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Pharamarobotic Automation System for Pharmacy

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ABSTRACT

Pharmarobot was designed to deliver drugs to overcome human intervention. Dispensing medicines is time-consuming, confusing and mostly error-free. The pharmacy robot thus enables the team to deliver drugs quickly and reduce the probability of error in drug selection. The designed access pharma robotic automation system (PAS) offers a faster, more robust and greener service. It is an automatic controlled robotic arm using radio frequency identification (RFID) technology to collect and place medications. The robot and the pharmacist communicate using Bluetooth voice transmission. Accordingly, the robots select the required drug and return to the pharmacists and return the remaining drug to the same location.

Keywords – Radio Frequency Identification Infrared, Bluetooth voice transmission,pick and paste medicine

I. INTRODUCTION

In the medical field, robots are changing the way surgeries are performed, simplifying supplies and disinfection, and allowing providers to focus on working with and caring for patients. The use of robotics in the medical field allows for a high level of patient care, efficient processes in the clinical environment and a safe environment for patients and healthcare workers, as well as the current pharmacy management system is more time-consuming, there is the possibility of human medication in the medicine of childbirth, and they directly affect patient safety. The current working system in this hospital today is computerized as tables and other necessary drugs are arranged in racks and shelves, these numbers are accessed by software in the computer that is accessed by software in the computer that is accessed only through human intervention. This process is the in another way, the robots can be solved by bluetooth transmission of the voice of the staff working in the hospital, where the robots receive input from them. Accordingly, the robots will receive the required drug and move to reach the required staff and return the remaining drugs to the same location.

II. LITERATURE SURVEY

[1] Nur Syahirah Ahmad et.al discussed that in addition to selling health products and supplements, Sharifah Nur Pharmacy also offers medical and nutritional consultations, patient profiling management system and health care programs for its clients. However, no online system has been developed to allow direct communication between employees and clients. Therefore, there is a need to develop a chatbot application for smartphones that will allow customers to have an online conversation with the bot. Based on the information provided by the customer, the chatbot is able to advise what medicines should be taken. The development of the application can improve the communication process between customers and the pharmacy, and at the same time it helps the pharmacy to have a better customer management system.

[2] Hui Sun et al. explained the problems of low labor efficiency and high labor intensity in traditional pharmacies and other warehouse models, intelligent logistics storage and handling equipment are slowly moving into modern warehouses. This paper analyzes and designs an intelligent logistics warehouse and handling robot for pharmacy warehouses and other places to specify its intelligence level. Combined with the actual needs of the overall mechanical structure design scheme, the structure, and the driving form of each component of the robot.

[3] MA Yongbo et. al proposed the overall design of the drug storage and dispensing system, and the design of the mechanical structure was completed. Second, the hardware of the control system was discussed in detail, and the overall structure of the control system was analyzed. According to the characteristics of the drug storage and dispensing system, the main control modules of the system, such as AC servo control module, I/O control module, and stepping motion control module, were designed. Third, with the application of multithreading technology, the design of the management software module and the supervision module has been completed. Finally, drive control methods were investigated based on the control requirements analysis. A program module was completed for control requirements such as synchronous servo motion, zero position reciprocating motion, and drug dispensing count.

[4] Carlos Franco et al, suggested that automation in healthcare is a big challenge improve service quality while reducing costs. Especially the right serving medication to patients is essential to ensure the quality of care during hospitalization and to minimize medication errors. Errors are more likely to happen when medication is administered manually (dispensing, ordering or administration). Reduce the risks associated with medicines automation of processes in the pharmacy appears to be a suitable tool for the solution situation. In this paper, we proposed a new mathematical model for optimization

processes related to the administration of unit doses and the preparation of recipes in the network HOSPITAL. Modeling uncertainty associated with drug demand, concept p-robustness is included; the concept of resilience is also considered a risk model centralized distribution processes.

[5] Javad Fotouhi et.al, discussed robotically assisted minimally invasive surgerywhich has been shown to improve patient outcomes as well as reduce complications and recovery timefor several clinical applications. While increasingly configurable robotic arms can maximize reach and prevent collisions in cluttered environments, positioning them correctly during surgery is complicated by safety regulations preventing automatic steering. We propose a head-mounted display (HMD)-based augmented reality (AR) system designed to guide optimal surgical arm setup. HMD-equipped personnel aligns the robot with its intended virtual counterpart. In this user-oriented environment, the main challenge is the perspective ambiguities preventing such a collaborative robotic solution

III. PROPOSED SYSTEM

Gone are the days when pharmacists were only known for dispensing pills. With the emergence of new drugs and many clinicians taking on new roles on the front lines of public health efforts, such as the administration of COVID-19, the pharmacist plays a vital role in the organization of human health care. Pharmacists are increasingly involved in patient care challenges such as many diverse resources, increasing number of specialty drugs, demand for multitasking, outdated information across databases, human and financial costs of medical errors.

Although the results of the action of the pharmacy robot are increasingly beneficial in the overall improvement, the morale of the staff and the functionality of the pharmacies, mechanical errors still occur. Errors, in turn, require human intervention and technology. The current working system in these hospitals today are computerized as tablets and other necessary drugs are arranged in racks and shelves, these numbers are accessed by software in the computer which is only accessible by human intervention.

