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Self-Activated Medicaments Dispensing System

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Abstract - As the life span of human being is increasing, the age related diseases are also increasing. Lot of time and effort has been spent by the caregivers in taking care of the patients. Giving medicines on time is one of the activities the caregiver is involved with. Designing assistive devices will decrease the burden on the family and caregivers. In this paper we are proposing self-activated medicaments dispensing system to assist the caregivers. This informs patients to take medicine at the prescribed time, dispenses the medicines and informs the caregiver if the patient forgets to take the medicine within scheduled duration. This system is proposed for people who are aged and patients who are suffering from various diseases. The system is designed to make sure that medicine is taken on time with right quantity.
Keywords – Dementia; Caregiving; Assistive devices; IoT.

1. INTRODUCTION

In 2012, around 117 million people had more than one severe health diseases. One in four had more than two health issues [1]. Arthritis is one of the communal disability. More than 50% of the people suffering from the disease mention that they have trouble with their normal activities [2]. Diabetes is the primary cause of kidney failure, which also leads to lower-limb amputations [3]. These chronic diseases make people to suffer for years. The percentage of people suffering from various disabilities is shown in Fig 1.

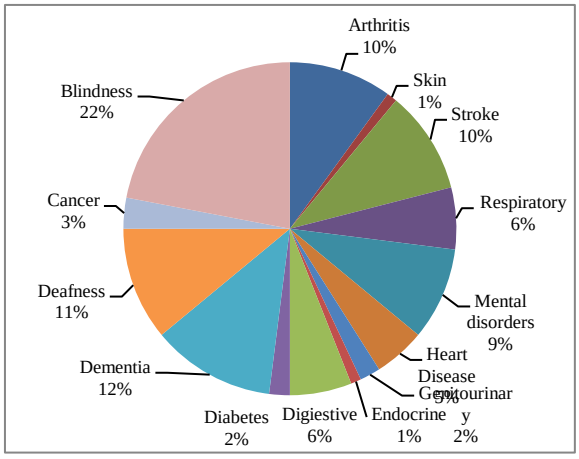

Fig.1: Contribution of enduring diseases

14% of the money spent on the patients' accounts to personal care assistance and 8% of the expenses is towards services provided to the patients. This accounts to 24% of the expenses, which is a huge portion (Fig 2).

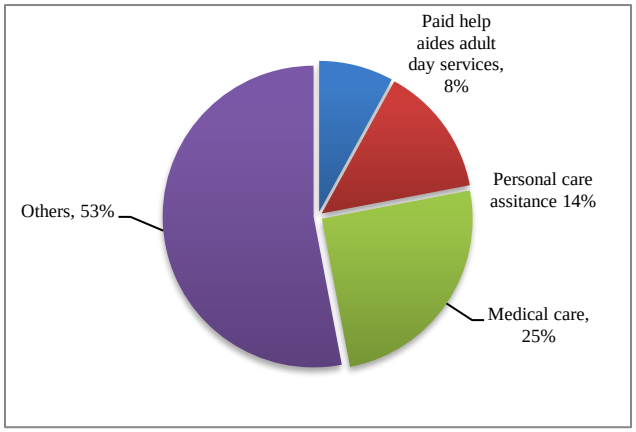

Fig.2: Percentage of annual cost spent on caregivers

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The mean value of daily hours (MDL) spent by the caregivers to supervise and provide personal care in different countries is represented in Fig 3.

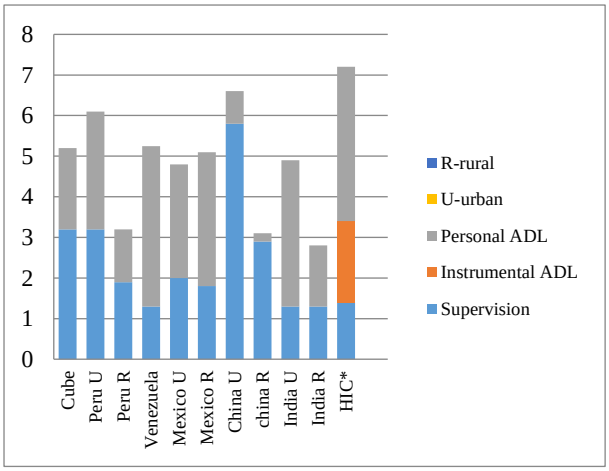

Fig. 3: MDL of personal activities of daily living (ADL) care and supervision provided by caregivers in countries with different economic status

The MDL spent on ADL in Peru urban, China Urban and India urban are high in comparison with other countries. Fig. 3 also shows that the hours spent by people in urban area is more in comparison with the hours spent by the people in rural area. This infers that there is a huge demand for caregiving in urban areas.

