Automatic Pill Dispensing Machine

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1 ABSTRACT

In today's world, people are sufferings from various diseases and disabilities and everyone on average is consuming 2-3 pills per day. There are several challenges that old people face and of them is taking their medications on time which if not being done on time or forgotten could lead to various medical implications and even death in some critical cases.

So to avoid such situations, the automatic pill dispenser safeguards the person from the fallible duty of consuming the wrong medicine at the wrong time. This report throws light on various solutions existing in the medical world, the improvements needed in them, and also try to propose some different solutions.

2 INTRODUCTION

Studies conducted across the world show that many people irrespective of their age become forgetful when it comes to the consumption of routine medicines. This issue is widely faced especially by the elderly all over the world. Also for the elders having multiple medications, the possibility of overdosing becomes considerably high. This could lead to very bad consequences such as permanent disability or even death in some cases.

Fostering the elderly is a big concern for every family and the younger ones are responsible for the care and management of these elderly people. In the current scenario, the working hours have increased and these younger people are always busy on the professional front so it is very difficult to pay attention to their elders. In the present age, most of the families are nuclear so it adds to the difficulties in taking care of the medications of the aged people. Also the elderly have a desire of being dependent which is quite natural but this adds to the worries of their children. Despite great efforts from their children, sometimes they fail to take medications on time [1].

3 LITERATURE SURVEY

In developing countries like India, the health care industry is facing many issues which can be in the form of the lack of the availability of medical staff,

less qualified doctors and nurses, a lower ratio of nurses to the patients which increases the risk to the health hazard. Due to these issues, the Government hospitals and the cheap health care centers wherein the population of patients is much higher, the doctors are unable to pay proper attention to each patient due to which the risk of medical errors increases. In hospitals, the nurses have to pay timely attention to providing prescribed medicines to the admitted patients. If for some reason if there is any lack of consciousness observed in giving the dosage may result in fatal health issues for the patient. The automatic pill dispenser with the correct dosage along with an alarm system can be useful for reminding the nurses at a particular time of the day [2].

In this modern era, many people being health conscious are using various vitamins supplements before and after their meal. An automatic pill dispenser with a buzzer arrangement can provide regularity in their medicine access. For working women, the pill dispenser can control their young children from access to hypersensitive medicine which can harm their health as the pill dispenser can be locked by giving the password [3].

So considering all these factors a need for a more proper, reliable, and automated product has arisen and so presently many such automated pill dispensers are available in the market and in the future, more advanced options will also be available. Further in this report, we would discuss these existing solutions and the improvements needed in them.

4 EXISTING SOLUTIONS

Many solutions to this problem have been developed in the form of devices to fulfill the timely medication requirement of the patient as per the prescribed dosage by the doctors for people of every age group who is in need. The list includes the reminder charts for pills, maintaining the diaries, alarm clocks, daily and weekly pillboxes, multiple compartment compliance aids(MCAs), voice message reminders through telephones, reminder settings in the watch, mobile phones, and automatic pill dispensers. These devices act as a boon to many explicit people who are using them for years. But the tracking of various medicines to be consumed at different times of the day becomes troublesome with the aged, physically disabled people with loss of vision, auditory perception, or people with severe cognitive diseases as they are dependent on caretakers or their near ones. The automatic pill dispenser provides the right solution for such people reminding them with an alarm and making the correct dosage of medicine available for them.

5 RELATED WORKS

5.1 WEEKLY ELECTRONIC PILLS DISPENSER

It consists of circular containers and it is a pill dispenser that depends on a PIC microcontroller in order to rotate 7 circular containers that are attached to a

servo motor wherein each container has 4 sections that correspond to 4 medicine servings per day for all 7 days of a week. A 2-line LCD with a few navigation buttons is used as the interface of the system. It also lets the user edit the time intervals at which the pills need to be dispensed. As the time for the pill comes, one of the sections will release the pills contained in it and the dispenser will produce an audio alarm to notify the user. One improvement that is needed in this dispenser is to add an SMS notification tool to alert the patients [5].

