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Medvault- GSM Based Medicative Assistive System for Elderly People Using Arduino

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Abstract

Our proposed system MEDVAULT is a device that assists elderly people who are suffering from two or more diseases and individuals who are short of memory to take their regular medication. MEDVAULT will be providing an alarm at the time of taking medicine and IoT will send a message to the respective patient, if the patient does not take medicine after the message, the alert system will get activated. Our system will be useful for people who are residing in old age homes and people who cannot afford a personal nurse to take care of them, comparatively, our system will have cost-efficient for assisting elderly people.

Keywords: GSM, IoT, Arduino, alert system, Rechargeable power supply

1. INTRODUCTION

In the must guarantee that the proper medicine should be taken at the proper time without any delay. One of the major differences between the successful and unsuccessful treatment is the medicine administration. The most common reported issues in medicine consumptions are: the medicine prescription which are hand written, sometimes may mistake, some may take the same medicines again and again which may lead to worsening of health condition, sometimes deadly combination of the medicine due to double dosing where the medicine are taken without noticing the medicine prescription. All of the above-mentioned reported issues will keep the life of the patient at risk, sometimes even it causes death.

The patients must know about their health conditions first, so that it can be easy for them to communicate with the health care professionals about their medication. New technological development in the medical field have the ability to change every face of the medical treatment and it helps the patient with improved comfort, better cordial relationship between the patient and doctor and well personalized care through the modern technology.

Survey that were conducted recently by various NGOs show that 85% of the people of the age of above 60 are taking regular medications of those 85% 45 percentages of people were taking medicines for diagnosing at least two or more diseases. Unlike in India people of age of above 60 are increasing in the world for example united kingdom has 25.21% of people aged above 70 in their total population (Data available in Age discrimination.info) , for the people above concern, medicative systems helping them to meet their needs will be a saviour

MED vault is designed to help the elderly people to take their regular medicine without any delay in time and also help them to take the correct dosage of medicine. This system makes the elderly people to take the medicine on their own without the help of others which makes them to reduce their dependency on others.

2. RELATED WORK

Researchers of this modern era are considering the INTERNET Of THINGS(IoT) as one of the most advanced technologies, because it was capable of changing the vision of health-related problems, it ensures safety and security, it was also able to addresses some challenging impacts which was happening within the society.Medical based companies are changing themselves from a device and medicine providers to the health care management firms of the patients. Ambient Assisted Living (AAL) methods are the new approaching methods which are able to meets the needs of the people. Ambient Intelligence technologies are widely developed in this domain which helps us to create cosy environments around those who are in needs and help them to maintain an independent living. However, there are some basic issues in AAL that still needs to be solved. Most of the recent work still doesn't not able to meet the needs of the people, and therefore the importance of social connections and social activities is less noticed. Various Research works are still undergoing in both sides of industrial research area and academics for more than past three decades.

Most of the existing methods are simple as they only alarms at the time of medication in order to alert the patients to take their regular medicine. Medication Assistive System(MAS) consists of a box which is mounted with display element and certain sensors which are used to track the real time. At the of medication the Box alarms in which the display element shows the message take medicine.Medication System which is used to remind the patient automatically to take the medicine from the bag. Smart phone based Medicative assistive system helps the patients to take the medicine without any mistake. It uses internet to track the real time and date which is used for reminding the patient about their medicine.

