INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

Autonomous Healthcare Robot

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ABSTRACT: Corona virus has spread rapidly, and many countries have been affected by this pandemic. While some countries are recovering, other countries are still in lockdown, and some are suffering from the second wave of corona virus. And medical services is one of the most important things now that can save the people with proper treatment and care. But the doctors and hospital staff can also have a chance of getting affected with this virus, while treating them. So here, the robotic implementation in patient monitoring and healthcare services can be a big boon for all of us. So that we can reduce the human interaction with the deadly virus affected patients to an extent. Not only in patient monitoring, but also in treating the patients, and helping the staff over there in the hospitals, the robots were started making their own mark. The embedded systems with mechatronics will help the robot in its motion, and artificial intelligence to learn things and make decisions on its own based on the situations, and internet of things to establish the wireless data transfer from the robot the human, computer vision to detect objects and other things. Here the robot was developed for assisting the hospital staff and the patients in making its own prominent role by updating the patient details, dispatching the medicines at the prescribed time, and informing the hospital authorities in case of any abnormal conditions of the patients.

I. INTRODUCTION

Medications are offered by health services throughout the world. However, with substantial and increasing medication use comes as a growing risk of harm. This is compounded by the need to prescribe for an ageing population with increasingly complex medical needs and the introduction of many new medications. These issues are particularly relevant in primary care. In many cases, prescribing is initiated in primary care and those initiated in the hospital may also be continued in primary care. A substantial amount of literature about medication errors is based in the hospital setting, but there are differences in the type of clinical problems encountered, classes of medications used and the organization of services in primary care. This means that the risks posed in primary care and the solutions required may differ from those in hospital settings. The Robot model get the data from database where we enter the data of the patient and their medicines. The data such as the patient's name, patient ID patient room number, name and quantity of the medicines with their respective timings. The model uses both IR Sensor and Ultrasonic Sensor for its movement. IR sensor is used for line follower method where path is represented in black line. The Ultrasonic sensor works in such a way that it sends and receives the pulse signal to measure the distance of the target. A wide range of robots is being developed to serve in a variety of roles with in medical environment. Robots specializing in human treatment include surgical robots and robotic prescription dispensing. The field of assistive and therapeutic robotic devices is also expanding rapidly. These include robot that help patient in health care is very useful and effective. By automating the medicine dispensing using robots have enhanced efficiency, error–free environment for medical dispensing and reduce the waiting time for patients. The robotic medicine dispensing leverages robots and automation to perform all the repetitive tasks – right from filling the patient prescriptions to organizing the medications and delivering the same to the correct patients via a 'QR code' recognition.

The robotic automation assistance along with the human intelligence and expertise in medical field, can increase the efficiency and ability of the services to a large extent. And in the recent days, the robots were developed in a large number for functioning in the hospitals, in many departments like helping the patients to take medication by some remainders, and updating the details of their health parameters to the hospital authorities, and also the instructions of the doctors to the patients in the wards, etc., And recently, with the help of advanced technology, many research and development organizations had built the advanced robots that have the ability to sense the tumors, and other health issues just by scanning and also helps the doctors in surgeries. Based on the automation in heatlh services, the surgeries have been done by the automated robots at a place by the instructions of the doctor who is some other place. This development of the robots involvement in health treatment leads to a great change and thus can improve the success rate, because of their clear vision and perfect placement. Here in this type of robots, there are many things to be involved and many constraints to be considered and many technologies to be implemented and integrated as a single system.

II. LITERATURE SURVEY

There have been several researches in the field of medical science to develop a system that reduces the dependency on the caretaker and also that reminds patients about their medicines.

[1] A. Jabeena, Rohit Roy, Animesh Kumar Sahu, N. Sardar Basha proposed "Automatic Pill Remainder for Easy Supervision" which reminds patients about taking their pill. In this paper work, the system just displays the time for the next medicine in a LCD screen and when the time arrives, it generates messages repeatedly, along with LED blinking indicating which compartment to be open. But it is not able to check whether the patient is in the state of detecting the sign instructed to the patient. So if the patient is taking rest, then there is no chance of indication.

[2] Ying-Wen Bai and Ting-Hsuan Kuo proposed "Medication Adherence by Using a Hybrid Automatic Remainder Machine"which reminds patients about their pill. This design uses a Bluetooth bracelet to cooperate with the reminder machine. The bracelet will make a sound and flash to remind user to take pills from a specific bag. But the drawback is that it is not able to detect that whether patient was awake to sense the indication done by it.

[3] WissamAntoun, Ali Abdo, Suleiman Al-Yaman, AbdallahKassem, Mustapha Hamad and Chady El-Moucary proposed "Smart Medicine Dispenser (SMD)" by an Android application which is to dispense the pills, by arduino via Bluetooth of phone sending commands indicating which container should be opened by the stepper motor. This paper presents a SMD prototype. The main purpose of this system is to help the patients to take their medications on time and also reduce the risk of over or under dosing accidentally.

[4] S Chawla proposed prototype of "Autonomous Pill Dispenser: Mechanizing the delivery of tablet medication,". This project is an arduino consumer device to dispense perfect amount of medication for which the user is notified via SMS configurable with an android application, caretaker can select date and time of the medication. The device relies on an Bluetooth module and first result set obtained measures how often the correct pill was dispensed and how often a single pill was trapped and dispensed. The second result set measures time elapsed between the scheduled release of a pill and actual release of the pill followed by the user receiving the notification. Apart from the preliminary step of loading medication in the device, this model is fully automated and the most effective in the current market.