5.2 SMART PILL DISPENSER USING INTERNET OF THINGS

The prototype uses a microcontroller that activates the GSM module to notify the user at the time which the user has already set, for his/her medication. At the same time, the microcontroller activates the pill dispenser for a short period to dispense the pills. The GSM module used here works on various frequencies and it can not only be used to access the internet but also for voice communication. This module is managed by an AMR926EJ-S processor that is used to control the phone and data communication. An app named 'Message Time' is used to send a message to the user at the time of medication. This dispenser uses an ultrasonic sensor for dispensing pills to the user. The sensor remains active for some time after sending the alert message to the user. This prevents the pill from going into the hands of the wrong person as the user needs to be time-bound to take his pill from the dispenser. Using IoT, the dispenser makes sure that no toddler or any other physical device present nearby can deceive its sensor for being a hand and this has been made possible by placing the dispenser at a formidable height. The LCD used as an interface displays the number of pills left in the stock. This record is maintained by initially setting the number of pills placed in the dispenser and after that at each activation period [6].

5.3 PILL DISPENSER WITH ALARM VIA SMARTPHONE NOTIFICATION

It is a pill dispensing system consisting of 3 box containers. It is based on an Arduino microcontroller that is connected to an RTC module in order to provide date and time. It uses servo motors to open the gate of one of the 3 box containers and a vibration motor that helps to dispense the pills out of the container. IR sensors have been deployed to detect the number of pills that have fallen out of the container and the process will be discontinued whenever the desired number of pills has been dispensed out. An LCD is used as an interface for the dispenser. As the time to take the pill comes, the Arduino microcontroller signals a Raspberry Pi B+, which will then notify the patients on their smartphone using the application named Instapush [7].

5.4 ADVANCED MEDICATION DISPENSER

This system uses a Digilent Chipkit that is connected to an EEPROM in order to store the drugs' information. A buzzer is being used to give a signal to the alarm. The container is controlled by 2 servo motors and user identification is done using RFID. The system is also connected to a Wi-Fi shield to let the user remotely monitor the pills. An LCD module with 2 capacitive buttons is used by the dispenser as an interface for the user. As the time for the medication comes, a timer starts and the buzzer starts ringing and a message is displayed on the LCD interface. In order to take the pills, the user has to identify himself using the RFID tag. As the pill is taken the timer and the buzzer stop and that pill is registered as administered. And if the user exceeds the limit of the timer, the buzzer stops ringing, and that pill is registered as missed. The registered state of the pill can also be remotely seen and that too with the user identification which in return helps the family members of the elderly to monitor whether the user has taken his medication or not just by sitting at their workplace [8].

6 PROPOSED APPROACH

6.1 DESIGN

The block diagram for the proposed design of automatic pill dispenser is shown in figure 1. It consists of a microcontroller (maybe Arduino or any other) that is connected to a GSM module to notify the user at the time of his medication. There is a buzzer that sounds out loud to alert the user at the time of medication. The design of the dispenser consists of a circular rotating base and it has 8 vertical sections that consist of a cylindrical structure at the periphery. Wherein 7 sections can be used for pills and the 8th section can be used as syrup dispenser. A stepper motor is attached in the center portion of the circular base to rotate it at the time of dispensing the medications. The interface for the user consists of an LCD that displays the number of pills dispensed at the time of the medication. A servo motor is attached to the dispensing unit of the pills to open and close the valve/gate. A centrifugal pump is attached to the dispensing unit of the liquid medication. At the dispensing unit of the pills, an IR sensor is placed to accurately count the number of pills dispensed. And there is a weight sensor placed at the liquid dispensing unit to measure the weight of the liquid dispensed. The time schedule for the medication, the quantity of the pills, and the weight of the liquid medication need to be set priorly using the mobile application and the proposed model also has the ability to notify the family members of the user or the hospital authorities via SMS that whether the user has taken the required medication or not and it also notifies them when the dispenser needs to be refilled. At the dispensing units of both solid and liquid medication, a small container is attached which is washable and can be attached and detached easily by the user in order to take his medicines.