3. PROPOSED SYSTEM

The main objective of our proposed system is to help the elderly people to take their medicine at the regular interval without any delay. Nearly two third of the people who are in the age of above 60 are suffering from more than two diseases, and also, they are not able to take their medicine regularly due to decline in memory which may lead to worsening of their health condition. Now a days in this modern world, many families are like nuclear families so that for them assisting old age people are tedious work for them, because of this issue many leaving their mother and father in hold age home for better assistant but in hold age home there will be only few helpers for all the elderly people. Those helpers cannot remind everyone’s medicine, proper dosage and timings. In order to help them we designed a med-vault which consists of three segments to keep the medicines. The set of medicines which has to be taken at different time and different time periods are kept at the separate segments. A display element which is mounted on the top of the med-vault will show us the name of the medicine, dosage and timings regularly. Real time is tracked by the RTC which is compared with medication timing which is stored in Arduino memory. When the Medication timings matches with the real time buzzer alarms and led glows. Three setups of led is used where each led setup is kept at each segment. The glowing led setup shows which medicine should be taken at that particular period. Initially, SMS will be sent to the Patient regarding their name of medicine and dosage. If there is no detection sensed by the IR sensor after two minutes of the buzzer alarm inside the particular section of the med-vault, analert SMS will be sent to the patient. Again, after five minutes from the last detection, if still there is no movement inside the section of the med-vault, an alert call will be initiated through the GSM module to the respective guardian or caretaker. Medicines which has been taken by the patient will be stored in the mobile application, which can be interpreted by the doctors lately to track the record of the medicines that has been taken by the patients. Our med-vault is a portabledevice which is powered by a rechargeable battery so that it can be carried anywhere without any effort. Since, our system is powered by a rechargeable battery, we are using a voltage sensor to determine the power in the rechargeable battery and the availablepower will be shown in the mobile application, it will be useful for us to know whether we have to charge the med-vault or not. With the help of Arduino, RTC, GSM and several sensors we designed med-vault which will be useful for the elderly people who needs assistant from others to take their medicine

4. DISCUSSION ON EXISTING AND PROPOSED SYSTEM

MEDVAULT- GSM based medicative system for elderly people using Arduino, our proposed system is modern age craft which will be very useful for the needy compared to the other existing system which have been proposed before, in this section comparison between the existing and proposed system is discussed briefly. In our system once the prescribed time arrives the alert system will eventually send the message to the patient about what medicine has to be taken, by the patient, dosage of the medicine and whether the medicine

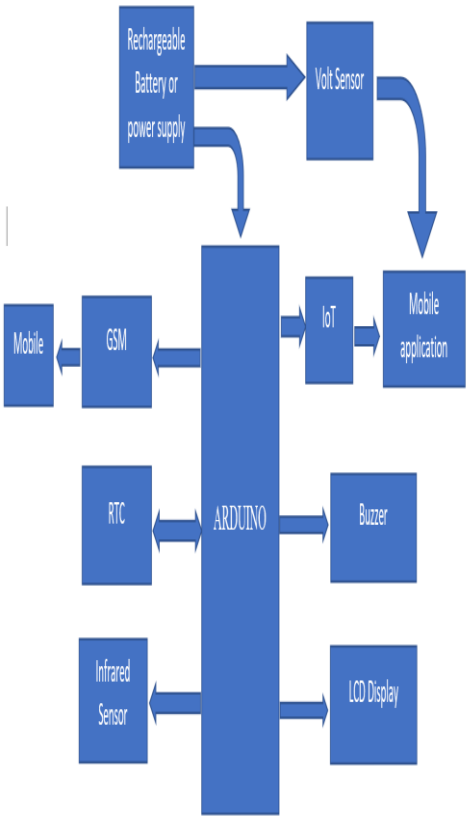

Fig 1 Block Diagram

taken after or before food, which is major advantage over the existing system because neither it does not send the information about patient's medical prescription nor it displays the data in the display element, so that medical prescription should be known or memorised by the respective care taker. Our system is totally reliable on rechargeable battery system that makes itself a portable device whereas the existing system are powered by direct supply which needs continuous power supply in the home or office, if there is any power shutdown or power supply issue the existing will be a lose venture, since our system uses rechargeable battery so it can be charged once it does not need any continuous power supply and issues like power failures, shut down etc will not be threat to our system, so that it will affect a medicine cycle of the patient.

In our system we are using a voltage sensor which will show the power available in our battery through app by which we can know that whether it needs to be charged or not, comparing to the existing system it is a most advanced feature, which helps in enhancing our proposed system from without any interruption from the power supply matters, in its process of assisting the patients.

The existing systems are more or lesser system which will only indicate the medicine should be taken at the time of medication, it does not care about whether the medicine taken or not by the Patient, whereas in our system the IR sensor inside the section of med vault will detect the movement inside the vault through which the system will know whether the patient has taken the medicine or not and it will be notified by our alert system of our med vault

Every other existing system largely relying on the IoT which is only gets activated through the internet if the patients staying in remote area where the internet cannot be accessed easily in such cases the existing becomes more vulnerable, but in our system along with IoT, GSM module also used which does not require any internet and it helps the patient more in the process of medication

HARDWARE

Arduino: Arduino is open-source hardware which is used for the communication between medicative assistive system and

RTC: RTC is real time clock which is used to keep track of the real time and date which is used for medication

LCD Display: LCD display is a liquid crystal display which is used to display the particular time at which the medication should be taken and also display the medicine status.

