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Survey towards Drug Pill Recognition with Deep Learning

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Abstract. The natural process of aging is usually marked by the loss of faculties like memory or vision. These changes make it difficult for senior citizens to conduct daily duties, which can occasionally put them in danger. One of the most pertinent is associated with incorrect drug intake or even forgetfulness. Elderly people's health and lives are seriously threatened by these kinds of mistakes. Furthermore, the technological solutions currently in use to address this issue are geared toward experts or the general public, ignoring the needs of the elderly in particular. To address this lack of assistance, an image processing tool will be introduced, marking the beginning of a more comprehensive collection of tools designed with senior citizens in mind. This proposal's procedures comprise the following:

1 Overview

As people age, they also lose some of their talents, such their memory and vision, which puts them in danger. A typical one has to do with medicine. Elderly people frequently forget or fail to take their medications as prescribed, which can cause major health problems. However, when people become aware of this circumstance, their confidence is undermined, necessitating assistance to alter the condition. The disparity between taxpayers and recipients will continue to widen annually due to the state of affairs in Europe. It is extremely unlikely that the health care system will provide this assistance. As a result, an alternate solution based on current technology trends—mobile devices—is suggested for this system. This answer is a subset that comes from

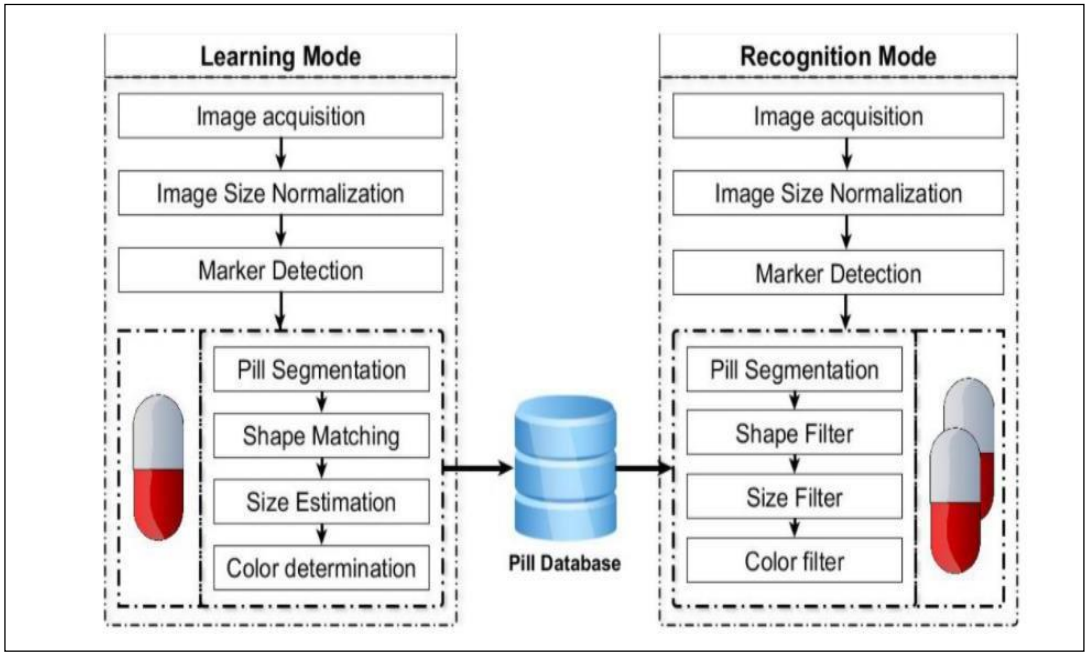
Generally speaking, older individuals with vision impairments will be more prone to forget to take their prescription or to take it incorrectly. The subject was also mentioned in the study. Therefore, it is anticipated that drug usage errors involving visually impaired patients may result in significant medical losses, and these patients might not have access to adequate care in this area. We examine the necessity of a method for visually impaired chronic patients to recognize medication pills in order to address this issue. The suggested approach can help visually impaired chronic patients utilize medications safely.

The following are the goals: • Drug pill detection; • Drug pill recognition; • Text to speech conversion of pill name

Problem Statement: This project's goal is to design and develop methods for identifying drug pills.

