Extracting medicine name and expiry date from medicine strip

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Abstract: Visually challenged people and uneducated people face a lot of adverse challenges in their day to day life Most of the time they are perplexed in a new environment or surrounding due to issues related to accessibility. So, this prevents them from experiencing the world in the same way as others do. Identifying and accessing things is something many of us may take it for granted. But the visually challenged people are curbed by their disability. Especially in a medicine taking scenario, it is difficult for them to find whether they have identified the medicine correctly or not. They will have to seek others help for it. Moreover, a mobile application will be easy to use and the hardware needed is very limited. We have proposed a system in order to expedite easy and innate ways to find the medicine name and expiry date from its packaging for the visually impaired people. In this system, the pictures of the medicine strip held in the hand are captured by the inbuilt camera of the wearable device. The image is processed and consequently text localization and extraction is done by which the name of the medicine and expiry date is identified**.**

Index Terms **- Optical Character Recognition (OCR), Python, Medicine Strip, Computer Vision, Natural Language Processing, Text Classification.**

I. INTRODUCTION

Proposed According to the World Health Organization (WHO) statistics, there are approximately 285 million visually impaired people in the world, of which 140 million are elderly people over the age of 50, and 110 million of these visually impaired elderlies suffer from multiple chronic diseases. It is known that people's physiology is degraded with age. In the case of multiple medications usage, these 110 million vulnerable visually impaired elderly people would be more likely to take the wrong medicines.

On the other hand, the number of irrational drug deaths in the world has already accounted for one-third of the deaths of the disease. The mistakes in drug use of these visually impaired patients will cause great medical losses, and the visually impaired have no life support in this regard.

Also, we observed that people don't understand medicine terms or people who don't have the knowledge of English language, they have hard time reading the medicine name.

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. The ability of people who are blind or have significant visual impairments to read printed labels and product packages will enhance independent living and foster economic and social self-sufficiency.

II. LITERATURE SURVEY

In [1] Dr D.Jayashree, Rajalakshmi Institute of Technology, Chennai, India, they have proposed a system which makes use of grey scale conversion, edge detection technique to extract medicine name from the image. However, this works for the ideal condition when there is only single text on the packaging. Medicine strip has bunch of texts on it. So, extracting medicine name would be difficult task.

In [2] Analytical The Chucai Yi, Student Member, IEEE,2013 in the work proposed a camera-based assistive text reading framework to help blind persons read text labels and product packaging from hand-held objects in their daily lives. This paper proposes a Gaussian based approach in which initially the object of interest is identified, followed by region of interest identification and performing various image processing operations on the identified image to retrieve the desired text. Here the object from which the text is to be extracted is isolated from the background by shaking the object using motion-based object detection. The captured series of frames are analyzed to find the foreground object followed by applying mean of the estimated foreground masks. Then the region of interest is found where the text is localized based on edge or textural properties and finally the desired text is extracted.

In [6], This paper introduces a system that can detect text in any document including medical reports and recognizes a drug that can help the visually impaired without being blocked by a third party and motivate them to live longer. The system assists these

people with mobility and can also verify medication details. The proposed program is implemented using a smartphone and an android system. Users can start the app by moving the phone. Information is stored on the MySQL website via the TOMCAT server. After scanning, the text detector detects the drug and transmits it to a server. It tests and adheres to medications and when to take them. At the appropriate time to take the medication, the server sends a notification and finally after receiving the information, it is converted into speech.

In [7], This paper proposes text to speech device for the visually impaired including Raspberry Pi. The system structure consists of two main modules: an image editing module and a voice processing module. Once the Raspberry Pi camera has taken a photo, as part of the photo correction, gray measurement and binary options are performed. Then the image processing module uses tesseract OCR and directs the text. User takes a photo with a GPIO PIN. Once the text is released, the TTS correction and voice module translate it into speech. The Flite and speak supported by Raspberry Pi is used for this.

