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DEVELOPMENT OF MEDICINE SUPPLY ROBOT

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ABSTRACT:

Now a day's trend in healthcare is to move routine medical checks and other health care services from hospital to the home environment. A modern healthcare IOT platform with an intelligent medicine box along with sensors for health monitoring and diagnosis will be proposed. An intelligent home based medicine box with wireless connectivity along with an iot application helps patients and doctors to be in more close communication. The proposed model has an intelligent medicine box that gives alerts to patients for their medication at right time. It is connected to internet to make timely updates about medicine to patient's Smartphone through notices in IOT application. The system automatically gives alarm to the patient to take the medicine at right time. SMs alerts are given to predefined guardian if there are any vital signs noticed.

1. INTRODUCTION

Now a day's healthcare is a burden factor for systems are struggling with aging population, prevalence of chronic diseases, and the accompanying rising costs. Aging populations and the rising incidence of chronic disease consume a disproportionate amount of healthcare resources. In the World, about 75% of healthcare dollars go to chronic disease care and two out of every three Medicare recipients suffer from at least two chronic diseases. More than 40% of world population suffers from chronic conditions, often with no cure in sight, which can get hugely expensive. Healthcare has been recognized to be the next generation form of healthcare, and distributed, patient-centric and self-managed care is emphasized as an alternative to the traditional hospitalized, staff-centric and professional-managed care. Pervasive healthcare based on the emerging technologies of the Internet- of-Things (IOT), as so-called Health-IOT, is highlighted as one of the killer applications of the IOT. Many projects and initiatives have been devoted in this promising area. Unfortunately, the concern to prescription medication noncompliance, a basic type of self-managed care, is insufficient in the existing research. A frequently cited fact is: medication noncompliance costs the United States healthcare system up to $100 billion per year, and it is the cause of approximately 11% of US annual hospitalizations.

It has been proven that, for the 4 most drug-spending chronic conditions (diabetes, hypertension, hypercholesterolemia, and congestive heart failure), hospitalization rates are significantly lower for patients with higher medication compliance. More startling figures are listed in a report from the National Council on Patient Information and Education (NCPIE) in 2007: only about 50% of American patients take their medicines as prescribed, resulting in approximately $177 billion direct and indirect costs to the U.S. economy annually. To address the medication noncompliance problem, one solution from traditional packaging industry is the One Dose Packaging which packetizes the tablets or capsules of one dosage into one small box of bag. It just makes medication more convenient for patients, but neither improves the compliance nor prevents from noncompliance. Noncompliance detecting and recording capability is offered by the Smart Medical Refrigerator in, the microchip powered tablet package in and the Smart Dose Reminder in.

But these are mainly afterward checking measure instead of preventive measure, and the operations of these solutions are so complicated that they are only usable for trained caregivers instead of the elderly, disabled, and patients. At the same time, the increasing demands of daily monitoring prompt the Health-IOT solution to integrate more sensing and data processing capacities especially for on-site diagnosis and prognosis. For example, tri-axis accelerometer, electrocardiogram (ECG), blood pressure, blood oxygen saturation (SpO2), respiration oxygen saturation, blood sugar concentration, body temperature can be monitored on 24/7 basis.

So a powerful in-home terminal is needed not only to address the medication noncompliance but also to be used as a generic in-home healthcare station (IHHS) in everyone's home. In this paper, extending our previous works in, an in-home medication management and healthcare system is proposed based on intelligent and interactive packaging (I2Pack) and intelligent medicine box (iMedBox).

Preventive medication management is enabled by the intelligent pharmaceutical packaging which is sealed by Controlled Delamination Material (CDM) and controlled by wireless communication. Various vital parameters can also be collected by wearable biomedical sensors through the wireless link. On-site diagnosis and prognosis of these vital signals are supported by the powerful architecture. Additionally, friendly user interface is emphasized to ease the operations especially for the elderly, disabled and patients. A prototyping system is implemented and verified by field trials.