In India, 40 million unpaid family caregivers devote a large portion of their own money towards the care of their loved ones. According to the World Health Organization, non-communicable diseases or chronic diseases are cancer, heart ailments, respiratory diseases and diabetes. In India, over 20 per cent of the country's population suffers from at least one of the non-communicable diseases (NCDs), which are estimated to cost India USD 6.2 trillion during the period 2012-2030 [6]. Patients' family members are spending an average of $6,954 a year, nearly 20 percent of their income. This infers us that there is a need to design an assistive device to help the caregivers.

As life expectancy increases, age-related problems and chronic diseases are also increasing, and patients need help from caregivers and activities of daily living. However, they are also encouraged to promote functional independence. By using SAMDS, the functional independence between the patient and the elderly is enhanced, while reducing the pressure on the nursing staff. This work uses a solenoid valve to open the box.

In this paper, Section I focuses on Introduction, Section II focuses on Literature survey, Section III gives an insight on Design Methodology. Section IV focuses on flowchart and is followed by results, Conclusion and Future work.

2. LITERATURE REVIEW

Karat and Jackrit proposed a method to dispense medicine using an intellectual system prepared with an automated guided vehicle and a robot distributing instrument. Information technology covers systems including drug storage. This information system helps pharmacists, employees, and automated guided vehicles (AGVs) monitor the AGV process of transporting drugs to the ward. The system will automatically record and refresh the system every minute according to the settings. The prescription must be approved, and the entire system requires constant monitoring by the pharmacist [7].

Researchers have designed a machine equipped with some simple and emergency medicines that needs to be refilled. This helps the people to access the medicine when they need without approaching any pharmacy. The advantage of this work is that it can be installed in remote places. Parameters like temperature and Blood pressure can be tested through this instrument and the indicated medicine will be dispensed depending on the status of the patient. The problem with this work is that the message about well-being of the patients is neither sent to the caregivers nor to the nearest health centers [8].

The author introduced the design and prototype of drug compliance intelligent system that can be conveniently used by ordinary patients in their homes. This is a RF-ID based system. RMAIS aims to maintain the independence of patients so that they can take the appropriate dose of multiple daily drug doses at the right time. Passive RFID tags are affixed to the medicine bottles to store medicine information. The cost of the labels used is high. The cost of each tag is $1, and the system requires a large number of tags [9].

Frank Sposaro et al. provide an analysis on caregiving of people with Dementia. In this work it is mentioned that the caregiver needs to help the patient in care giving on a regular basis. This work with recent technology and promotes the functional freedom of the patient. It explains a tool through which android applications can be used to improve the quality of treatment for patients with dementia. It runs on multiple applications that use GPS functions and communication functions. This facilitates the nursing staff to remotely monitor the patient. The authors have used machine learning methods to evaluate data and take actions as needed. This system requires users to carry a dedicated unit [10].

Researchers proposed smart homes that are designed for elderly people. In this work, an Android Application is developed to help elderly people to lead independent life. The system tracks elderly people in their living space and avoids unwanted situations [11].

The authors designed a system to track and locate Patients suffering from Alzheimer's disease (AD). Wandering is one of the major problems faced by the AD patients. In this work the patient is tracked using GPS and the system informs the caregivers about the whereabouts of the patients. This helps the caregivers to [12].

S R Bhagyashree et al., has provided the design of Automated Medication Dispensing System (AMDS). This device dispenses the already stored medicines at the time set by the user. The system gives audio and visual information to the user. The disadvantage is, at the cap the medication is exposed [13].

3. DESIGN METHODOLOGY

Self-Activated Medicaments Dispensing System (SAMDS) is a device using which the medicines that are already loaded are dispensed at the time set by the caregiver and informs the caregiver through a text message informing whether the patient has taken the medication or not. The feedback system is the special feature of SAMDS. In SAMDS Caregiver has to place the tablets as per the prescription of the doctor and he has to set the time. The system comprises of Real Time Clock. The user set time will be getting compared with RTC on regular basis. When they match an indicator will come on.

As people become old, complications the ability of sense organs starts diminishing. Having medications at the right time is a difficult job for them. The system provides both audio and visual indication for such people that make them to have an intimation that they need to take the medication.

