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Medicine Detection and Alert for Visually Disabled People

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ABSTRACT: Medication management is a complex process and is taken into account of daily activities. Moreover, participation in daily activities could define the wellbeing. On the other hand, the medication management process for visually impaired individuals is more difficult. Nowadays, the technologies like E-Health and RFID, have caused a significant progress in both areas of medication management systems and visually impaired Independent Living. Therefore, the aim of this work was to develop an assistive medication management system for visually impaired people in order to improve the medication adherence among them. The development process started by requirements extraction according to goal directed design methodology introduced by Cooper. Then the system, called Med Vision was developed, consisting of an android mobile application, RFID device and a medication box with vibration motors and it is developed for Iranian visually impaired individuals in Persian language. At the final step of this study, a functional assessment was performed in order to improve the system even more in next prototypes.

KEYWORDS: Medicine Strip, Computer Vision, Text Classification.

I. INTRODUCTION

The use of technological innovation in the field of healthcare continues to improve the quality of human life. Since smart devices are increasingly common and accessible to everyone everywhere, there are many types of smart applications and information systems. There are limited mobile applications for users who are visually-impaired, and those that are available fail to meet the required standard of quality, design and accessibility. “Be My Eyes” is an android application which supports voice commands. The application is developed for visually impaired people that can help patients in several ways, such as assisting their rehabilitation, monitoring and tracing their health condition, providing a consultancy service and suggestions in relation to their medication. Applications on smartphones have been specifically designed with functions that benefit people with impaired vision or have vision disability modes. Despite evidence of the existence of more than a thousand commercial health applications. Now-a-day digital technology and image capturing devices are growing rapidly. This advanced technology reached to some corner of the society like visually impaired people and older people who are struggling with their daily activities like reading, identifying known and unknown people and specially identifying daily consumable medicine. Due to perspective distortion, aspect ratio, font size, unique style, detecting text from scene image is complex job compared to the printed document. There should be some hardware device which can help the visually impaired people to detect text and identify the medicines. But such devices are costlier and need to carry such devices would make things more complex. The proposed system will help visually impaired people to detect text by converting it to voice message and identifying medicines using in-built camera and application of the smart phone.

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II. LITERATURE SURVEY

This section focuses on exploring communication methods/techniques available for blind or visually impaired people.

In this paper [1], Researchers have designed and developed a device which is to process the input Image, pdf, Documents, Textbooks, and News Papers as input into a voice as output. It also has the ability to play and stop the output while reading. The limitation for this device is that it requires more processing time and also a good lightning to process the image module.

In this paper [2], Researchers developed system is successfully able to extract the required labels of the medicines: name, price, manufacturing date and expiry date. The model is built using Nano net API. The limitation of this project was that a very small database was used so that the accuracy was also less. Proper text extraction techniques were not used.

In this paper [3], camera-based system which will help blind person for reading text patterns printed on handheld objects. This is the framework to assist visually impaired persons to read text patterns and convert it into the audio output. Limitation of this system is that it will only recognize the text from the image and convert it into audio format which is not sufficient.

In this paper [4], proposed system, feature extraction is done to recognize the pills based on structural, texture and Hu moments. If the pill is picked from the medicine box, the label present on the pill is considered for text recognition. Convolutional Neural Network is used to convert text to speech. The accuracy for this system was less in some conditions and also the proposed system faced over fitting problem

In this paper [5], YOLO, a unified model for object detection. model is simple to construct and can be trained directly on full images. Unlike classifier-based approaches, YOLO is trained on a loss function that directly corresponds to detection performance and the entire model is trained jointly. Limitation of this model is that it can be used only for object detection which can work in some particular scenarios and hence cannot be used in medical field.

In this paper [6], The proposed application tries to imitate this job for them and helps them better understandtheir medicines. The application scans the medicine content side and uses the advancedtechnologies like Tesseract optical character recognition (OCR), Computer Vision, Text toSpeech technology to extract the required information and makes it available to the user inthe form of audio. The application helps visually impaired people to independently carry outthis task without the hindrance of a third person.

