human being's disabilities, and several strategies have been introduced to change the visually impaired people's life style. In this project, an automated vision approach for recognizing expiry date numerals of product is presented. Product should contain clear information of expiry date and retail price in the label. Due to the writings and distorted characters, the MRP expense and the expiry date detail printed on the product cover faced some challenges. The system consists of four stages: pre-processing of numeral strings, segmentation of strings of numerals, extraction features and numeral recognition. In pre-processing module, the image is converted to binary image based on threshold. In the segmentation module a vertical projection method is followed for the isolation of numerals. Fourier Magnitude (FM), Local Energy (LE) and Complex Moments (CM) derived from the outputs of Stretched Gabor (S-Gabor) filters are extracted at different filter orientations in the feature extraction module. Additionally, it extracts the mean and variance of each function map. The process of recognition is achieved by classifying the extracted features, which represent the numeral image, using k-fold cross validation procedure with a qualified Multilayer Neural Network (MNN). From experiments, the richness of knowledge is highlighted in the S-Gabor features. The collection of features therefore demonstrates its usefulness for practical use.

Key Words: Medicine, OCR, Raspberry pi, Tesseract, Text-to-speech

1. INTRODUCTION

Visually impaired people experience many challenges using existing technology to read printed text, including problems with balance, concentration, precision, mobility and performance. Reading is essential in today's world. Blind people are an integral part of our society. But their disabilities forced them to rely on others to assist with daily life tasks such as shopping, reading sign posts etc.

This has also made them to have lesser access to computers, internet 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 society. Today in the world there are more than 30 crore people who

are visually impaired, out of which more than 4 crore people are blind.

Expiry date of the product is important information for consumer. Due to the pencil stamping process, packaging phase and many other constraints, expiry date faces some difficulties on the production line. Also, the product expiry date may appear distorted and get damaged in the storage period, and the characters may be distorted.

Too, the character image may be skewed; the thickness and the shape of characters are incoherent. Despite the importance of this information in our daily use, it is not treated before in literature. This project presents an automated vision approach for product Expiry Date Recognition (EDR).

The proposed EDR system can be divided into four main modules: pre-processing of the expiry date file, segmentation of the expiry date code, extraction features and finally classification of the numerals. The input image is binarized in the first stage using morphological operator.

The segmentation then is carried out using vertical projection. Then, output of Stretched Gabor (S-Gabor) filters such as Fourier Magnitude (FM), Local Energy (LE) and complex moment with statistical features is extracted from a set of features. Finally, Multilayer Neural Network (MNN) is used to classify the expiry date numeral into ten classes.

The rest of the project is devoted to present an overview of the method. This section is divided into: The input image binarization, the segmentation of the numeral string, S-Gabor filters design, the features extraction steps and MNN classifier.

1.1 PURPOSE IMAGE PROCESSING

1. Visualisation-Observe non-visible objects.
2. Image sharpening and restore-Making a better picture.
3. Image retrieval-Search for interesting image.
4. Pattern measurement-Measures different objects in an image.
5. Image Recognition-Distinguish image objects.

1.2 CHARACTERISTICS OF IMAGE PROCESSING

Image is transformed into a digital image before progressing with it. Digitization requires image scanning and the quantization of sampled values. Processing is done after the image has been converted to bit information. This processing technique can include Image enhancement, Image restoration, and compression of images.

Image enhancement:

It refers to the accentuation, or sharpening, of image features such as margins, or contrast to make a graphical display more usable for display & analysis. This process does not increase data value inherent in the information. This involves manipulation of the gray level & contrast, noise reduction, edge crisping and sharpening, filtering, interpolation and magnification, pseudo-coloring, etc.

Image restoration:

It's all about filtering the observed image to mitigate degradation results. The efficacy of image restoration depends on the extent and quality of the information about the process of degradation as well as on the nature of the filter. Image restore varies from image enhancement, since the latter is concerned with more image extraction or accentuation.

Image compression:

It's about minimizing the number of bits needed to display an image. Compression uses include television broadcasting, satellite remote sensing, aircraft military communication, radar, teleconferencing, facsimile delivery, educational and business records, computer tomography medical images, optical radiology and magnetic resonance imaging, motion, picture.

