

# A Survey Paper on Drug Pill Recognition Using Artificial Intelligence

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**Abstract-** Typically, aging is a natural process characterized by loss of vision and memory. These transformations interfere with seniors' quotidian tasks sometimes leading to dangerous situations for senior adults. One of the most relevant is related with the wrong ingestion of medication. Errors of this kind represent a very real threat to the health and lives of elders. Furthermore, the existing technological solutions concerning this problematic, are designed for professionals or general public disregarding elderly needs in particular. In order to overcome this lack of support, it has been presented an image processing tool, which is the first step for a larger toolset adapted for elderly persons, under construction. The proposal follows procedures including image acquisition and pill characterization based on its shape, dimensions and colours. The information on pills stored on the local database is used in the learning step to describe and store the system. Later, in the recognition step, the same features are determined and compared against database to provide the user with relevant information related to the pill under recognition.

**Keywords-** health care, visually impaired, drug pill recognition, image processing, CNN

## I. INTRODUCTION

Ageing brings to a person loss of capabilities such as vision and memory, exposed to dangerous situations. A common one is related with medication. The elderly tend to forget or fail the correct ingestion of medication which can lead to serious health damages. When they realize this situation, their self-confidence gets weakened, and they need support to change this scenario. The situation in Europe - increasing the imbalance between taxpayers and beneficiaries every year. It is highly unavailable that this support arises from health care system. Thus, in this system, it is proposed an alternative solution based on technological trends, namely mobile devices. The development of the solution is by computer vision techniques to help the elderly identify their medication, the formulation of the solution is a subset belonging to wider computer vision techniques for elderly, the formulation of this solution is a subset belonging to pill identification task, aiming a reinforcement of confidence and autonomy [9].

In general, visually impaired elderly people will be more likely to take the wrong medicines or forget to take their medication. The study also reported that the subject. Such errors in drug use affecting visually impaired patients are expected to cause high medical losses, and such patients may not have access to sufficient support in this regard. This problem is overcome by considering the need for a way to identify pill prescriptions for visually impaired chronic patients. The proposed system can support the medication-use safety of visually impaired chronic patients [7].

The paper states the review for drug pill recognition for visually impaired person. The section I is introduction of subject and gives overview. The section II considers literature survey done over few papers and datasets formed for recognition while section III gives proposed system for the system.

## II. LITERATURE REVIEW

Different approaches had been presented by different researchers. Some of the methods have been presented in this section. To provide related functionalities (such as drug pill recognition and medication reminders) to facilitate safe medication use, many related tools have been developed and assessed.

A. D. Ushizima, A. Carneiro, M. Souza, and F. Medeiros. "Investigating pill recognition methods for a new national library of medicine image dataset"

Correctly identifying pills has become a critical task in patient care and safety. Using the recently released National Library of Medicine (NLM) pill image database, this paper investigates descriptors for pill detection and characterization. Authors describe efforts in investigating algorithms to segment NLM pills images automatically, and extract several features to assembly pill groups with priors based on FDA recommendations for pill physical attributes. Our contributions toward pill recognition automation are three-fold: we evaluate the 1,000 most common medications in the United States, provide masks and feature matrices for the NLM reference pill images to guarantee reproducibility of results, and discuss

strategies to organize data for efficient content-based image retrieval.

*B. Z. Yaniv, J. Faruque, S. Howe, K. Dunn, D. Sharlip, A. Bond, P. Perillan. "The national library of medicine pill image recognition challenge: an initial report "*

In January 2016 the U.S. National Library of Medicine announced a challenge competition calling for the development and discovery of high-quality algorithms and software that rank how well consumer images of prescription pills match reference images of pills in its authoritative RxIMAGE collection. This challenge was motivated by the need to easily identify unknown prescription pills both by healthcare personnel and the general public. Potential benefits of this capability include confirmation of the pill in settings where the documentation and medication have been separated, such as in a disaster or emergency; and confirmation of a pill when the prescribed medication changes from brand to generic, or for any other reason the shape and color of the pill change. This is an initial promising step towards development of an NLM software system and application-programming interface facilitating pill identification.

