Health-IoT Platform that Integrates Unobtrusive BioSensor and Smart Medication Box for Elderly People

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ABSTRACT

The progress in IoT health care is considered to be a massive contribution to the elderly people. The elderly people and people who are suffering from chronic diseases need to intake tablets regularly on timely basis. Care takers with their busy daily routine may forget the instructions and time about pills which are prescribed for patient. Also care takers who are dealing increased number of patients may feel hectic to sort the medicine list for corresponding patients at proper time. Earlier many researches have been carried in this area and different pill boxes have been proposed already. The intelligent medication box proposed in this work have specialized features including six sub boxes which helps to organize six different pills, provides timely remainders for the patient or caretaker in an android application like hand-held devices like smartphone. This intelligent medication box contains bio-sensor for monitoring of temperature and heartbeat. Overdosage and improper intake of medicines may lead to serious issues in health of elderly people to avoid misusage of medicines a simple authentication process either by the care taker or the patient himself is performed. The proposed medication is much safer as it clearly intimates about time, dosage, stock of medicine and sorts out different pills in correct sub boxes during the next fill by caretaker.

Problem Statement

In the current scenario home healthcare is evolving since IoT is playing an efficient role in improving the medication management system for elderly people and people who are suffering from chronic diseases .These patients needs consume pill in daily basis and also need a constant supervision, traditionally dispensing medications is done by the patient himself or if the patient is aged the responsibility is assigned to care taker. Sorting out different medicines is found to be difficult when the number of pills is many and specifically when a care taker is

assigned too many patients with different medical record. To address this problem an intelligent and safe medication box is proposed which is designed with the idea of handling and sorting six different pills also the medication box contains the Bio-sensor for supervision of temperature and heartbeat.

Objectives

The vital aspect of the system is to send the notifications to the elderly and chronic patients about their timely intake of medicines

i.   Dispense of medicines from capsule box at a scheduled time.

ii.   Medical alerts to the caretaker.

iii.   Generation of Online report about medicine.

iv.   Real-time health statistics monitoring of drugs.

v.   Configuration data is sent through a mobile app.

Methods

In the Pill refilling and dispensing module, the attender can refill the pill box as required. The refilling can be done from the top surface of the medication kit. Supportive pill box management software and database helps in refilling the medication box. A prompt will be given to insert a specific capsule and after inserting a button is pressed which completes the process of filling that particular compartment. After pressing the button next prompt will be given which insists the attender to refill the next pill continuously all the six different pills get refilled. Next pill dispensing is performed when the Arduino sends the signal, the pill which needs to be dispensed will fall in the tray. The pill dispensing module is responsible for selecting the correct compartment for dispensing from the pill storage. At a particular time only, single pill will be dispensed and for the next pill another signal will be sent from the Arduino. More than one pill will not be dispensed at a time which may cause fatal error. The Arduino controller monitors the pill loading and pill releasing. The intelligent medication box framework undergoes three stages every time when the pill falls in the tray i.e. pill loading, pill releasing and default stage after releasing the pill in the tray.

Major Findings

Our Intelligent medication box is tested in the old age home environment with a patient managed by a single caretaker. Since care taker is not able to remember all the medicines and dosages of the patient. Patient and care taker are authenticated initially, pill refilling and feeding necessary information such as name, quantity, duration till the medicine should be used are done by the care taker. Based on RTC alerts the pills will move from the storage space to patient's tray. Proper dosage gets differentiated by milligrams measurement unit. From six different medicines based the motor controller alert any one pill will fall in the tray and the next pill for the second alert from motor controller and it goes on as user required.

Results

The IoT enabled smart capsule kit which works with the basic authentication using the patient name and password helps to set medicine remainder and other related functionalities like availability of the medicine, alerts during prescribed medicine intake time for the patient, the name of the medicine to be taken at that particular time. The smart medication kit also sends timely alerts or notification to the care takers who are remote location via the mobile application. To improve safety and to avoid confusion in consuming the medicines among the elderly people our smart capsule kit will be a best choice in home care needs and old age homes.

Publication Details

i. Published patent entitled "smart medication system for real-time monitoring of elderly and chronic patients, application number: 2021141002260.

ii. Published a paper entitled "Health-IOT Platform That Integrates Unobtrusive Bio Sensor and Smart Medication Box for Elderly People" in International Journal of Future Generation Communication and Networking Vol. 13 No. 2 (2020): Vol. 13 No. 2 (2020).

iii. Published a paper entitled "Intelligent and Safe Medication Box in Health IoT Platform for Medication Monitoring System with Timely Remainders," 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS), 2021, pp. 1828-1831, doi: 10.1109/ICACCS51430.2021.9442017.