- Text compression – CCITT GROUP3 & GROUP4
- Still image compression – JPEG
- Video image compression – MPEG

1.3 ADVANTAGE OF IMAGE PROCESSING

- Images are produced quicker and more cost-effectively. One requires less processing time, and less film and other equipment for photographing.
- Processing the photos is more environmentally friendly. There is no need to process or patch chemicals for digital images to be taken and stored. Printing inks are therefore important for digital image printing.
- When shooting a digital image, one can see whether the picture is successful or not right away.
- It is easy to copy a digital file, and the image quality remains good when compressed. Keeping an image as a jpg-format, for instance, compresses the file. The compressed image will be recompressed by resaving

the image as a jpg file, and the quality of the image will get worse with every saving.

- Easier picture updating and retouching. With new Photoshop 7, smoother face wrinkles can be rendered in a few seconds with a new Healing Brush Tool.
- Faster and cheaper recovery (as opposed to restoring the image with a repro camera).
- The image can be used on a variety of platforms by adjusting file size and resolution.

2. LITERATURE SURVEY

There are numerous applications focused on helping visionless people in many ways such as, the application which detects Quick Response Code (QR Code) of the products, decodes it and convert text to speech to give speech output regarding product name [1]. The mobile application which is intended to read the barcode of the product and decoding it to provide expiry date [2] but QR code and Barcode are not available in most products. Reliability of decoding the barcode to obtain text remains as an issue.

Another application used to find the product using RFID tags, in this the details about requirement of products has to be updated before entering into supermarket. This system locates the required products by providing Buzzer sound [3]. Product identification and navigating in indoor place by detecting obstacles on the way, so this application lets the visually impaired people in autonomous shopping. Here the mobile application which reads RFID and QR code is implied to find product [4].

Similar to the above-mentioned application another system which involves in identifying product in pantry and also navigating the user to nearby shops like supermarket, medical shop, etc. [5]. Another application which requires the help of shopkeeper or pharmacist to enter the product detail like expiry and quantity so that automatic refill of required product id possible through this application [6].

Some of the applications specified above uses OCR algorithms to detect the text in the products. An Automatic identification technique for Arabic Characters using Gobar filters is a method used to classify characters [7]. An effective method for identifying and compensating noise level in a picture is phase congruency. It is claimed that high-pass filtering should be used to obtain information on the picture at various scales. With this approach the option of scale only affects the relative sense of features without weakening their position [8].

The Optical Character Recognition (OCR) system is a two-layer Probabilistic Neural Network (PNN) with topology 108-180-36, the efficiency of which reached 89.1 percent for whole image recognition. Based on data collected from algorithmic image processing, the PNN is trained to identify alphanumeric characters from car license plates [9]. For classification purposes K-Nearest Neighbor (KNN) is used.

Although KNN is a simple classifier, the recognition levels achieved has proven that Gobar filters are successful in statistical classification of characters [10].

Table -1: LITERATURE REVIEW ANALYSIS

Title	Year	Analysis
Product Details and Its Expiry Date Recognition through Speech	2019	This application uses the Quick Response Code detection and recognition of products via speech
Smart Store Assistor for Visually Impaired	2018	Identifying products using RFID tags. Smart cart with automatic billing
Mobile assistive technologies for the visually impaired	2018	Locate the targeted product by scanning the barcode. Obstacle detection is also possible
Indoor Navigation and Product Recognition for Blind people	2016	Indoor products identification. White cane aided with RFID reader is used.
Multitask Grocery assistance system for visually impaired	2016	Identifying objects in pantry and also identify other shops while navigating. Locating required objects and picking them
Product Barcode and Expiry Date Detection for the Visually Impaired using a Smartphone	2015	Identifying the product by scanning it through smart phones by pointing the phone towards product.
Smart trolley using Smart Phone and Arduino	2017	This application uses RFID to scan the products and sends the details to database. Shopping starts by pressing the start button.
Usage of Hough Transform for Character Extraction via Optical Character Recognition	2016	The rotation angle of an image using the Hough transform and the impact of image binarization using adaptive Gaussian threshold is used to extract character.

Expiration date tracking application	2016	visually impaired would take the app to the pharmacist when he/she buys the medicines and the medicine details and expiration dates are entered and requests for automatic refills are made.
Arabic character recognition using gabor filters	2017	A technique for the Automatic recognition of Arabic characters using Gabor filters is presented. K-Nearest Neighbor (KNN) is used for classification.
Image features from phase congruency	2019	Phase congruency is a dimensionless quantity that is invariant to changes in image brightness or contrast; hence, it provides an absolute measure of the significance of feature points.

