

Smart Medical Dispenser using Digital Image Processing

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Abstract

Using digital image processing, the smart medical dispenser is a device created to assist people in better managing their medication. To recognise and organise pills, capsules, and other medications, this system makes use of digital image processing techniques. The medication is photographed by the dispenser's camera, which is connected to software that deciphers the photos to determine the medication, dosage, and other information. When the right medication is found, the dispenser delivers it at the right time, ensuring that patients receive the right dosage. In particular for patients with chronic diseases who need many drugs, this method has the potential to completely change medication management.

Keywords: Smart medical dispenser, Digital Image Processing

I. INTRODUCTION

Digital image processing-based smart medicine dispensers are a cutting-edge innovation that could completely change the way healthcare is provided. These dispensers precisely administer medication to patients by using cutting-edge algorithms and image processing techniques. These devices can recognise different types of tablets and other medications, match them to the recommended amount, and accurately dispense them by combining computer vision and machine learning.

By lowering prescription errors, ensuring patients take the proper dosage at the right time, and eliminating unintentional overdoses, this technology has the potential to enhance patient outcomes. Furthermore, it can offer healthcare professionals useful information on patient compliance and drug adherence, enabling more individualized treatment strategies.

Smart medical dispensers are a promising advancement in this age of digital transformation that can enhance healthcare.

II. LITERATURE SURVEY

• SMART MEDICAL DISPENSER WITH PULSE METER.

A cutting-edge medical device known as a smart medical dispenser with a pulse metre combines the functionality of a smart drug dispenser with a pulse metre. This device effectively dispenses medication to

patients and monitors their vital signs using cutting-edge technologies like digital image processing, machine learning, and artificial intelligence.

The device's pulse metre measures the patient's heart rate and gives medical professionals real-time feedback. The patient's status can be tracked using this data, and treatment plans can be modified as necessary. The pulse metre may also identify irregular heartbeats, which may be a sign of potentially dangerous medical diseases including atrial fibrillation.. [1]

Digital image processing is used by the device's smart medical dispenser to precisely identify and distribute medications. To ensure they take the right dosage at the right time, patients can programmer the gadget to deliver medication at certain periods. Patients can receive reminders from the device when it's time to take their medications.

The capacity to enhance patient outcomes and medication adherence is one of the main advantages of a smart medical dispenser with a pulse metre. This gadget can assist patients in more efficiently managing their chronic diseases and lowering the risk of adverse events by giving precise medication dosages and keeping track of the patient's vital signs.[4]

Overall, a smart medical dispenser with a pulse metre is an innovative development in medical technology that has the potential to transform the way healthcare is delivered and enhance patient outcomes.[4]

- **AN IOT BASED SMART MEDICINE DISPENSER MODEL FOR HEALTHCARE.**

Innovative technology that employs the Internet of Things (IoT) to provide increased functionality in medication administration is known as an IoT-based smart medicine dispenser model for healthcare. This concept automates the drug delivery procedure and provides real-time information via a network of connected devices, such as sensors and smart devices. The Internet of Things-based smart medicine dispenser can be set up to distribute medication at predetermined times, ensuring that patients receive the proper dosage at the appropriate time. Patients can receive reminders from the device when it's time to take their medications. The use of this technology can increase drug adherence, which is important for treating chronic diseases like diabetes, heart disease, and hypertension. Additionally, the smart medicine dispenser has sensors that can track the patient's vital signs and transmit the data in real time to healthcare professionals. This information can be utilised to modify treatment programmes and stop negative outcomes. The gadget may also monitor the stock of medications and automatically place new orders when the stock is low. This IoT-based smart medicine dispenser model's ability to let healthcare professionals remotely monitor patients and alter treatment programmers as necessary is one of its main advantages. Patients with limited access to healthcare services or who live in remote areas may benefit the most from this technology. The IoT-based smart medicine dispenser paradigm is an exciting development in medical technology that could enhance patient outcomes and completely change the way healthcare is provided. With the use of this technology, patients can better manage their chronic diseases and lower their risk of unfavourable outcomes, which will eventually enhance their health and quality of life. [5]

- **PILL DISPENSER WITH ALARM VIA SMART PHONE NOTIFICATION**

A cutting-edge technology that aids patients in managing their medicine by sending reminders and alerts when it's time to take their medications is a pill dispenser with an alarm that can be notified via smart phone. By ensuring that patients take their medications at the proper time and in the appropriate dosage, this gadget is intended to avoid medication errors and enhance patient compliance.

The pill dispenser has a timer and alarm that may be set to automatically distribute medication at predetermined periods. The gadget sends a notification to the patient's smartphone and produces an auditory alert when it's time for them to take their pills. The medication's name, dosage, and any further instructions can all be customized for this notification.