In [8], the authors have applied for the visually impaired. Provides complete assistance in cases of drug use using label reading. This program has the potential to remind patients when to take medication. By means of visual elements, medicine boxes are obtained. Edge detection, color reduction is some of the techniques used. Each drug is registered with an audio and image file before the application begins. Finally, when they scan the medicine box with the camera, it tells them whether to choose the right one or not.

In [9], The authors propose a system to get a hand-held object in real time to help the visually impaired. The proposed system reads text from a camera captured. The framework consists of three stages namely - scanning, data processing and audio output. The data processing unit is trying to find text patterns. The MESR algorithm is used to detect blobs in images. After OCR detects the text, the Microsoft speech software development kit plays audio output. The paper shows that high performance can be achieved using MESR and OCR for text acquisition and recognition.

In [10], the authors propose a medical aid diagnostic program for the visually impaired. The system works in two parts: 1) The drug pill and 2) the medicine box. Turkish Journal of Computer and Mathematics Education Vol.12 No.14 (2021), 748 - 755 750 Research Article Drug pills are identified based on their characteristics. Sobel edge detector morphological operations are used for the same. Once a person has picked up a pill from a box, its label is extracted using OCR and is matched to the templates found in the databases.

PROPOSED SYSTEM ARCHITECTURE

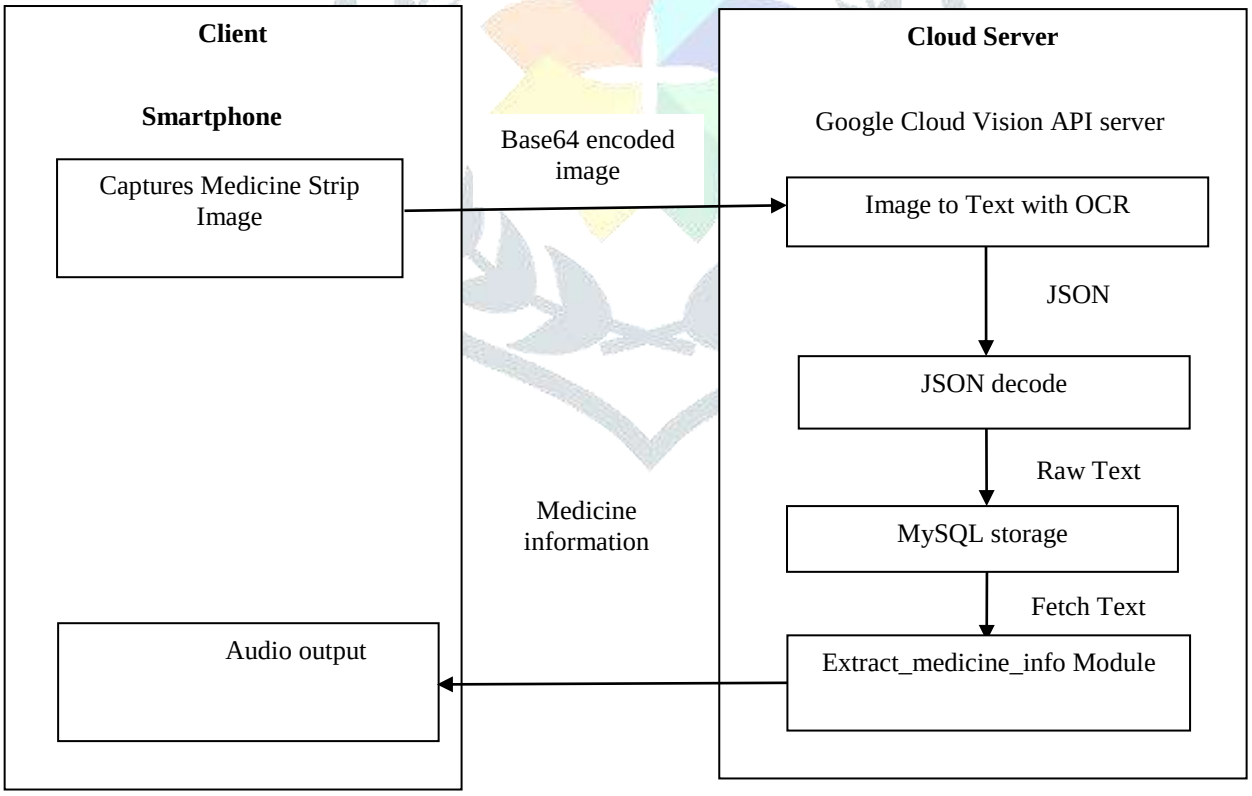


Figure 1: Proposed system architecture

The proposed system as shown in Fig.1, follows client-server architecture. We have developed a mobile application for visually impaired and blind people to identify medicine name and expiry date on medicine strip. The user will take the photo of handheld medicine strip. An image will be sent to the server. The server will extract medicine information and send information to the client. The mobile application on the mobile device will convert it into voice.

III. METHODOLOGY

3.1 DATASET

The dataset contains of 510 images of medicine strip having all the information such as different text information, size and font color. This is an unlabeled dataset.