*C. R. A. Calix, R. Gupta, M. Gupta, and K. Jiang. "Deep gramulator: Improving precision in the classification of personal health experience tweets with deep learning "*

Health surveillance is an important task to track the happenings related to human health, and one of its areas is pharmacovigilance. Pharmacovigilance tracks and monitors safe use of pharmaceutical products. Twitter data can be used for this task given that users post their personal health related experiences on-line. One problem with Twitter data, however, is that it contains a lot of noise. Therefore, an approach is needed to remove the noise. In this paper, several machine learning algorithms including deep neural nets are used to build classifiers that can help to detect these Personal Experience Tweets (PETs). Finally, we propose a method called the Deep Gramulator that improves results. Results of the analysis are presented and discussed.

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

This paper proposes an intelligent medicine recognition system based on deep learning techniques, named ST-Med-Box. The proposed system can assist chronic patients in taking multiple medications correctly and avoiding in taking the wrong medications, which may cause drug interactions, and can provide other medication related

functionalities such as reminders to take medications on time, medication information, and chronic patient information management. The proposed system consists of an intelligent medicine recognition device, an app running on an Android based mobile device, a deep learning training server, and a cloud-based management platform. Currently, 80 different medicines can be recognized by the proposed system.

*E.M. Ervasti, M. Isomursu, and I. I. Leibar. "Touch- and audio-based medication management service concept for vision impaired older people "*

The service concept allows older users with vision impairments to manage their daily medications autonomously by providing them means to identify medicines and retrieve personal medication 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 touching the medicine package. Findings revealed that older users learned and used the basic functionality of touch- and audio-based system quite easily. They found potential value in the technology also in tagging and identifying other everyday physical objects than medicine packages and using their own self recorded audio messages for marking objects.

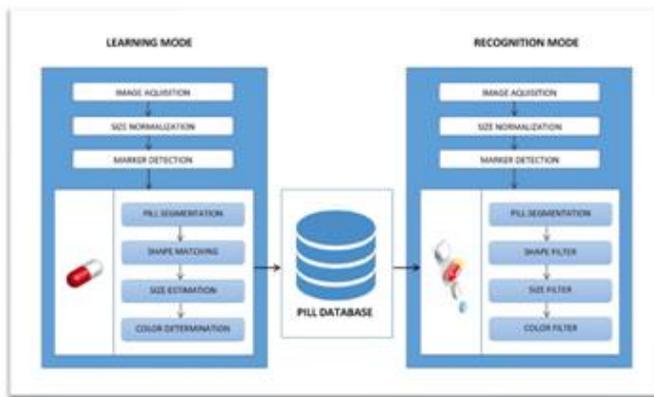
### III. ALGORITHMS

1. Canny Edge detection- A Canny edge detector is a multi-step algorithm to detect the edges for any input image. It scans the image pixel-by-pixel to identify the edges of the pills [9].
2. R-CNN (Region-based Convolutional Neural Network)- This algorithm is used to detect the shape of the pill which is complex to detect and it uses complex neural network for scanning shape, size and color of the pill [6].
3. Optical Character Recognition (OCR) – This algorithm allows to scan the image and convert the typed or handwritten text or messages into machine-recognizable text [7].

### IV. SYSTEM ARCHITECTURE

The Below figure demonstrates the basic architecture of the proposed system [9]. The system will be consisting of two major modules

- a) Learning Mode and
- b) Recognition Mode.



#### - Learning Mode:

This mode is specifically intended to be handled by the caretaker, where they will be supposed to capture an image of the medicine the visually impaired patients have in their prescription and add the sufficient details of the medicine in the pill database along with the appropriate text-to-speech output that would be audible to the end user. This learning process will include various steps such as image capturing, size normalization, pill segmentation and size-shape-colour determination before registering the pill to the database.

#### - Recognition Mode:

This mode is specifically intended to be used by the end users or the visually impaired patients, where they will also first have to capture the image of the pill they wish to identify. This process of recognition will also go through the steps in the same way as the learning mode such as shape-size-colour determination for proper identification of the pill. Also as a result this mode will return text and well as voice output of the pill details available in the pill database which were registered by the particular caretaker.

### V. CONCLUSION

Thus, we can conclude that this project will help a lot of people in the future who are visually impaired and may need help in this medication process. This reviews states proposed architecture and algorithms for drug pill recognition. The proposed system uploads medication information to the cloud-based management platform to build medication-use records, allowing family members or caregivers to monitor the medication status of visually impaired chronic patients by using the mobile device app.

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