In this paper [7], To develop a system that can identify indoor and outdoor objects, notify the users, and send all information to a remote server repeatedly at a fixed time interval. This paper represents an IoT-enabled automated object recognition system that simplifies the mobility problems of the visually impaired in indoor and outdoor environments. The overall accuracy of the proposed system in object detection and recognition is 99.31% and 98.43% respectively. In addition, the proposed system sends all processed data to a remote server through IoT.

In this paper [8], the point of this paper is to research the improvement of a route help for visually impaired and outwardly weakened People. It has microcontroller which has Wi-Fi inbuilt module. This guide is convenient and offers data to the client to move around in new condition, regardless of whether indoor or open air, through an easy to use interface. Then again, and so as to lessen route challenges of the visually impaired, a deterrent location framework utilizing ultrasounds and vibrators is added to this gadget. The proposed framework identifies the closest hindrance through ultrasonic sensors and it gives an alert to illuminate the visually impaired about its confinement.

In this paper [9], the aim of this article is focused on the design of an obstacle detection system for assisting visually impaired people. A dense disparity map is computed from the images of a stereo camera carried by the user. By using the dense disparity map, potential obstaclescan be detected in 3D in indoor and outdoor scenarios. A ground plane estimation algorithm based on RANSAC plus filtering techniques allows the robust detection of the ground in every frame. A polar grid representation is proposed to account for the potential obstacles in the scene. The design is completed with acoustic feedback to assist visually impaired users while approaching obstacles. Beep sounds with different frequencies and repetitions inform the user about the presence of obstacles. Audio bone conducting technology is employed to play these sounds without interrupting the visually impaired user from hearing other important sounds from its local environment.

In this paper [10], It's a known fact that estimated number of blind persons in the world is about 285 million, approximately equal to the20% of the Indian Population. They are mostly dependent on someone for even accessing their basic daily needs. In our project,we used Tensor Flow; it's a new library from Google. Tensor Flow models our neural networks. The Tensor Flow Object DetectionAPI is used to detect many objects. We have Introduce an algorithm (SSD). SSD uses a similar phase while training, to match the appropriate anchor box with the bounding boxes of each ground truth object within an image. Essentially, the anchor box with the highest degree of flap with an

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object is responsible for predicting that object's class and its location. It has microcontroller which has wi-fi inbuilt module. This guide is convenient and offers data to the client to move around in new condition, regardless of whether indoor or open air, through an ease to use interface. Then again, and so as to lessen route challenges of the visually impaired, a deterrent location framework utilizing ultrasounds is added to this gadget. The proposed framework identifies the closest hindrance through ultrasonic sensors and it gives an alert to illuminate the visually impaired about its confinement.

In this paper [11], recent advances in machine and deep learning algorithms and enhanced computational capabilities have revolutionized healthcare and medicine. Nowadays, research on assistive technology has benefited from such advances in creating visual substitution for visual impairment. Several obstacles exist for people with visual impairment in reading printed text which is normally substitutedwith a pattern-based display known as Braille. Over the past decade, more wearable and embedded assistive devices and solutions were created for people with visual impairment to facilitate the reading of texts. However, assistive tools for comprehending the embedded meaning in images or objects are still limited. In this paper, we present a Deep Learning approach for people with visual impairment that addresses the aforementioned issue with a voice-based form to represent and illustrate images embedded in printed texts. The proposed system is divided into three phases: collecting input images, extracting features for training the deep learning model, and evaluating performance. The proposed approach leverages deep learning algorithms; namely, Convolutional Neural Network(CNN), Long Short Term Memory (LSTM), for extracting salient features, captioning images, and converting written text to speech. The Convolution Neural Network (CNN) is implemented for detecting features from the printed image and its associated caption. The Long Short-Term Memory (LSTM) network is used as a captioning tool to describe the detected text from images.