Scope: For visually challenged chronic patients, the machine learning-based solution offers convenient drug pill recognition and medication time reminders.

Research Methodology: The steps taken in this proposal involve taking pictures and characterizing pills according to their colors, shapes, and sizes. These features are used by the system to characterize and store pill information in a local database during the learning phase. In order to give the user pertinent information about the pill being recognized, the same attributes are later identified and compared to a database in the recognition step.



System prerequisite Hardware

200 GB hard drive; 8 GB RAM

Processor: Nvidia Camera Software Resources; GPU: Nvidia Pentium i5 and above Technology Needed: Python IDE for Python

System software: Windows XP or later

The review of drug pill recognition for people with visual impairments is presented in the paper. Section I provides an overview and introduces the topic. While section III provides the suggested methodology for the system, section II examines a literature survey conducted over a small number of publications and datasets created for recognition.

2 Review of Literature

Various researchers have proposed various techniques. This section has presented a few of the techniques. In order to promote the safe use of medications, numerous related functions, including drug pill recognition and prescription reminders,

Tzu-Chın Yang, Cheng-PeıLın, Wan-Jung Chang (Member, Ieee), Lıang-BıChen (Senior Member, Ieee), Chıa-Hao Hsu, Jheng-Hao Chen, etc. "MedGlasses: A Deep Learning-Based Wearable Smart-Glasses-Based Drug Pill Recognition System for Chronic Visually Impaired Patients"

Globally, there are over 285 million visually impaired persons, 140 million of whom are over 50. 110 million of them have several chronic illnesses, which makes prescription errors more likely. In order to solve this problem, the study presents MedGlasses, a deep learning-based drug pill recognition system that uses wearable smart glasses to guarantee that visually impaired people take their medications safely. MedGlasses consists of a cloud-based platform, a smartphone app, smart glasses, and an AI-powered recognition box. 95.1% accuracy in the experimental results lowers the possibility of giving the wrong drug and improves patient safety.

Joseph Abraham Sundar K., Prabu S. "Deep Learning Algorithm-Based Real-Time Pill Detection and Recognition Framework"

Oral pills, including tablets and capsules, are among the most often used dosage forms in medicines because they are more stable and convenient to administer than forms like syrups or injections. Nonetheless, misidentifying pills is a common problem in medical facilities as well as after they are delivered to patients. This research presents a deep learning algorithm-based real-time system for pill detection and recognition. Three main models are included in the framework: text detection, pill strip identification with YOLOv5, and a recognition module that extracts important data like the price, expiration date, and name of the pill. High recognition accuracy was attained by the framework in spite of issues with image quality.

CF Chen, HY Chiu, SL Chung, and HW Ting "A drug recognition model created with deep learning technologies: a Taiwanese medical center's experience"

Patient safety depends on the proper prescription being written, and pharmaceutical errors—especially with "look-alike and sound-alike" (LASA) drugs—are a serious problem. There are drawbacks to the current LASA error prevention methods. Identification has been transformed in many domains by deep learning approaches, which may lead to advancements in this field as well. This study attempts to comprehend the identification confusion that exists by using a baseline deep learning drug identification (DLDI) system. That occurs with LASA drugs by analyzing how deep learning models simulate cognitive processes, offering new insights and possible solutions for better drug identification

*WJ Chang, LB Chen, CH Hsu, CP Lin, TC Yang "A deep learning-based intelli-gent medicine recognition system for chronic patients"*This paper introduces **ST-Med-Box**, an intelligent medicine recognition systempowered by deep learning, aimed at assisting chronic patients in managing multiple medications and preventing drug interactions. The system includes a recognition device, a mobile app, a deep learning server, and a cloud-based platform. It also offers features like medication reminders and chronic patient management. With the ability to recognize eight different medicines, the system achieved a recognition accuracy of 96.6%, helping reduce medical errors and ensuring a safer environmentfor chronic disease patients.