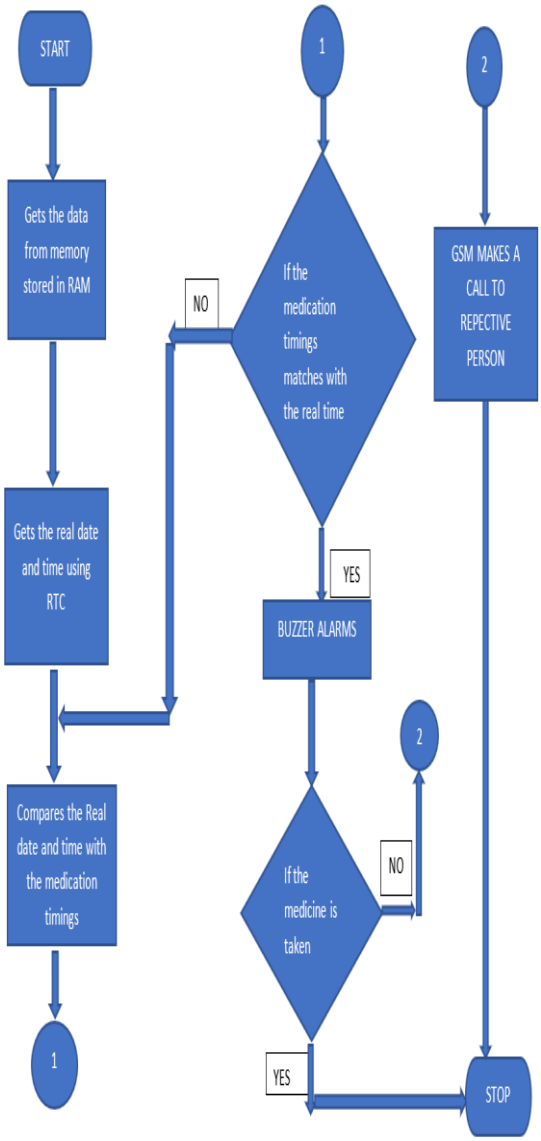

Fig 2 Flow Chart

Buzzer: Buzzer is used to alert the people to take their medicine at the respective timings as prescribed by the doctor

Mobile Application: Mobile application is designed in case if there is any changes in the medication which can updated with the help of mobile application. The battery status of the entire medicative system is updated in the mobile application.

Rechargeable Battery: The power for the entire medicative is provided with the help of battery where the battery is a rechargeable

Infrared Sensor: Infrared sensors is used to detect whether the medicine is taken or not by detecting whether the segment is opened or not at the particular timings as prescribed by the doctors

SOFTWARE

The block diagram for the entire medicative system is described above. If the med -vault is turned on by supplying power from battery the Arduino gets data related to medication timings and stores it in the RAM. Arduino gets the real time and date by using RTC Module. Then Arduino compares the real time and date with the medication timings whenever there is match between the medication timings and real time buzzer alarms automatically. The buzzer alarms for two minutes to alert the patients to take their medicine. The medicine is taken or not is detected with the help of infrared sensor which functions by detecting the movement in the segment. If the medicine is not taken then the GSM module makes a call to the respective person or guardian. The medicine taken by the patient for the past one years are updated in the mobile application which is very useful for the further treatment of the patient.

CIRCUIT DIAGRAM

Circuit diagram of our proposed consists of three system 1) Indication System 2) Detection system 3) Alert system. Indication System consists of LED and buzzer. Detection System consists of Infrared sensor. Alert system consists of GSM module and IoT.

When the medication time arrives the alert system gets activated, which gives an indication to the patients to their regular medicine.