3.2 CLIENT-SIDE PROCESS:

CAPTURING MEDICINE IMAGE:

- The user will use an existing image or capture the photo of handheld medicine strip.
- The image will be converted into base64 encoding.
- Base64 encoded data will be sent to backend API server.

JSON RESULT:

- An API server will send the medicine information containing medicine name and expiry date in JSON format. Client would decode the JSON response and using Text-to-Speech, it will generate the audio for the same.

3.3 SERVER-SIDE PROCESS:

GOOGLE CLOUD VISION API:

- The Google cloud vision – Optical Character recognition (OCR) Application Program Interface (API) provides an image to text conversion.
- It returns the JavaScript Object Notation (JSON) response which holds text extracted from the image.
- JSON response is then sent to the API server.
- The reason behind using Google Cloud Vision OCR API is that it has highest accuracy among other OCR systems available in the market.

BACKEND API SERVER

- API server receives JSON response from Google Cloud Vision (OCR) service which contains the text from medicine strip.
- System will process the text and will return medicine name and expiry in JSON format.

JSON DECODING:

- Once we receive the JSON response from the Google Cloud Vision server, PHP script will catch the response and will decode it to extract raw text

MYSQL DATABASE:

- The proposed system stores the raw text into MySQL database.
- This information remains in the database as a history and it can be used for the future use.

EXTRACT_MEDICINE_INFO MODULE

- This module is responsible for extracting medicine name and expiry date.
- First it will perform pre-processing on the raw text to remove unwanted data.
- A smart search is performed to extract medicine name and expiry date information from the data.
- The extracted date is validated for expiry.
- The medicine information containing medicine name and expiry status is sent to the client.

3.4 FOLLOWING IS THE STEP-BY-STEP METHODOLOGY USED:

MEDICINE_MEDICINE_NAME

Step 1: Client sends image to the Backend API server.
Step 2: API server will then send image to Google Cloud Vision service.
Step 3: API server receives raw text from Google Cloud Vision service which contains medicine strip information.
Step 4: Image Pre-processing:
In this stage, image is pre-processed. System will remove dirty words from the special corpus we have created.

