Automatic Medicine Dispenser for Hospitals and Old Age Homes

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Abstract — In the Hospitals or the Old Age Homes where multiple people have to be taken care by a limited number of staff members, it becomes difficult to differentiate and remember the needs of the patient or elderly person. For this, currently the nurse or the care taking staff maintains their diaries to dispense and deliver the medicines appropriately. However, Medication adherence among the elderly has become a common issue in the healthcare industry, even if the medicines are taken by the patients they may tend to take wrong medicines at the wrong time. To counter this issue an Automatic Medicine Dispenser is proposed. The authentication system includes Face recognition of the nurse so that only the authorized person will be able to control the robot which is programmed to carry as well dispense medicines to the patient. Various apps such as patient app, nurse app, and the device app are created for communication between the patient and the nurse.

Key Words: Line Following, Medicine Delivery, Face recognition Raspberry-Pi, Authentication, Python, Old Age Home Conditions, Old Age Home Issues.

1. INTRODUCTION

Medication adherence is the most common issue among elderly patients, taking medicine at the right time and the right dosage of medicine intake is very crucial because it causes minor healthcare problems to become worse.

But when we consider the situation of the hospital and old-age home it is the responsibility of the nurse/caretaker to assist the patients, but most of the nurses/caretakers due to lack of delegations, and negligence tend to give wrong medicines to patients.

So to overcome all these issues Automatic medicine dispensing system is designed which will help the patients recover fast from their health issues, since the medicines are taken on time as prescribed by the physician. Which will also help nurse/care taker to manage their tasks. So that the nurse or the caretaking staff could give more time to the patients who really needs their assistance.

2. RELATED WORK

There are several methods to remind patients about their medical schedule, patients maintain pill boxes in which they can store medicines for their daily, weekly requirement, besides there are other systems to remind patients about their medical schedule such as a computer based alarm technique is used which reminds the patients about their medication with closed loop communication between the doctor, nurse, patient using the internet of things concept[1], by monitoring non-compliance of medication in a single platform with mechanical design in which 3 trays are used to dispense the medicines, which helps dispense medicine smoothly, this work gives an insight of android architecture, and secure end to end encryption for sending the patients data on to the cloud, the device maintains only one time medication of the patient.

[2] A pill dispenser which can ensure that the medication is taken safely and on time, especially among the elderly. The main advantage of this system is that the alarm function is added to the system as a popup notification using the Instapush application on the smart phone.

The main technique presented in this work is the Instapush application which will, not only be used by patients, caretakers and doctors but also by the family members to monitor the elderly person's health.

[3] An electronic pill box which can record the time of medicine taken from the box. This may lead to bigger issue of medication misuse, especially among the elderly patients. It is very crucial for them to take the medication as per the prescribed dose and duration. For this purpose, they may need family members' help to remind them the medication schedule however this method is not suitable for the elderly who stay alone at home.

All of the above mentioned techniques concentrate mainly about the patient who are at home. But the proposed system is used in health care environments like hospitals and old-age homes where the nurses and caretakers are much benefited because they can give their time to much critical patients who needs their assistant the most.

3. PROPOSED SYSTEM

The Block diagram of the proposed system is shown in Fig-1. The motors 1 and 2 is used for line following mechanism Tray1 and Tray2 are used to dispense out the medicines to the patients. Raspberry Pi is a mini computer that is used in the Automatic Medicine Dispenser for the

control of the device. The Automatic medicine Dispenser is designed in such a way that once it reaches the patient, a notification will be sent to the smart phone by an Android app to the caretakers or nurses mobile that the patient has taken the medicines. And in case of an emergency the patient can press an emergency key which will automatically send the notification through the app indicating for help.
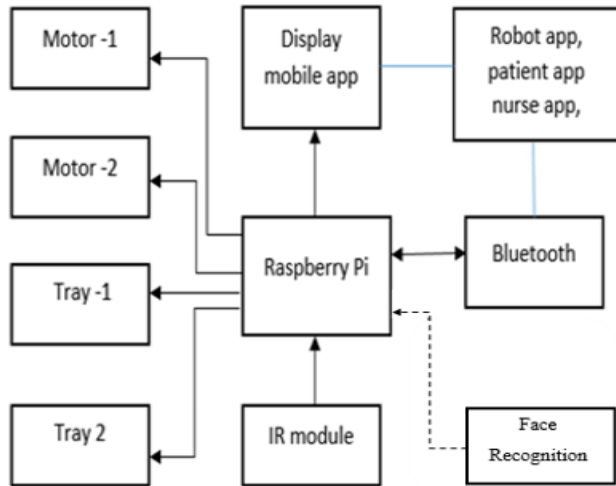

Fig -1 Block diagram of the proposed system.