2.1 DISADVANTAGES FROM SURVEY:

- Identification of the product only by using RFID tags.
- Specification of the product will not available.
- RFID tags need to be installed in the product.
- For navigating inside the supermarket, complete details of that place are required.
- Locating the barcode using mobile is difficult.
- User must depend on third person to know the information.

3. DISCUSSION

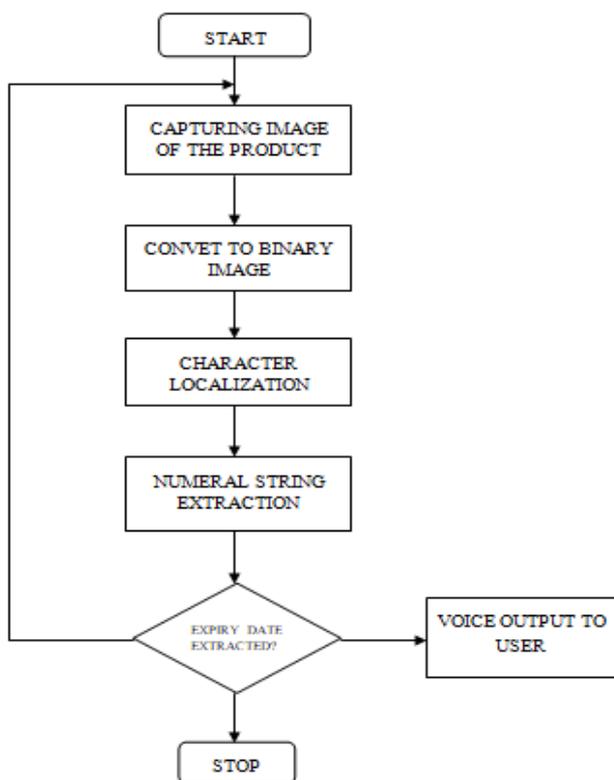
The solution can be developed based on a system for analyzing images captured with the camera module in microcontroller. In order to focus the object within the camera view a camera with wide angle is used as an approximate solution. Then the image content is extracted using OCR method (Tesseract) and to extract the required text (Expiry date and Retail price) contour algorithm can be used. After obtaining the required data it is analyzed whether the medicine is consumable and voice output regarding the results shall be given to user.

The system may include a database storing (i) a set of base object models, (ii) a set of correlation filters, and (iii) a set of convolutional neural networks (CNNs), a memory storing an image processing routine, a communication module, and a processor interfacing with the database, the memory, and the communication module. The processor may be configured to execute the image processing routine to cause the processor to receive, via the communication module, a set of images from a user interface device, access, from the database,

- i) a base object model of the set of base object models corresponding to the target image position,
- ii) at least a portion of the set of correlation filters corresponding to the base object model, and
- iii) at least a portion of the set of CNNs corresponding to the base object model, analyse the set of images using the base object model, at least the portion of the set of correlation filters, and at least the portion of the set of CNNs, to determine a set of changes to the target image as depicted in the set of images, and transmit, to the user interface device via the communication module, information indicative of the set of changes, the user interface device configured to present, in a user interface, the information indicative of the set of changes.

Text detection from an arbitrary image is a challenging task and current algorithms are not appropriate for application in real time-even on a desktop PC. In addition, there is no certainty that an identified date is in fact the expiry date. Alternative approaches to identify expiry dates must be examined. It can easily be observed that most goods can retain such types of packaging within a reasonable timeframe.

4. FLOW DIAGRAM



5. CONCLUSION

Even though different systems have been proposed for visually impaired which helps them in detecting obstacles, smart shopping assistive devices, etc. But no device involves in finding expiration detail without the support of third person. So a Smart glove that detect expiration and MRP detail is proposed. In this project, A vision approach for expiry date numeral recognition using S-Gabor based features and MLP network. The results reported in this paper show that the current set of features can achieve high performance for digit recognition using NN and SVM classifiers. From the results, the proposed approach can be generalized for many computer vision applications. In addition, the use of new set of features derived from Gabor filter can be considered encouraging for character recognition. This study is meant to be a seed for the development of a system of recognition for many types of printed digits.

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