[5] Bates DW, Spell N, Cullen D J, et al, proposed a system to assess the additional resource utilization associated with an adverse drug event (ADE).where the Incidents were detected by self-report stimulated by nurses and pharmacists and by daily chart review, and were classified as to whether they represented ADEs. Information on length of stay and charges was obtained from billing data, and costs were estimated by multiplying components of charges times hospital-specific ratios of costs to charges. The substantial costs of ADEs to hospitals justify investment in efforts to prevent these events. Moreover, these estimates are conservative because they do not include the costs of injuries to patients or malpractice costs.

[6] Zarowitz B J, Stebelsky LA, Muma BK, et al., proposed "Reduction of high-riskpolypharmacy drug combinations in patients in a managed care setting". This systemto enhance physician and patient awareness of polypharmacy; to decrease the risks, drug costs, and waste resulting from polypharmacy; and to make the business case for reducing misuse, overuse, and underuse of drugs by reducing polypharmacy.These interventions reduced drug costs and numbers of prescriptions in a managed care cohort of patients at high risk for adverse drug events due to polypharmacy. By providing clinical information, decision support, patient self-management support, and care delivery redesign some of the problems resulting from polypharmacy can be solved.

BLOCK DIAGRAM OF THE PROJECT
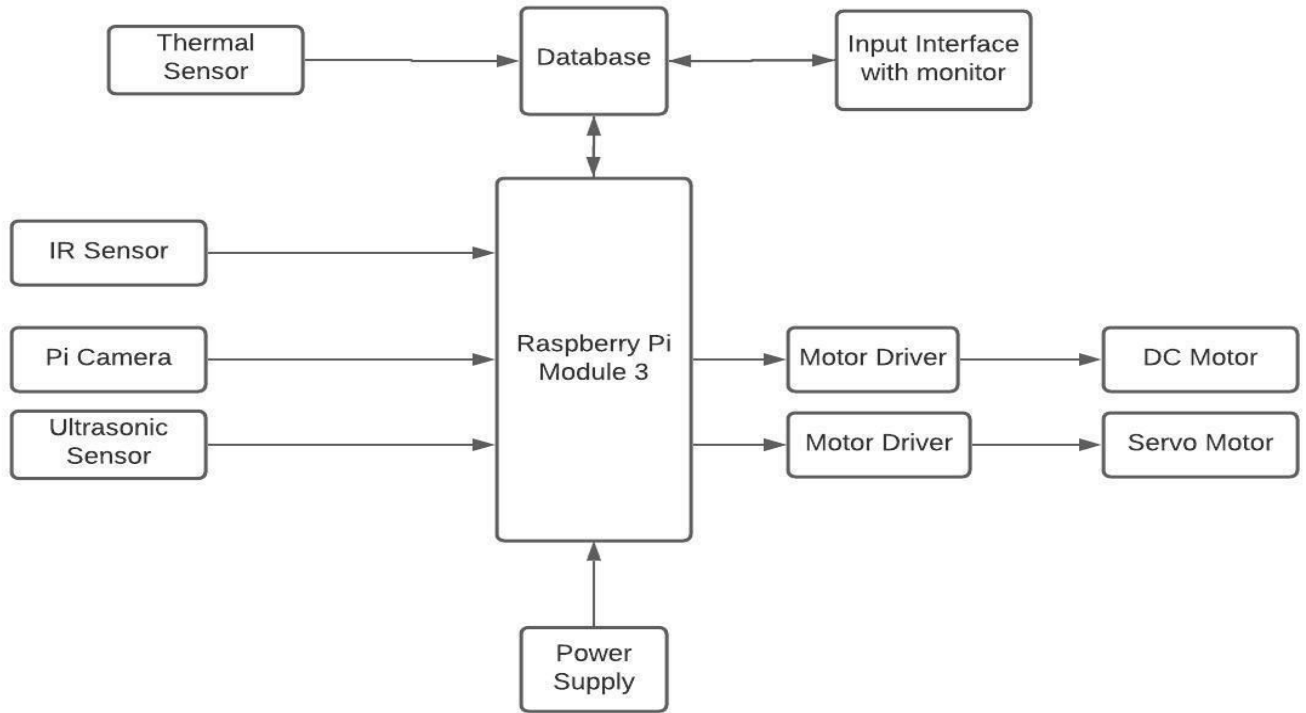
HARDWARE REQUIREMENTS OF THE PROJECT

- Raspberry pi 4
- Contactless temperature sensor
- Raspberry pi camera
- Ultrasonic sensors
- Robot wheels
- Power bank
- Servo motor
- Robot Chassis
- Motor driver
- Jumper wires
- IR Sensors

SOFTWARE REQUIREMENTS OF THE PROJECT

- Raspberry pi OS
- TensorFlow
- Pycharm IDE
- Python programming language

ADVANTAGES OF THE PROJECT

- Open source
- Easy installation
- Bed vacancy identification
- Remote monitoring

APPLICATIONS OF THE PROJECT

- Medicine Dispensing
- Face Mask Detection
- Patient Monitoring
- Assisting Medical Staff
- Indoor and Outdoor Contactless Temperature Scanning

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