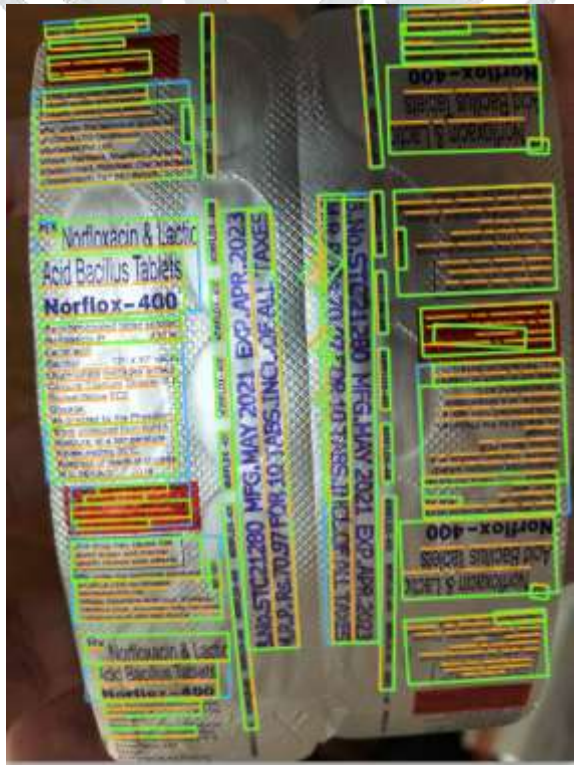
Step 5: Identification of medicine name.
This module has an algorithm to identify the medicine name. Algorithm uses Natural Language Processing to extract the medicine name out of the pre-processed text. Algorithm has identified some patterns through which it is able to find the medicine name out of it.
Step 6: Sending medicine name to the client's phone in JSON format.

EXTRACT_MEDICINE_EXPIRY

Step 1: Client sends image to the Backend API server.
Step 2: API server will then send image to Google Cloud Vision service.
Step 3: API server receives raw text from Google Cloud Vision service which contains medicine strip information.
Step 4: Image Pre-processing:
In this stage, image is pre-processed. System will remove dirty words from the special corpus we have created.
Step 5: Identification of expiry date.
This module is responsible to find the medicine expiry date from the pre-processed text information. An algorithm is developed which can identify the expiry date. Algorithm is capable of finding any type of expiry date format since it is trained with various expiry date patterns.
Step 6: System will then compare identified expiry date with the current date and then it will send the result to the client.

IV. RESULT AND ANALYSIS

The dataset contains of 510 images of medicine strip having all the information such as different text information, size and font color. This is an unlabeled dataset.



The figure 2 shows the medicine name extracted from the raw text. The second array contains which word has highest probability. Here nor has 31 so the medicine name will be Norflox 400.

Figure 2

The figure 3 indicates if the medicine has expired or not. If medicine is already expired, it will notify the user. As shown in figure 1, medicine expiry is in April,2023 so medicine is not expired yet.

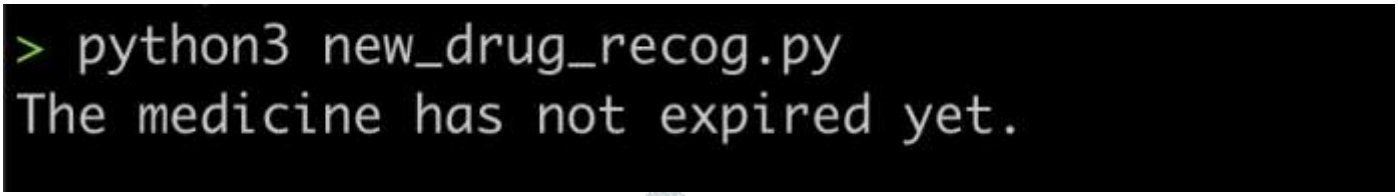


Figure 3

The model is tested against 500 medicine images. The overall accuracy was 99.4 % which is much higher than the recent work.

Expiry date: The model was able to successfully extract all the expiry out of 500 images so accuracy was 100 %
Medicine name: The model was able to successfully extract from 497 out of 500 image which gives 99.4 % accuracy.

CONCLUSION

In this research work, we have proposed a system to help visually impaired people to get correct medicine. This system also validates medicine if it is safe to take it by checking expiry date of the medicine. If the medicine is already expired then system will inform the user.

Future In the future work, intelligent system can be implemented. If medicine wrapper is split into pieces then it would be difficult to detect medicine name and expiry date. Thus, an intelligent system will be able to detect medicine and it will able to fetch medicine name & expiry date.

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