F. Medeiros, M. Souza, A. Carneiro, and A.D. Ushizima. Accurately identifying pills has become crucial for patient care and safety. "Investigating pill recognition methods for a new national library of medicine image dataset" This research explores descriptors for pill recognition and characterization using the recently open National Library of Medicine (NLM) pill picture database. In order to assemble pill groups with priors based on FDA recommendations for pill physical qualities, authors discuss efforts to investigate algorithms to segment NLM pill images automatically and extract many aspects. We make three contributions to the automation of pill recognition: we assess the 1,000 most widely used medications in the US, and we supply masks and feature matrices for the NLM reference pill images to ensure reproducibility.

P. Perillan, A. Z. Yaniv, J. Faruque, S. Howe, K. Dunn, D. Sharlip, and A. Bond. "A preliminary report on the image recognition challenge for medicine pills in the National Library."

Using its authoritative RxIMAGE collection, the U.S. National Library of Medicine announced a challenge competition in January 2016 to develop and discover high-quality algorithms and software that rank how well consumer images of prescription pills match reference images of pills. The necessity to quickly identify unknown prescription medications for both the general public and medical professionals served as the impetus for this project. Potential advantages of this feature include the capacity to validate the pill in situations when the medication and documentation have been separated, like during an emergency or disaster; and the ability to authenticate a pill when

K. Jiang, R. Gupta, M. Gupta, and B. R. A. Calix. "Deep gramulator: Using deep learning to increase accuracy in the classification of tweets about personal health experiences" "

Pharmacovigilance is one field of health surveillance, which is a crucial responsibility to monitor events pertaining to human health. The safe use of pharmaceutical items is tracked and observed by pharmacovigilance. Because individuals share their own health-related experiences on Twitter, data from this platform can be used for this objective. Nevertheless, there is a problem with Twitter data: it is noisy. Consequently, a strategy is required to eliminate the noise. This paper builds classifiers that can assist in detecting these Personal Experience Tweets (PETs) using a variety of machine learning approaches, including deep neural nets. Lastly,

L.-B. Chen, C.-H. Hsu, C.-P. Lin, T.-C. Yang, and C. W.J. Chang. "An intelligent medicine recognition system for chronic patients based on deep learning"

In this paper, the ST-Med-Box deep learning-based intelligent medication recognition system is proposed. In addition to offering other medication-related features like medication information, chronic patient information management, and timely medication reminders, the suggested system can help chronic patients take multiple medications correctly and avoid taking the incorrect ones, which could result in drug interactions. An intelligent medicine recognition device, an Android-based mobile application, a deep learning training server, and a cloud-based management platform make up the suggested methodology. The suggested methodology can currently identify 80 distinct medications.

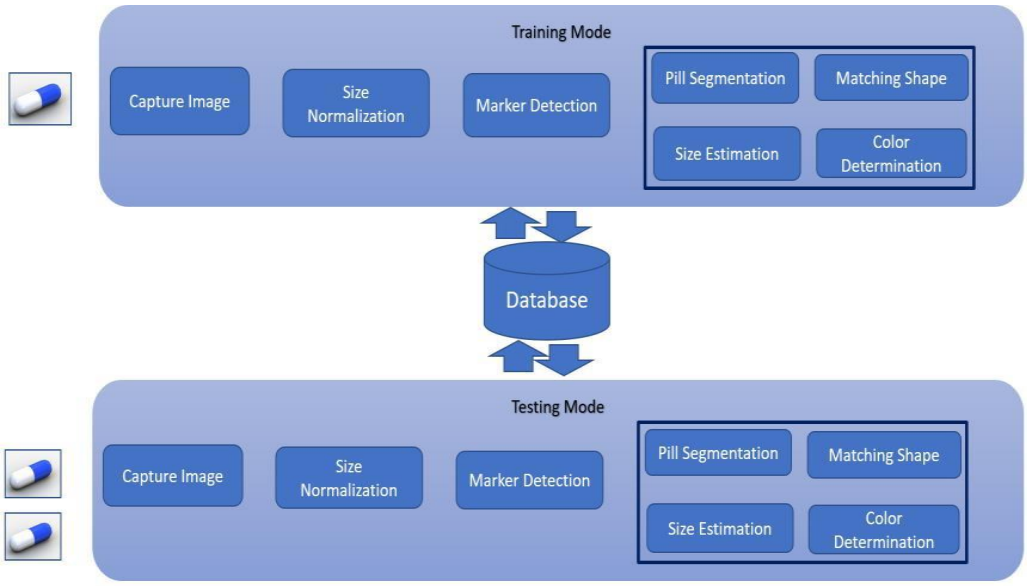
*A.M. Ervasti, M. Isomursu, and I. I. Leibar. "Touch- and audio-based medication MAmanagement service concept for vision impaired older people "*The service conceptallows older users with vision impairments to manage their daily dications autono- mously by providing them means to identify medicines and retrieve personal med-ication information. In order to demonstrate the feasibility of the concept, an early prototype called Blind NFC was implemented. It is a NFC enabled PDA with a basic functionality of reading the medicine name and dosage information aloud by touch-ing the medicine package. Findings revealed that older users learned and used the basic functionality of touch- and audio-based system quite easily. They found po- tential value in the technology also in tagging and identifying other everyday phys-ical objects than medicine packages and using their own self recorded audio mes-sages for marking objects.