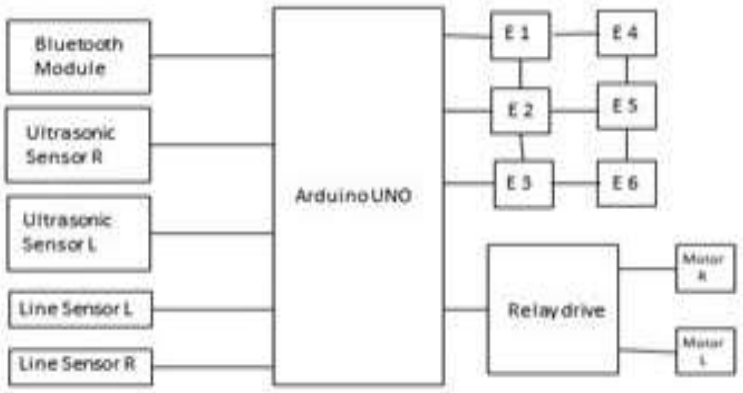

Fig1 Block diagram (Arduino)

Automated methods have been introduced into many pharmaceutical distribution systems to address the risks of manual dosing and administration systems. In addition, there is a big push to reduce expenses and reallocate time from manual distribution. Putting these resources into larger clinical work has been successful in that we have developed new methods and procedures to reduce patient wait times, provide drug therapy information to physicians and pharmacists, and increase productivity by automating administrative tasks.

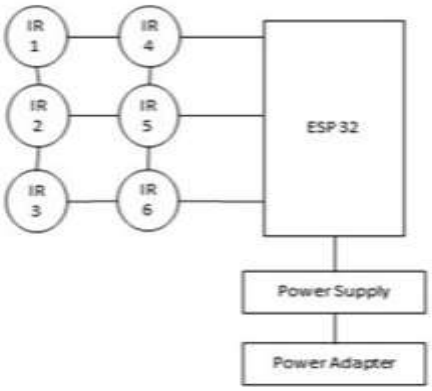

Fig 1.1 Block diagram (ESP32)

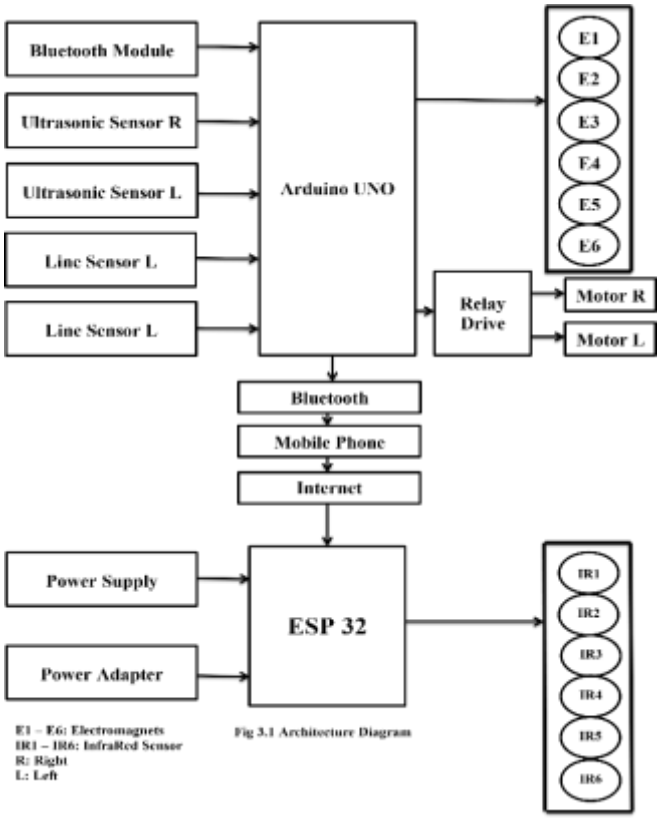

Fig 1.2 Architecture Diagram

SL.NO	Components
1	ESP32
2	IR Obstacle sensor
3	7805 Regulator IC
4	1000 micro palet capacitor
5	Arduino Uno
6	Electromagnet
7	IR line Calling Sensor

Advantages:

• Today, robotic pharmacy dispensing and workflow systems are the keys to the successful functioning of pharmacies. These systems increase patient safety, enable pharmacists to build relationships with both patients and physicians, and allow pharmacies to operate more efficiently to remain competitive.

• Most robotic systems employ numerous safeguards to ensure that the right drug always reaches the right patient in the right dose.

• This also allows technicians to monitor the safety of each filled prescription.

• A pharmacist can perform multiple high-level clinical duties, including building better relationships with patients.

Disadvantages:

• It is very expensive. Not every hospital can afford to buy these robots to improve the hospital.

• Robots replace humans and unemployment occurs in cities.