LITERATURE REVIEW

"Visual Identication of Medicine Boxes Using Features Matching"[2012]

Gomes and Benjamin et.al, proposed a system which used visual features matching in the identification of medicine boxes for visually impaired people. It uses a camera device, available in devices like computers, televisions and cell phones, to identify relevant features on medicine box. After the medicine box detection, related audios are played to inform about dosage, indications and contra indications of the medication. For each medicine separate audios are recorded. This vision system can help many visually impaired people to take the right medicine at the right time prescribed by the doctor. Experiments with 15 blind folded volunteers demonstrated that 93% of them believe that the system was useful to identify the medicine box.

"A Smart Pill Box with Remind and Consumption Confirmation Functions"[2015].

Huai-Kuei Wu et.al, proposed pill box, where the camera is placed in inner side of the box to detect the matrix barcode and the medicine bag. A hardware module above the box was used to provide pill reminding and alarm functions. After visiting a doctor and returning home, a patient need only scans the matrix barcode using the camera of the pillbox, and all medicine related information will be loaded into the pill box. After the matrix barcode is scanned, the patient places the medicine bags in the pill box without dispensing the medicine in to the cell. This method is suitable for the elderly who do not have access to the internet as well. Furthermore, because private medical information is not transmitted via the internet, the risk of information theft is greatly reduced. Moreover, if an internet connection does exist, then patients can search for their medicine information from the hospital database.

"The Smart Pill Box"[2012].

Brianna Abbey et al. proposed the smart pill box in 2012. The purpose of this system was to develop a medication device that increased medication compliance, monitored medication taking behavior, and communicated with pharmacists. The device consists of 28 chambers that are placed in seven columns made up of four rows. Each column represents each day of a week. The 4 rows represent four distinct dosage times in a day. The LED light located behind each chamber provides the light source for the patients. used as the indication for the ambient light sensor which is used to detect the light when the pills are removed from the chamber.

"The Intelligent Pill Box - Design and Implementation"[2014].

Shih-Chang Huang et.al, proposed a system where the infrared sensors are fixed at the entering where the patients take the medicine package. The detection of medicine taken will be delivered to the back-end control system and record to SQL server via the wireless serial port. The time to take the medicine package away will be recorded. The motor controls the spring which is used to put the medicine packages.

"Congestion-aware, loss-resilient biomonitoring sensor networking for mobile health applications"[2013]

Decision-Support System (DSS) frameworks provide the mechanism with which clinical data from tele health devices is analyzed. This paper will also show the importance of DSS in tele health management systems for all patients with a chronic disease, not just those with diabetes. Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touch screen mobile devices such as Smartphone and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input.

"An In-home Medication Management Solution Based on Intelligent Packaging and Ubiquitous Sensing".[2013]

A healthcare solution for medication noncompliance problem would help to save $177 billion annually in the United States. In addition, an in-home healthcare station (IHHS) is needed to meet the rapidly increasing demands for daily monitoring with on-site diagnosis and prognosis. In this paper, an intelligent medication management system is proposed based on intelligent package and ubiquitous sensing technologies. Preventive medication management is enabled by an intelligent package sealed by Controlled Delamination Material (CDM) and controlled by RFID link.

"A cloud computing solution for patient's data collection in health care institutions"[2010]

Existing processes for patients' vital data collection require a great deal of labor work to collect, input and analyze the information. These processes are usually slow and error-prone, introducing a latency that prevents real-time data accessibility. This scenario restrains the clinical diagnostics and monitoring capabilities. We propose a solution to automate this process by using sensors

attached to existing medical equipment's that are inter-connected to exchange service. The proposal is based on the concepts of utility computing and wireless sensor networks.