Automatic drug pills detection based on en-hanced feature pyramid network and convolution neural networks.	A convolution neural network-based detector is proposed in this work to overcome the difficulties and to assist patients in drug identification. The proposed system includes a localisation stage and a classification stage
"Pill Image Classifica- tion using Machine Learn-ing,"	Authors propose an automatic classification system for pill images based on their shape and color. Thus, they use image processing techniques to specify an attribute set used by Support Vector Machines and Multilayer Perceptron classifiers.

"MedGlasses: A Wear- able Smart-Glasses-Based Drug Pill Recognition System Using Deep Learning for Visually Im- paired Chronic Patients,"	Two types of deep learning modules are usually used for ob-ject detection. The first module is an object position detection module, such as an R-CNN the module you only look once (YOLO) ,The second is an image classification module, such as an Inception series module a residual network (ResNet) moduleor a mobilenetv1 module.
"Machine Learning- based Pharmaceutical Tablet Inspection and Recognition Techniques – A Review",	The paper compares deep learning and machine learning techniques in the current state-of-art. The methods analyzed find application in the tablet production industry, drug identificationby customers and packaging industry.
Medication utilization problem among blind pop-ulation in Nepal",	This study was done to highlight the medication utilization status of the blind population in Nepal. Most of the people de- pend upon touchable markings or assistance from others in the identification of their medicines while some also identify by storing different medicines in different places

3. Architecture of the System

Image acquisition and pill characterisation based on shape, size, and color are part of the suggested process. These attributes are used by the system to characterize and store pill information in a local database during the learning phase. In order to give the user pertinent information about the pill being recognized, the same attributes are later identified and compared to a database in the recognition step.



There are two different ways that our drug pill detecting system can function. In the first mode, an image containing the marker and pill is first taken in order to create and store pill profiles. The process of obtaining an image from a source and resizing it to a standard size is known as image acquisition. When the marker is detected, the system analyzes the pill's size, shape, and color to identify it and stores all relevant data in its database for later retrieval.

The pill profile and filtering task are used to identify pills in the testing mode. Like the Training mode, the Testing mode starts by obtaining and resizing photos. The system segments the pill and carries out the filtering process after identifying the marker.

Once the shape has been estimated, the system looks for the To make applying a color filter easier, the remaining tablets are last subjected to color determination.There are three possible outcomes from the procedure: either no pill was found, one pill was found, or several pills were found.Based on its height and dimensions, the size is calculated to filter the current pill. After that, a color filter is applied to the remaining pill by subjecting it to color determination.One of three possible outcomes can result from the process: either no pill detection, one pill detection, or multiple pill detection.

In conclusion

Deep learning is the suggested method for medicine pill detection in chronic patients with visual impairments. The suggested approach, which supports safe medicine use, consists of a cloud-based information management platform, a mobile device app, an intelligent drug pill recognition box powered by artificial intelligence (AI), and a pair of wearable smart glasses. Through the use of a mobile device app, family members or caregivers can keep an eye on the medication status of visually impaired chronic patients thanks to the suggested methodology, which uploads medication information to the cloud-based management platform to create medication-use records. Therefore, the suggested approach can successfully address the issue of drug interactions brought on by taking the wrong prescriptions, lowering the expense of medical.

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