The medicine the medicine taken or not is detected with the help of detection system. Detection system

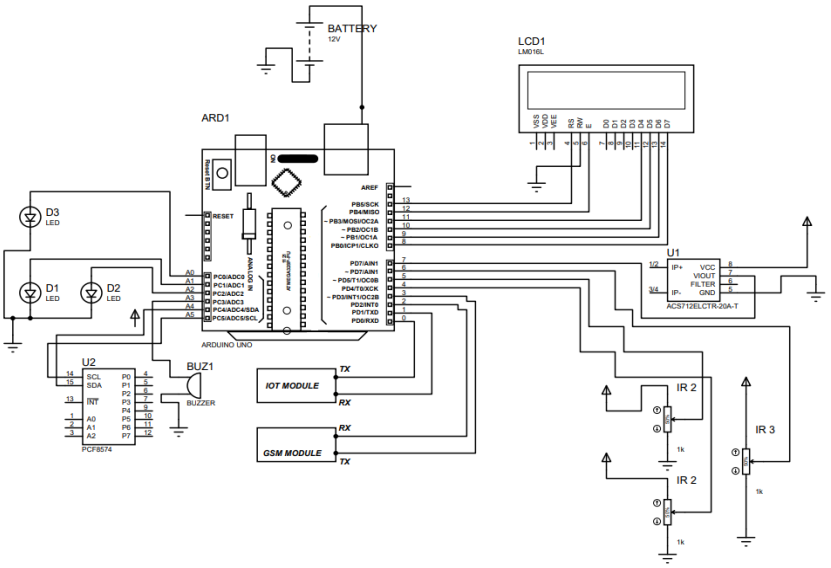

Fig 3 Circuit diagram

consists of infrared sensors, where each infrared sensor is placed at each segments of the med vault. After the buzzer alarm the infrared sensor inside the segment gets activated. During the medication timing if the infrared sensor detect any movement inside the corresponding segment it won't activated the alert, else it activates the alert system. The Alert System consists of GSM and IoT. Incise any movement is not detected inside the corresponding segment initially GSM sends a message to the patients. sends a message to the patients. After the message still there is no movement is detected inside the box GSM makes call to the respective cake taker or guardian. In order to keep track of the medicine consumed by the patient it gets uploaded on mobile app once mobile app is connected to IoT.

EXPERIMENTAL SETUP

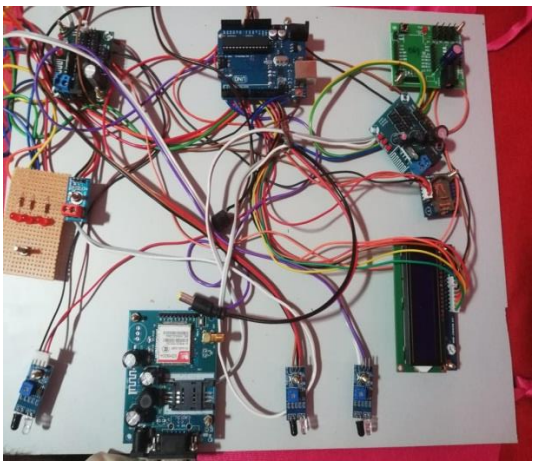

Fig 4 prototype of our med vault system

Fig 4 shows the prototype of our proposed system

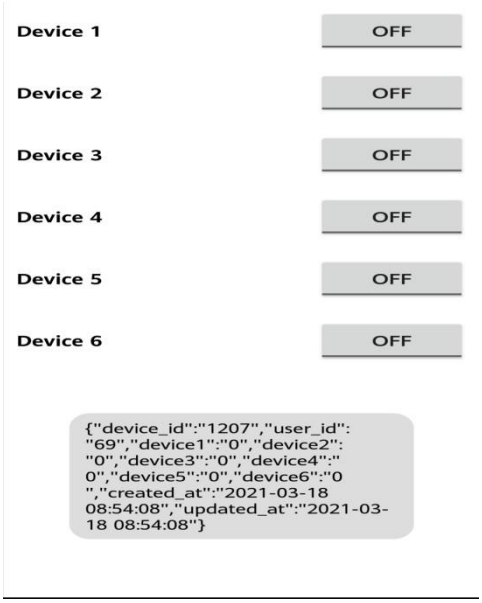

Fig 5power consumption shown in app

fig 5 shows diagram shows the power consumed by the system

Fig 6 Display Element

Fig 6 shows the display element in our proposed system. At the time of medication the display element display the message take medicine and also display the current the time which will be useful for the patient to remind about their medication .