The Liquid Crystal Display displays the current time all-around. When the current time matches with the preset time, it also displays a message mentioning “Please Take the Medications”. Whenever the patient takes the medicine, the sensor detects that the medicine has been taken. If it doesn’t sense, then the system understands that, no medication has been taken and it activates an LED and buzzer. Then it waits for five minutes. If patient fails to take the medicine, then the system sends a message through GSM to the caregiver informing the failure of the patient to take the medication.

SAMDS finds real-time application and is very useful as it allows people to take the right medicine at the right time and does inform the people to take the medicine if they fail to take it.

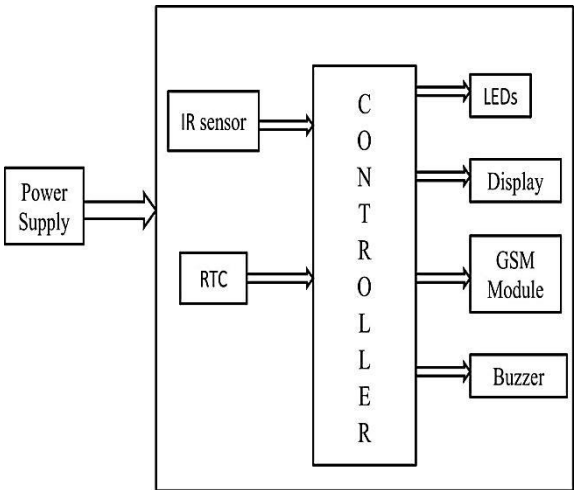

Fig. 4 Block Diagram of SAMDS

In spite of this if he fails to take the medicine, the system will inform the caregiver.

4. FLOW CHART

The flowchart of the proposed work is shown in Fig 5. When the system is switched on, the welcome note “SAMDS” is displayed on the display. Then the predefined time that is prescribed by the medical practitioner and set by the user as a preset time along with current time is displayed on the display with a gap of a few seconds. The program keeps comparing the user set time and the present time. When they match the box opens and a message “Please take the Medicine” is displayed informing the user to take the medicine.

The Light Emitting Diode and the Buzzer will also be switched on indicating that the person has to take the medicine. The audio and light indications will be on for duration of 5 minutes.

If the patient doesn’t take the medicine within five minutes, then a message will be sent to the caregiver indicating “Failed to take the medicine”. The process continues.

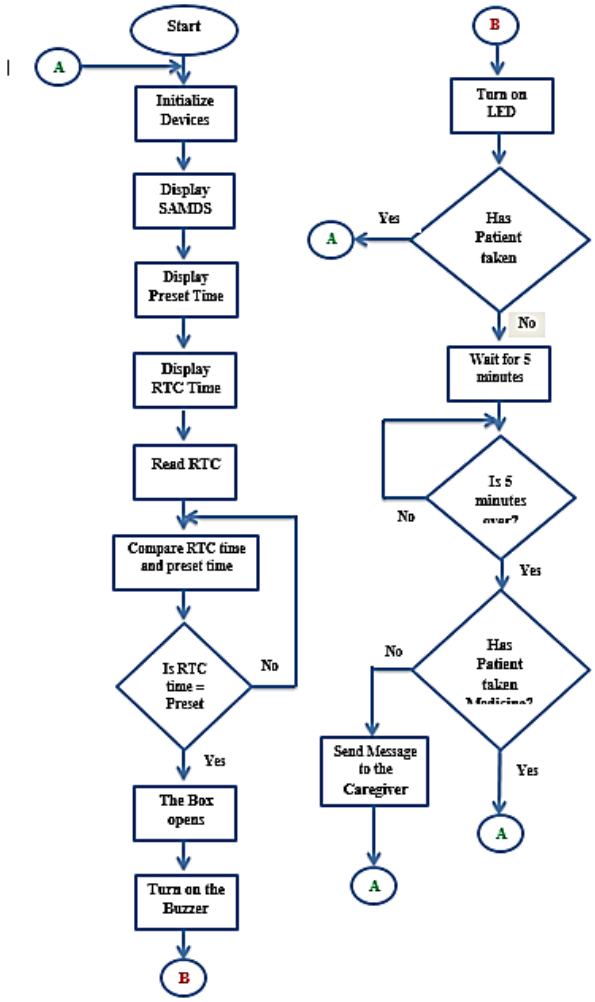

Fig. 5: Flow chart

5. RESULTS

This section includes the results obtained at each step. When the system is switched on, the display "SAMDS" will be displayed and is shown in Fig 6. Real time clock (RTC) is interface with Arduino Uno and LCD that displays the present time on the LCD screen.