In [12], In this paper, a smart stick is intended andexecuted to aid blind persons so that they can walk independentlywithout much difficulty. Firstly, pothole detection and avoidance system are implemented by setting the ultrasonicsensor at 30-degree angle on a suitable blind stick to sense if there is a hole or staircase in front of the blind at about 30 cmdistance to avoid a person from falling and as a result may be producing many damages. Secondly, a moisture sensor isplaced at the down of stick to measure the degree of water land soil moisture in forward-facing of the user and awarehim as soon as that degree exceeds a measured level that may submerge the foot of him. Thirdly, knee above obstacledetection and avoidance system is implemented by using an additional ultrasonic sensor on the top of the stick to turnan alarm and vibration ON when there is a person, obstacle or wall at a distance of 50 cm in front to avoid an accidentand thus helping the person to move independently. Fourthly, an ultrasonic sensor is placed down the stick at about 20 cmfrom the ground level to detect and avoid knee below obstacles and stairs at a distance of 70 cm in front of the user. Fifthly,a wireless remote consisting of RF modules (transmitter and receiver) is implemented, so if a person drops stick or forgetit somewhere, he can press a switch of the remote consisting of transmitter part, and as a result alarm with vibrations will
turn on, so the user can know the location of the stick. The stick is implemented practically using single wheel leg blinding cane, Arduino microcontroller three ultrasonic sensors RF modules. Also, two buzzers and two vibration motor are used on the stick to fit on when any difficulties occur.

In this paper [13], Blind stick is a progressive stick designed for visually disabled humans for advanced navigation. The guy has been struggling with illnesses and weird. Visually challenged human beings are the ones that are hard to cope with of their manner. The main purpose of this paper is to feel the visually challenged people like a normal person with a higher navigation device. This smart walking stick is newer than traditional walking sticks. It makes use of a microcontroller to discover a barriers in the front, left, proper aspect, and additionally directs up-right all the way down to a man or woman. It is primarily based totally on ultrasonic sensors for distance size property. There is a voice playback module for displaying obstacles, which makes it possible to use sensors to track the path of obstacles around men or women with visual impairments. Also, a receiver and battery are attached to a stick to make it durable. This stick includes LDR that's used to come across darkish area round them.

In this paper [14], Over the last few decades, the development in the field of navigation and routing deviceshas become a hindering task for the researchers to develop smart and intelligent guiding mechanism atindoor and outdoor locations for blind and visually impaired people (BVIPs). The existing research needto be analyzed from a historical perception including early research on the rst electronic travel aids tothe use of modern artificial vision models for the navigation of BVIPs. Diverse approaches such as: e-caneor guide dog, infrared-based cane, laser based walker and many others are proposed for the navigation ofBVIPs. But most of these techniques have limitations such as: infrared and ultrasonic based assistance hasshort range capacities for object detection. While laser based assistance can harm other people if it directlyhit them on their eyes or any other part of the body. These trade-offs are critical to bring this technologyinpractice. To systematically assess, analyze, and identify the primary studies in this specialized ledandprovide an overview of the trends and empirical evidence in the proposed field. This systematic researchwork is

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performed by determining a set of relevant keywords, formulating four research questions, deningselection criteria for the articles, and synthesizing the empirical evidence in this area.

In this paper [15], Blindness or say eye disability is the most worrying problem among the people. Visuallydisabled people find difficulties to travel or say navigate. The Visually Impaired System (VIS)supports this process by providing key facilities a short-range system for detecting obstacles,a short-range system for identifying obstacles, a signboard recognition system, and a shortestpath guidance system for source to destination. Obstacle Detection, Distress Calling, GlobalLocation Tracking, Voice Command Functionality & Shortest Route Guidance are all realtimefeatures of this system. The aim is to build a program that will direct visually impairedpeople to reach the desired destination and help them understand the natural world aroundthem. The blind or visually impaired mainly rely on their other senses such as sound, touchand smell to understand their environment. They find it pretty hard to go out alone, not tomention toilets, subway stations, restaurants etc. The visually impaired program aims atgiving blind people great exposure to their environment.