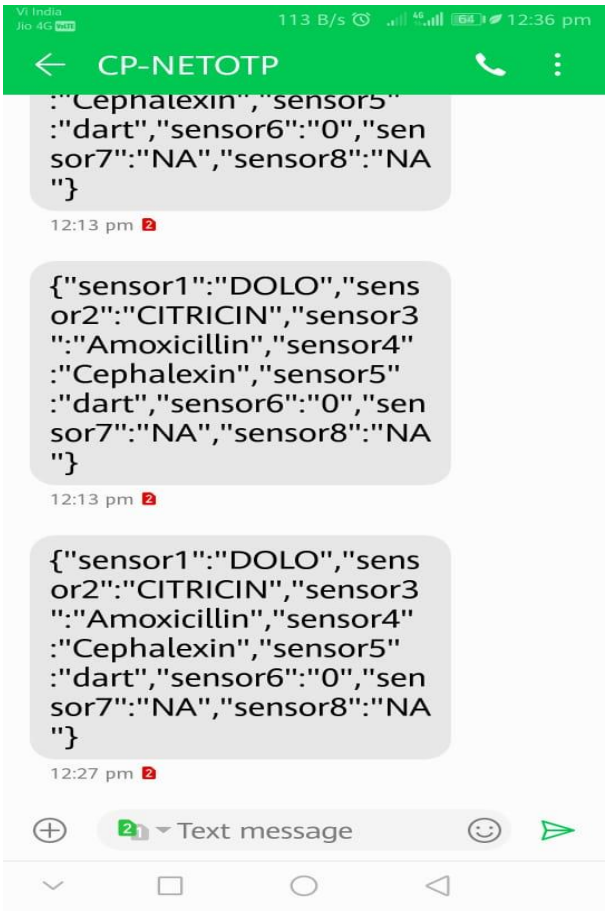

Fig 7 Medicine Name Sent through message

sensor_id	user_id	sensor1	sensor2	sensor3	sensor4	sensor5	sensor6	sensor7	sensor8
10927	69	test ok	iotuser	iotuser	iotuser	iotuser	iotuser	3/11/21	iotuser
12421	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
12423	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13040	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13041	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13042	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13043	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13044	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13045	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13076	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
13184	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	NA	NA	NA
14056	69	DOLO	CITRICIN	Amoxicillin	Cephalexin	dart	0	NA	NA

Fig 8 Medicine update In app

Fig 7 shows the screenshot of the message send to the patient phone through SMS about the name of the medicine at the particular time of medication which will be helpful for the patients to take their regular medicine without any mistake

Fig 8 shows the medicine update in app. The medicine taken by the patient for the one year gets updated in Mobile Application which will be useful for further treatment.

FUTURE WORK

In the nearby future we are planning to add certain features with our med vault system to make it as system with a many more advanced features like voice assistant and tracking the location of the patient. By speaking about voice assistantif the patient tell certain command to the system, the system will respond accordingly. For example, if the patient tells open morning section the section will open the morning section automatically, It is not only an implement regarding voice assistant but also a mechanical improvement to our whole system because we are going to use motors to automatically open the sections regarding to their command through voice assistant. Coming to another implementation (i.e.) tracking the location of the patient, in our mobile application we are going to add a new button a GPS, if you touch the GPS button the app will automatically send the present location of the patient to the responsible person or guardian, we are adding this feature because if there is any emergency situation, in a single click it will deliver the location of the patient along with a message indicating that the patient is in some kind of trouble. As of now we are planning to add the above-mentioned features in the near future.

CONCLUSION

We have designed our prototype in a cost-effective manner which will be very useful especially in old age homes because there will be only one or two caretakers available for twenty to thirty elderly people because of this ratio it will be difficult for the care taker at least to set reminder to all of them and simple deviation in the remainder may lead to the worsening the health condition of the respective person, so that our med vault will be very useful in such a situation. Our system also will store the history of medicine that have been taken by the patient for the past one month which will be very useful for the medical examiner to know the medication which have been prescribed early. As a part of our future work, we are planning to add separate cooling system to store the syrups and drugs.

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