Fig 7 shows the real time display when the real time and preset time are equal, then the compartment of the box opens and the medicine is dispensed.

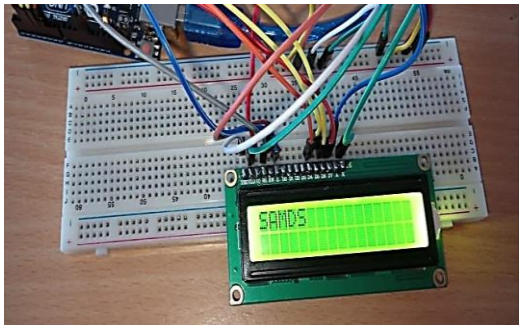

Fig. 6 : Displays SAMDS

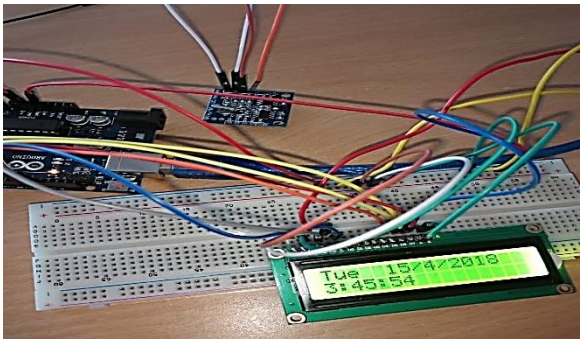

Fig. 7 LCD displays Present time

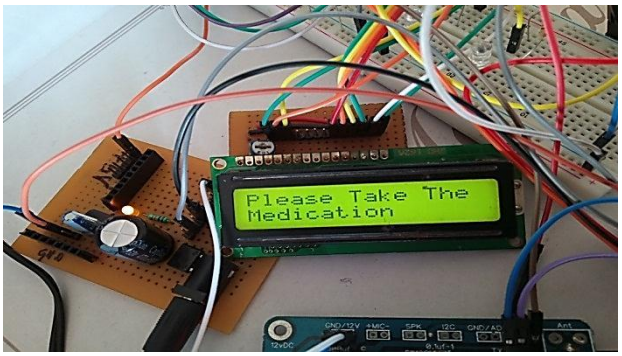

Fig. 8 Compartment of the box is opened

Fig 8.shows the opened box when the preset time matches with the real time clock The LCD display displays a message “Please Take the Medication” to the patients when the box opens. Fig 9. show the displayed message.

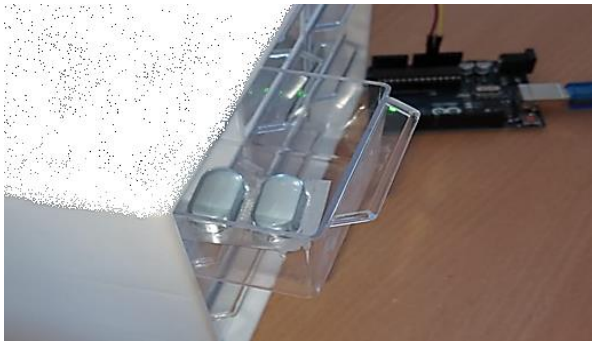

Fig. 9 LCD displayed message

The buzzer and the LED turn on after the message is displayed indicating that the patient has to take the medication. Fig. 10 shows the indications provided to the deaf, blind and elderly patients.