IR sensors are used to detect the position of the line to be followed with respect to the position of the robot. The most widely used sensors in line following is IR sensor, that works on the fundamental observation that "the white surface reflects the sunshine and therefore the black surface absorbs it". Based on this concept the line following mechanism is initiated to deliver medicines to the patient

Fig- 3 shows the model of the proposed system, line following technique is used in the device which senses the line with the help of infra red sensors mounted on the device which is used to judge the boundaries by calculating the voltage differrnce so that the device moves to the patient and delivers the medicines to the patients.

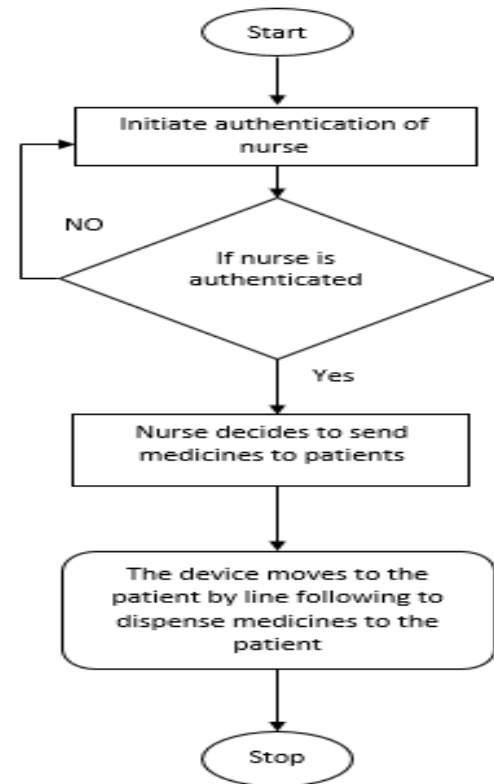**Fig- 3** The prototype model of the system

Fig-2 General flow diagram of the system.

Fig-2 shows the general Flow diagram of the system firstly the process is initiated by the authentication of the nurse only after the authenticity of the nurse the Automatic Medicine Dispenser will be activated and moves to the patient by line following technique to dispense medicines to the patient based on the medicine intake as prescribed by the physician.

4. IMPLEMENTATION

The Face recognition system is used in the authentication of nurse/caretaking staff. Histogram of Oriented Gradients (HOGs) and Neural Networks is used for face recognition. OpenCV has various libraires to support face detection and recognition which are imported in the python code. [6] software implementation of the entire system is formulatated using python scripting language. The entire app interface is controlled by bluetooth by RaspberryPi[8].

Fig- 4 shows the user interface where first the nurse has to signup using her name and password in order to create her user id and password for her first time login, then the next window pops up for face recognition as shown in figure 5 where the nurse should authenticate her face and password only if the face and password is matched the nurse or the caretaking staff would be able to access the device and send the medication to the patient. The access of device from nursing station to the Automatic Medicine Dispenser is through Thingspeak.
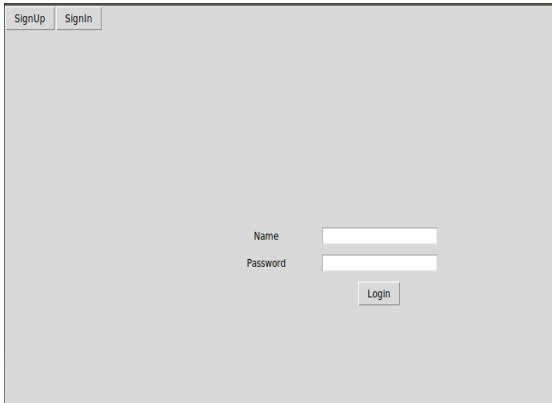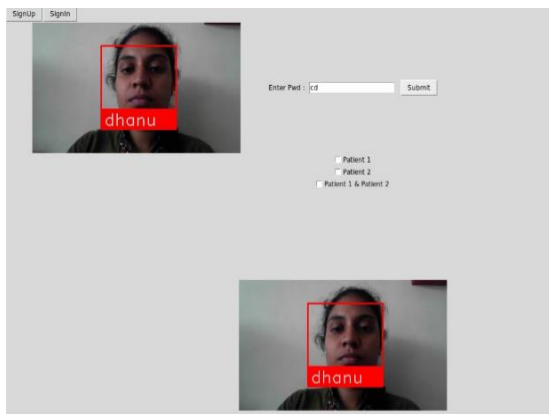
Fig- 4 GUI to login