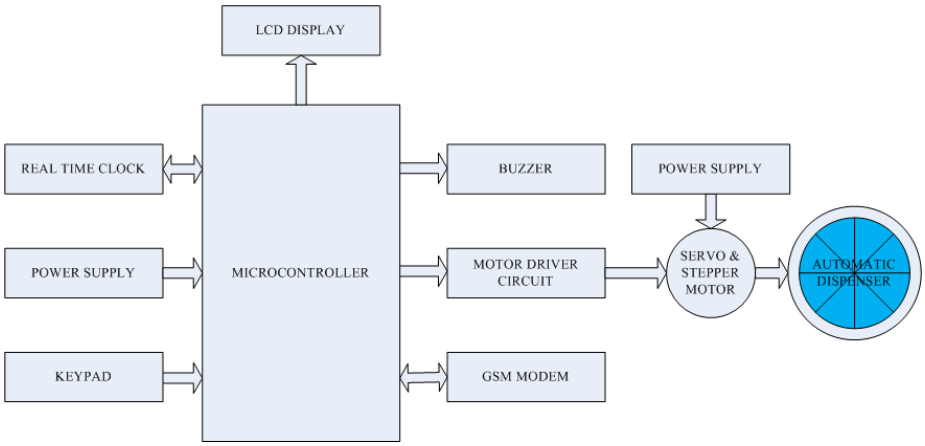

Figure 1: Block Diagram

6.2 ADVANTAGES OVER OTHER DISPENSERS

• In comparison to other dispensers which are fit just for pills, this dispenser is fit for both solid and liquid forms of medication.

• The other dispensers follow the system of using small sections so, for example, there are 28 sections so it means that 28 different doses can be scheduled using it. So if the user needs to take 4 doses per day then after every one week he needs to refill the dispenser and also arrange each dose i.e he needs to keep all the pills that he needs to take simultaneously in one section and he has to make 28 such sections which is a cumbersome task which needs to be done every week and it also has the chances of human errors. Whereas in our dispenser we have made cylindrical sections with much higher capacity and each section is just for single medicine so different pills need to be kept in different sections which separately dispense the scheduled combination of pills at the scheduled time. So for the same example as given above, here the user just needs to fill the dispenser once a month, and as there are separate sections for different pills so the chances of error at the time of refilling become negligible and the process becomes much easier.

7 CONCLUSION

This report suggests an automatic medicine dispenser for aged and elderly persons who dwells on medicine for various health issues. The proposed design help them to take their medicines regularly on daily basis without any assistance. It provides a relief from weekly filling of the medicine as it is designed for monthly refills. The automatic pill dispenser also has a provision of dispensing syrup along with the pills which is an added advantage.

8 BIBLIOGRAPHY

[1] Navyashree, D. S. Smart Drug Dispenser For Aged and Feeble People.

[2] Jagdale, K., Rao, A., Hora, R. (2017). Microcontroller based Medicine Dispenser and Reminder. International Journal of Computer Applications, 177(7).

[3] Minaam, D. S. A., Abd-ELfattah, M. (2018). Smart drugs: Improving healthcare using smart pill box for medicine reminder and monitoring system. Future Computing and Informatics Journal, 3(2), 443-456.

[4] van Eijken, M., Tsang, S., Wensing, M., de Smet, P. A., Grol, R. P. (2003). Interventions to improve medication compliance in older patients living in the community. Drugs aging, 20(3), 229-240.

[5] Fărcaş, C., Ciocan, I., Palaghiţă, N., Fizeşan, R. (2015, October). Weekly electronic pills dispenser with circular containers. In 2015 IEEE 21st International Symposium for Design and Technology in Electronic Packaging (SIITME) (pp. 125-129). IEEE.

[6] Arora, K., Singh, U. (2018). Smart pill Dispenser using Internet of Things. Journal of Engineering Research Technology, 7(7), 486-489.

[7] Othman, N. B., Ek, O. P. (2016, October). Pill dispenser with alarm via smart phone notification. In 2016 IEEE 5th Global Conference on Consumer Electronics (pp. 1-2). IEEE.

[8] Alexan, A. I., Osan, A. R., Oniga, S. (2013). Advanced Medication Dispenser. Carpathian Journal of Electronic and Computer Engineering, 6(2), 26.