3. METHODOLOGY

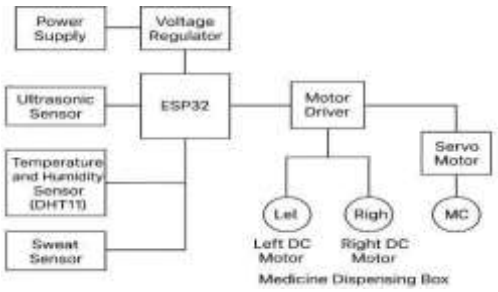


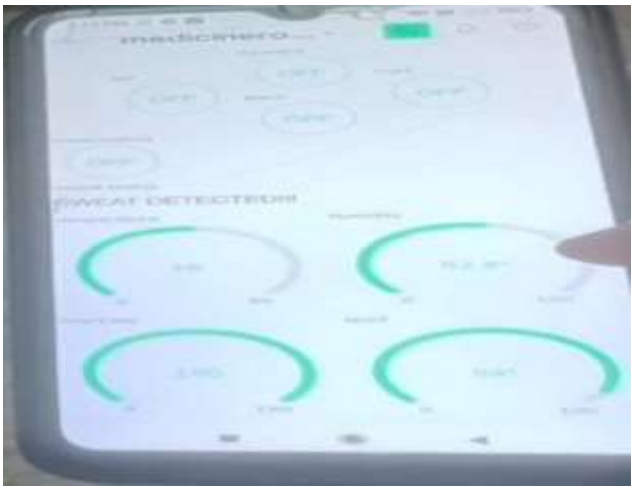
Fig-1: BLOCK DIAGRAM

4. WORKING PRINCIPLE

The Medicine Supply Robot works by first receiving medicine requests or prescriptions through a software interface used by hospital or pharmacy staff. Once the request is verified, the robot, which can be a mobile unit or a robotic arm, retrieves the required medicines from the storage area using sensors such as RFID readers, barcode scanners, or cameras to ensure the correct medicine and quantity are selected. After picking the medicines, the robot navigates autonomously through the hospital or pharmacy, avoiding obstacles, and delivers the medicines to the designated location, such as a ward or pharmacy counter. Upon delivery, the system updates the inventory in real-time, tracking stock levels and expiry dates, and generates alerts for low or near-expiry stock. Safety mechanisms and error-handling protocols are integrated to prevent collisions or incorrect deliveries, ensuring efficient, accurate, and contactless medicine dispensing while reducing human workload and errors.

The working of the ESP32-based medicine dispensing box starts when power is supplied to the system and regulated to the required voltage. The ESP32 continuously monitors inputs from the ultrasonic sensor, temperature and humidity sensor (DHT11), and the sweat sensor. The ultrasonic sensor detects user presence or checks the position or level of the medicine, while the DHT11 ensures that the surrounding conditions are suitable for medicine storage. The sweat sensor helps in monitoring the user's condition. Based on the sensor readings and the programmed logic, the ESP32 decides when medicine needs to be dispensed. It then sends control signals to the motor driver, which provides sufficient power to operate the motors. The left and right DC motors perform the required mechanical movement inside the box, such as rotating or positioning the medicine tray, while the servo motor precisely opens and closes the medicine compartment. After dispensing, the system returns to its initial state and continues monitoring for the next operation.

5. RESULTS



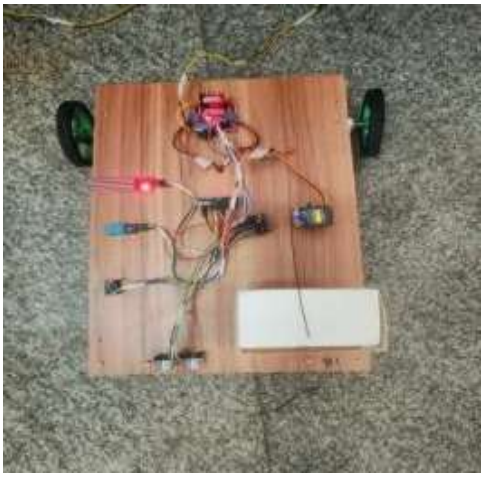


Fig-1: Output

6. CONCLUSION

The medicine supply system aims to streamline the process of delivering medicines to healthcare facilities, ensuring timely and accurate supply. It uses technology like barcode scanning, GPS tracking, and route optimization to reduce errors and enhance efficiency. This system improves patient care, reduces waste, and optimizes resource utilization. Additionally, it enhances transparency and accountability throughout the supply chain, enabling better decision-making. It also helps reduce costs and improve overall healthcare outcomes. The system can be integrated with existing healthcare infrastructure, making it a scalable solution. It also enables real-time tracking and monitoring, reducing the risk of medicine shortages or overdoses.

7. REFERENCES

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