Fig- 5 User interface with face recognition and password

Fig- 6 Shows the Device app which is used to give indications to the patients during the time of medications such as the image of the patient1/patient2 will be displayed and the device displays "mooving towards patien1/patient2. Based on the value received from the nurse, that is to deliver the medicines to patient1/patient2 or both the patients.
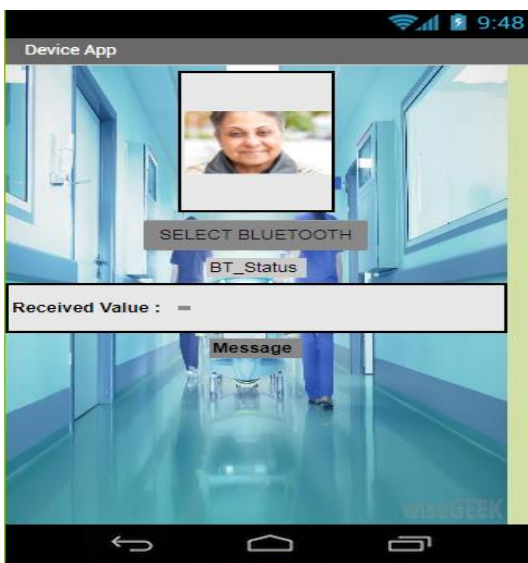

Fig- 6 Device App

Fig- 7 Shows the Patients app which gives notifications to the patients during the time of medication indicating "Time for medication" based on which a notification will be sent to the nurses app whether the medicines are taken by the patient or not. An emergency button is also included in the app during emergency which when clicked by the patient initiates a direct call to the nurse. So that the nurse can act to the situation immediately.
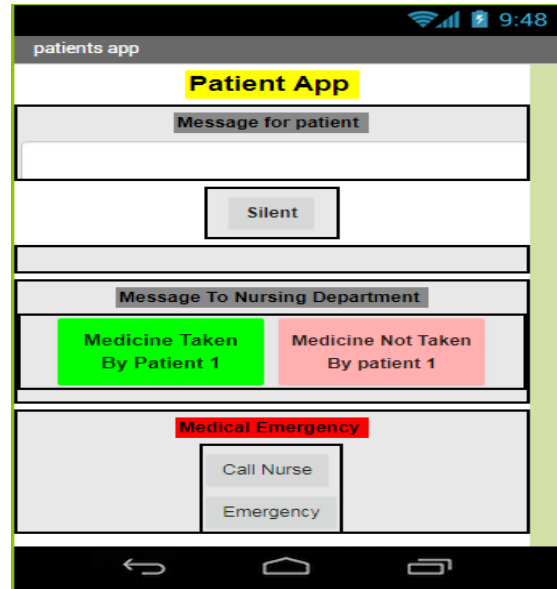

Fig- 7 Patients App

Fig- 8 shows the nurses app which gives intimation to the nurse with colour indicators such as "red" indicates that the patient1/patient2 has not taken the medicines "green" indicates that the patient1/patient2 has taken the medicines. The correct delivery of medicines to the patients is indicated by "yellow" else it remains "grey" in colour.
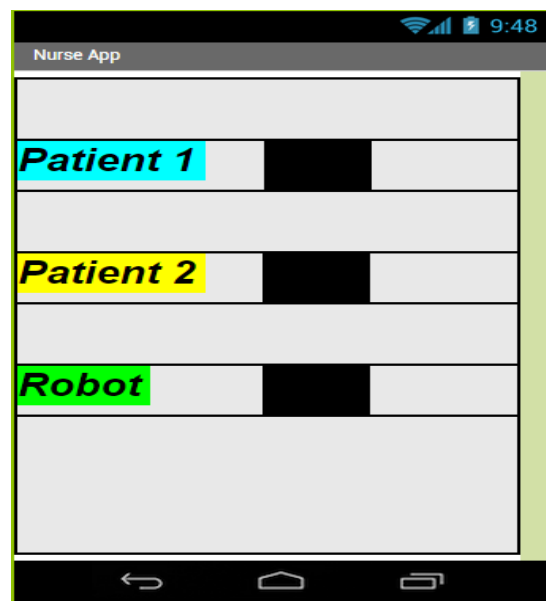

Fig- 8 Nurses App

5. CONCLUSION

In this project a GUI is created for authentication of the nurse, HOG algorithm is used in face recognition using open source library such as OpenCV, OpenFace and dlib as prerequisites on Linux platform. The "Medicine Dispenser" is automated using Raspberry Pi and IR sensors are used in line following. The entire app development such as the nurse app, The Patient app and the Device app is developed using MIT app development portal for communication with the patients. Thus the system successfully dispenses correct medicines at the correct time to the patient.

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