III. PROPOSED SYSTEM ARCHITECTURE

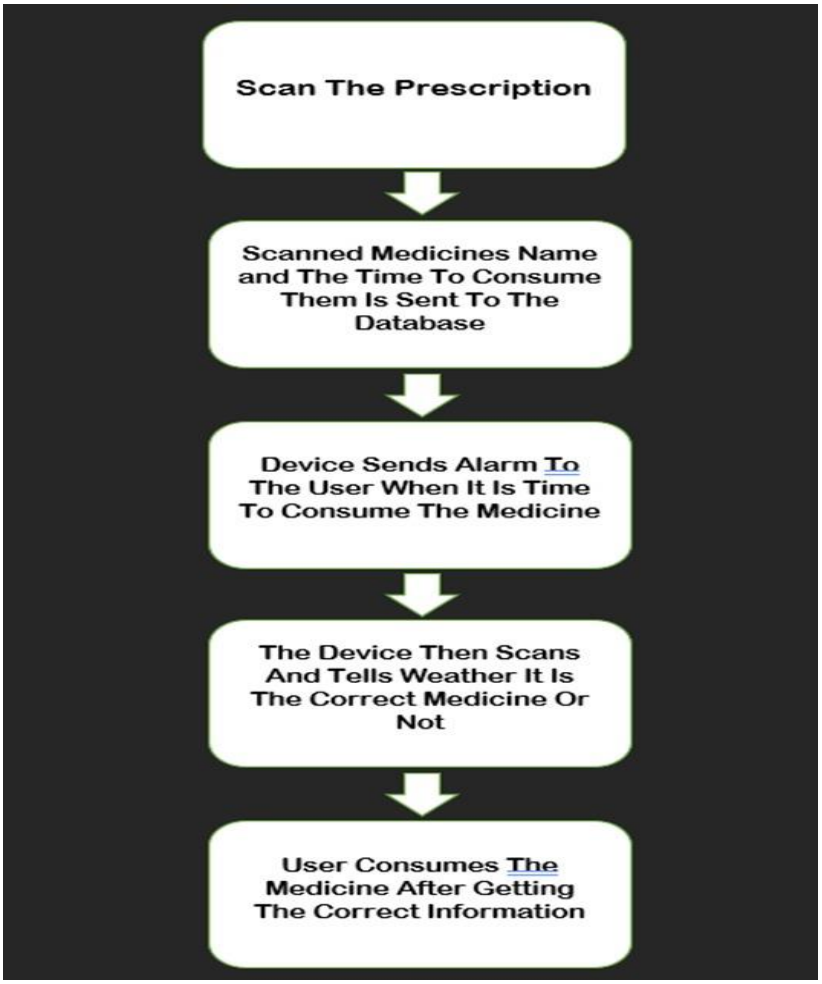

Figure 1: Proposed System Architecture

The user gets a reminder as a voice output which tells when to take the medicines and this reminder is set based on doctor's prescription The reminder also gives the information whether the medicine should be taken before food or