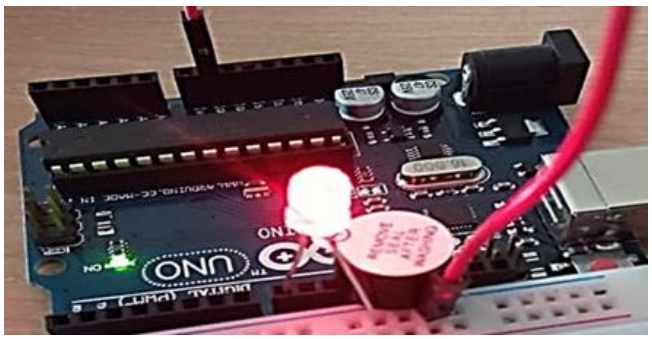

Fig. 10 The Buzzer and LED Turned on

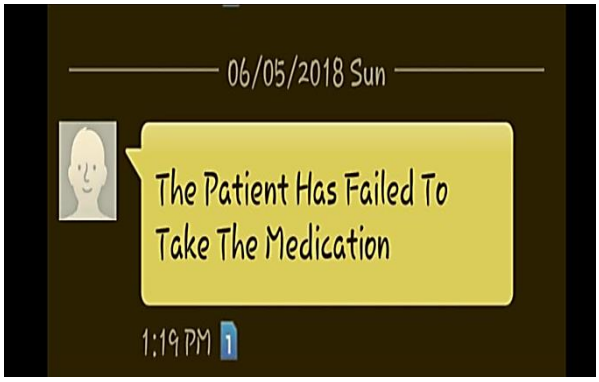

Fig. 11 Message that is sent to the caregiver

If the patient hasn't taken the medicine on time, then the GSM module is triggered and a message is sent to the caregiver mentioning "The Patient Has Failed to Take the Medication". Fig 11 shows the message sent to the caregiver.

6. Conclusion and Future Work

SAMDS helps the elderly people to take medicines on time as suggested by the doctor. This relieves the caregivers the duty of giving medications to the patients at the set schedules. It also ensures that proper dosage of medication was given at the appropriate time in the absence of caregivers. The caregiver will be intimated in case if the patient doesn`t take the on time. The system has the flexibility of changing the timings. The implementation of this work reduces the burden on caregiving.

The additional advantage is the patient shall be habituated to take the medicines at a particular time interval which may not happen with expected accuracy with human intervention.

The future update for the existing system includes increasing the number of the days an also the frequency of taking the medication.

References

[1] Ward B W, Schiller J S, Goodman R A. Multiple chronic conditions among US adults: a 2012 update doi: 10.5888/pcd11.130389 Prev Chronic Dis.2014;11:E62, updated in 2012.

[2] Centers for Disease Control and Prevention. Leading causes of death and numbers of deaths, by sex, race, and Hispanic origin: United States, 1980 and 2014 (Table 19), Health, United States, https://www.cdc.gov/nchs/data/hus/hus15. Accessed June 21, 2017.

[3] Centers for Disease Control and Prevention. National Diabetes Fact Sheet of 2011, Accessed December 20, 2013.

[4] G. Alexander and E.Reiman, Neuroimaging, "The dementias:diagnosis, treatment and research" Neuro imaging, 2003

[5] S. R Bhagya Shree and Dr. H. S. Sheshadri "An initial investigation in the diagnosis of Alzheimer's disease using various classification techniques" IEEE ICCIC, 2014.

[6] Over 20% of Indians suffer from chronic diseases:report:Livemint, ht6tp://www.livemint.com

[7] Thanaboonkong, Karat, and JackritSuthakorn. "A study and development on ro7botic drug storaging and dispensing system in drug logistics for a midsized hospital." Robotics and Biomimetics (ROBIO), IEEE International Conference on, IEEE, 2014

[8] Mahaveer peena, Dankan v Gowda, JJ Jijesh,Shivashankar, "design and implementation of automatic medicine dispensing machine"IEEE international conference on recent trends in Electronics, Information and communication Technology (RTEICT) 2nd edition, pp-1961966, 2017.

[9] Corey McCall, Branden Maynes, Cliff C Zou, Ning J. Zhang "RMAIS: RFID- based medication adherence intelligence system" annual international conference of the IEEE engineering in medicine and biology, pp-3768-3771, 2010.

[10] Frank Sposaro, Justin Danielson, Gary Tyson. 2009 iWander: An Android Application for Dementia Patients. Department of Computer Science. Florida State University. Tallahassee, Florida 32306, 2009.

[11] Muhammad Fahim, Iram Fatima, Sungyoung Lee, young-Koo Lee. "Daily Life Activity Tracking Application for Smart Homes using Android Smartphone", 14th International Conference on Advanced Communication Technology (ICACT), 2012.

[12] S R Bhagya Shree, H S Sheshadri, R Shivakumar, H S Vinay Kumar "Design of embedded system for tracking and locating the patient suffering from Alzheimer's disease" IEEE International conference on computational intelligence and computing research, pp- 1-5, 18 Dec-20 Dec, 2014

[13] S. R. Bhagya Shree, P. Chandra Shekar, A. Arjun, G. R. Manoj, A. Nithin and R. S. Raj, "Automated medication dispensing system," *2014 Eleventh International Conference on Wireless and Optical Communications Networks (WOCN)*, Vijayawada, India, 2014, pp. 1-6, doi: 10.1109/WOCN.2014.6923079