To manage many prescriptions at once, patients can utilize the pill dispenser with an alarm through smart phone notification. Up to 28 doses of medication can be stored in the device, which can be set to dispense medication up to four times daily. Additionally, the device has a locking mechanism to stop patients from ingesting too many tablets by mistake. [6]

III .WORKING MODEL

Our project has 2 main parts. First part is processing, i.e; we can either use raspberry Pi or laptops, in which it is connected to the camera. Therefore, video feeds will be come out of the camera. Thus, we can extract the frames from the coming video feeds. These extracted frames will be applied for image processing, and face detection will be done. If there is any presence of face, then it starts feature extraction. After the feature extraction, it compares the frames with the database .i.e.; total face recognition will be completed. When the far recognition is one done, it ensures whether the person is in the dataset and collect his/her details to check the database. For e.g.- It checks, if the person has taken his medicine in the morning, if he/she doesn't take the medicine, we will give an instruction to the controller to open the box in which the appropriate medicine has been filled. The controller can be Arduino .The controller will rotate the corresponding servo (SG90). Once the servo is rotated, the box will be open and it will close after taking the medicine. If he/she has taken the medicine at morning, no actions will takes place and the box remains closed.

IV. EXPERIMENTAL SETUP

- **HARDWARE**

Medicine Dispenser is a prototype. The main purpose of this system is to help the patients, primarily seniors, take their medications on time in an easy way without the possibility of missing pills, also reduce the risk of over or under dosing accidentally. Not taking medications correctly can have serious consequences such as delayed recovery, illness and even death. The medicine dispenser could solve such problems by informing and alerting the patients to take the appropriate dose at the right time. Also, it provides direct communication between the patients and the caregivers as it will immediately notify the caregiver in case the patient missed his/her pill. In addition, SMD provides the user with a touch interface available as an application on their smartphone which will allow them to remotely manage and control pill schedules and usage data.[1]



fig no 1:hardware

➤ WORKING

The hardware side mainly uses two components such as Arduino and servo motor and it is connected together. The servo motor here uses is SG 90. Data bases are verified with the images and if it is similar it will ask us about the type of disease for taking the medicine. Once it ask the medicine appropriate row of the medicine box will be opened.

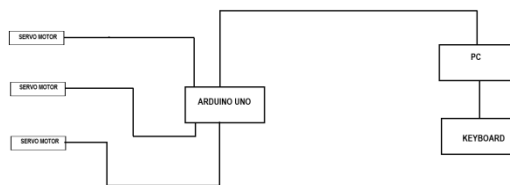


fig no 2:block diagram

➤ SOFTWARE

➤ FACE RECOGNITION

A facial recognition system is a piece of technology that can compare a human face in a digital photo or video frame to a database of faces. Such a technology locates and measures face features from an image and is often used to authenticate individuals through ID verification services. [7]

➤ DEEP LEARNING

A form of machine learning called deep learning includes teaching artificial neural networks with numerous layers to spot patterns and take judgement calls. Each layer of the network learns to recognise progressively more complicated elements in the data, mimicking how the human brain learns. Deep learning has been effectively used in a variety of applications, including speech recognition, computer vision, and natural language processing. Significant advances have been made in areas like voice and picture recognition, and it has made it possible to create cutting-edge technologies like self-driving cars and virtual assistants. There are worries about how it might affect jobs and privacy, and it also needs a lot of data and computational capacity.[10]

➤ CONVOLUTIONAL NEURAL NETWORKS

Convolutional neural networks (CNNs) are a particular kind of neural network made for analyzing and recognizing images. Convolutional layers, which extract characteristics from the input image, pooling layers, which lower the dimensionality of the data, and fully connected layers, which categories the image, are just a few of the layers of interconnected nodes that make up these systems. Large datasets are used to train CNNs, which are capable of identifying patterns and characteristics in images that are too complicated for conventional computer vision techniques. Numerous applications, such as object identification, facial recognition, and medical picture analysis, have effectively used them. It can be difficult for some applications to use them since they can be computationally expensive and need a lot of training data to reach high accuracy. [9]

➤ WORKING

There are mainly 3 softwares are used for the working of medical dispenser .Which includes Anaconda Project Jupiter and Python 3.9 . Anaconda is the distribution of python and R-programming language. It is mainly used in this project is due to the python environment and for the working of python libraries installed. Project Jupiter is an open source software and it is used in this face recognition process to write the Python codes. And the third programme here we used is the latest version of python 3.9.The working starts with a 4-line programme. The first line is the library,Second line is the data set .Third line is the train code And the fourth line is an open cv for capturing the images from the video.Each line is run for checking the working, i.e; if the image in the dataset and the image captured from the video is similar,Then the output will be displayed on the screen in the form of the image name inside a green rectangular box. If the image in the dataset and captured image is not similar the output will be displayed as unknown.

➤ RESULT

This project imparts almost all the aspects expected. Hardware side and Software is completed. This project has high reliability. This project mainly aims at giving medicines for the students, faculties and other staffs of an institution. By this method we can handle urgent needs without going to hospitals.

This project also focuses on the security of the users by their valid information that has already given.

➤ CONCLUSION

In conclusion, digital image processing-based smart medical dispensers are a creative approach to medication management that give patients and healthcare professionals a dependable and effective means to boost medication adherence and safety. Although there are difficulties and restrictions to take into account, there are substantial potential advantages of the technology, including the ability to enhance patient outcomes and lower healthcare costs. Smart medical dispensers are expected to be used more frequently in healthcare settings as technology advances, giving patients a safer and more effective way to manage their drugs.

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