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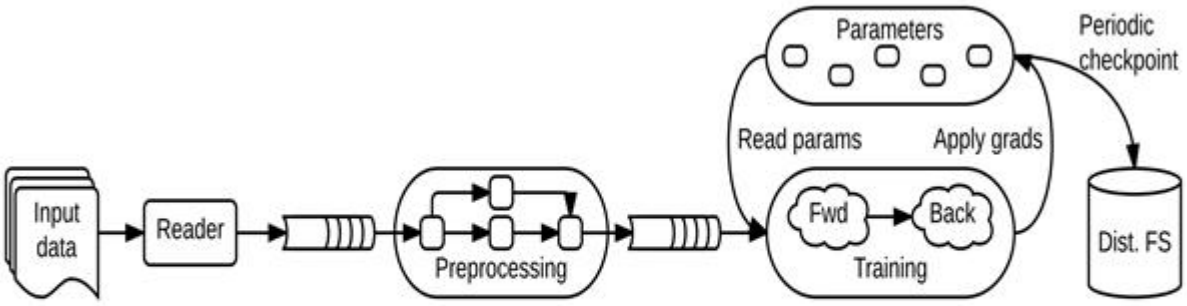
after food Before the user could take the medicine, it would be good if he could know if the medicine he has in his hand is the correct one or not. In order to facilitate this, the application allows the user to search for the medicine details and retrieve information about the medicine using.

III. METHODOLOGY

TensorFlowis an interface for expressing machine learning algorithms, and an implementation for executing such algorithms. A computation expressed using Tensor Flow can be executed with little or no change on a wide variety of heterogeneous systems, ranging from mobile devices such as phones and tablets up to large-scale distributed systems of hundreds of machines and thousands of computational devices such as GPU cards. The system is flexible and can be used to express a wide variety of algorithms, including training and inference algorithms for deep neural network models, and it has been used for conducting research and for deploying machine learning systems into production across more than a dozen areas of computer science and other fields, including speech recognition, object detection , robotics, information retrieval, natural language processing, geographic information extraction, and computational drug discovery.



A schematic TensorFlow dataflow graph for a training pipeline contains subgraphs for reading input data, preprocessing, training, and checkpointing state.

Fig 2. Algorithm Classification

We implement Tensor Flow as an extensible, cross platform library. Figure illustrates the system architecture: a thin API separates user-level in various languages from the core library. In this section, we discuss the implementation of the various components. The core Tensor Flow library is implemented in for portability and performance: Detection of images or moving objects have been highly worked upon, and has been integrated and used in commercial, residential and industrial environments. But, most of the strategies andtechniques have heavy limitations. One of the limitations is due to low computational resources at user level. Other important limitations that need to be tackled are lack of proper data analysis of the measured trained data, dependency on the motion of the objects, inability to differentiate one object from other, and also concern over speed of the object under detection and IL luminance. Hence, there is a need to draft, apply and recognize new techniques of detection that tackle the existing limitations. In our project we have worked upon a model based on Scalable Object Detection, using Deep Neural Networks to localize and track people, cars, potted plants and 16 others categories in the camera preview in real-time.

Image pre-processing is an essential step of detection in order to remove noise such as hair clothing and other artifacts and enhance the quality of original image. The main purpose of this step is to improve the quality of skin image by removing unrelated and surplus parts in the back ground of image for further processing. Good selection of preprocessing techniques can greatly improve the accuracy of the system. Image segmentation is a technique to determine the shape and size of the border. It separates the object from its background based on different features extracted from the image. After removing the noise and hair from the lesion area, the lesion needs to be separated from

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the medicine. Selected features are used for the recognition and classification of benign and malignant lesions. A wide range of classifiers can be built and used for this purpose. Classifiers such as SVM, C4.5 can be used for this purpose. A feature is a piece of information which is relevant for solving the computational task related to a certain application. Feature extraction is the process of extracting this information from an image.

IV.CONCLUSION

The developed system is successfully able to extract the required labels of the medicines: name, price, manufacturing date and expiry date. The model is built using Tensor Flow. If in case the model fails to extract any of the given information, various logics and techniques such as regex, morphological operations etc. are used. The accuracy achieved is. As a part of future study, the system accuracy can be increased by increasing the size of the database. The larger the dataset, the better the accuracy. Some pre-processing techniques other than the explored techniques like opening, closing, thresholding can also be studied for proper text extraction. The scope can further be extended to medicine bottles.

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