Components Required:

Hard Descriptions:

ESP32:

The ESP32 is a series of low-cost, low-power microcontroller systems on a chip with integrated Wi-Fi and dual Bluetooth. The ESP32 series uses either the Tensilica Xtensa LX6 microprocessor in dual-core or single-core variants, the Xtensa LX7 dual-core microprocessor or the RISC-V single-core microprocessor and includes built-in antenna switches, an RF balun, a power amplifier, a low-frequency noise amplifier, filters and power management modules.

IR Obstacle Sensors:

The infrared obstacle sensor module has a pair of infrared transmitting and receiving tubes. When the transmitted light waves are reflected back, the reflected IR waves will be received by the receiving tube. The comparator integrated circuit will perform the processing and the green indicator LED will come to life.

7805 Regulator IC:

The voltage sources in the circuit can fluctuate, resulting in not providing fixed voltage outputs. The voltage regulator IC keeps the output voltage at a constant value. The 7805 Voltage Regulator, a member of the 78xx series of fixed linear voltage regulators used to maintain such swings, is a popular voltage regulator integrated circuit (IC).

1000 Micro Palet Capacitor:

This is a 1000uf 25 volt radially polarized quality electrolytic capacitor. Electrolytic capacitors are widely used in power supplies, switching power supplies and DC-DC converters. This capacitor has long life, low leakage current and wide operating range.

Arduino Uno:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and originally released in 2010.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that can be connected to various expansion boards (shields) and other circuits.

Electromagnet:

Electromagnet, a device consisting of a core of magnetic material surrounded by a coil through which an electric current is passed to magnetize the core. Electromagnets are used wherever a controllable magnet is required, such as to vary, reverse, or turn on and off the magnetic flux.

IR line Calling Sensor:

Line sensors detect the presence of a black line by emitting infrared (IR) light and detecting the light levels that return to the sensor. They do this using two components: a transmitter and a light sensor (receiver). Below you can see an example of a TCRT5000 line sensor. Your components may be placed differently (all on one side, for example), but the components I will discuss will be present on most line sensors.

Software Descriptions:

Arduino IDE:

Programs written using the Arduino Software (IDE) are called sketches. This sketch is written in a text editor and saved with the file extension .ino. The editor has features for cutting/pasting and searching/replacing text. The message area provides feedback and also displays errors while saving and exporting. The console displays text output through the Arduino software (IDE), including complete error messages and other information. The lower right corner of the window shows the configured board and serial port. Toolbar buttons allow you to test and upload programs, create, open and save sketches, and open the serial monitor.

Bluetooth:

Bluetooth module Bluetooth module (Bluetooth module) refers to the basic circuit set of a chip with integrated Bluetooth function, which is used for short-range 2.4G wireless communication module. For the end user, a Bluetooth module is a semi-finished product used as a Bluetooth serial port prototype module. It can be easily programmed as master and slave. It is fully extended with a full 2.4 GHz radio transceiver and baseband with a data rate of 3 Mbps modulation..

Technology Details:

Robotic Technology (Pick and Paste):

In our project, robotic technology is used to collect and insert the drug. Our robot selects the medicine given by the instructor using Bluetooth and after picking it up, gives it to the instructor. After the instructor takes the medicine, he leaves the medicine in the same place again.

Bluetooth Technology:

Bluetooth is a wireless communication technology that can be used to transmit data at close range from one digital device to another. Bluetooth is essentially a one-to-one wireless connection that uses radio waves in the 2.4 GHz band. As the only 2.4GHz Wi-Fi and Bluetooth combo chip, the ESP32 supports Wi-Fi setup via both Smart Config and Bluetooth.

Android Technology:

In our project, we use Android technology as a mobile application called the Blynk app. The Blynk is an IoT platform for iOS or Android smartphones to control Arduino, Raspberry Pi, and Node MCUs over the Internet. This application is used to create a graphical interface or human-machine interface (HMI) by compiling and providing the appropriate address on the available widgets.The Blynk app is connected to our ESP32 using a hotspot and we can get the output in blynk app.

IOT Technology:

The Internet of Things (IoT) describes a network of physical "things" that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the Internet. In our project, IOT is used to detect whether the tablets are present or not, if not, it gives an indication and we can refill the tablet.

Working Principle:

Introducing a new generation of pharmaceutical robotics. This new technology offers faster, more robust and greener services than classic solutions. Our project is to build a robotic prototype that surpasses human invention. This fact represents a new paradigm between classical architecture and this new architecture robot control area. The current work system in the hospital today is computerized as tables and other necessary drugs are arranged on racks and shelves, these numbers are accessed by software on the computer that can only be accessed by human intervention. Another way robots can handle this process is by using the pharmacist's Bluetooth voice transmission in the hospital where the robots receive input from them. Accordingly, the robots receive the required drug and move all the way to reach the necessary staff and return the remaining drugs to the same place.

STEPS	EXPLANATION
Step 1	Patient to Pharmacist
Step 2	Pharmacist to Robot: Pharmacist tell the medicine to robots with the help of Bluetooth
Step 3	Robots pick the medicine with the help of RFID and IR sensors
Step 4	Robot give the medicine to the pharmacist
Step 5	Pharmacist gives the medicine to the patient
Step 6	Robot place the medicine back to their place

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