Patient Vital Science Monitoring Medical Machine Using Microcontroller

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Abstract: Rural hospitals are hardly worth mentioning. Most of them are horrifyingly underdeveloped. The Indian government is trying to deal with this problem, as these places are often in drastic need of health care, doctors and medicines. Often there is no quick access to medication, sometimes lives may depend on it. There aren’t that many options available in highways either, for people driving long distance or other similar situations. We also face a major problem with “expired” medicine, which is overlooked by many people, and which leads to a lot of problems. To deal with this ever-evolving issue, we have come up with the concept of the PATIENT VITAL SCIENCE MONITORING MEDICAL MACHINE USING MICROCONTROLLERS.

Keywords: Dispenser box, LCD display, PIC microcontroller, RFID reader, Sensors, Stepper motor.

1.0 INTRODUCTION

The World Health Organization reported that one third of the world’s population lacks reliable access to required medicines. Only 25% of the health facilities are available for use to 75% population in towns and rural regions. Many people suffer due to lack of medical facilities and also due to negligence of untrained hospital staffs. Appointments must be booked in advance to consult a Physician and the amount spent by a patient includes the money that is to be paid as salary to nurses and other workers in the hospital. The availability of common medicines is scarce in many places of world. Pharmacies are severely overcrowded and service is more often of less quality than required. We often see queues that run a mile long, at government hospitals that are filled with people waiting to get their required medication. Medical shops, dispensaries and pharmacies are mostly closed at midnight and holidays, so during emergency situations, immediate access to supplies may prove to be a major difficulty, and at times, even impossible. Inadequate distribution of medicines also affects the availability of medicines. To overcome all these problems in acquiring medicines with doctor’s prescription through interactivity we come up with a solution called “Patient Vital Science Monitoring Medical Machine Using Microcontroller”. It reduces the cost of visiting a Doctor in hospital/clinic at distant place. It provides immediate access to doctors, who are connected with the machine and also a quick delivery of medicines to the patient’s hand using a RFID card.

2.0 PROPOSED TECHNOLOGY

The proposed system provides tablet through online Doctor’s prescription at an instant of time with the help of the micro controller and dispenser slot provided in machine.

| STEP 1. User has to show their respective RFID card in RFID reader. |
| STEP 2. Then it will indicate the specific user name, age, gender and some other parameters. |
| STEP 3. User has to keep their finger in the specific heartbeat sensor, temperature sensor slots. And for the respiration issues user have to keep their face in respective slot provided with respiratory sensor. |
| STEP 4. Depending on the sufferings of patient, doctor checks the availability of the medicines and deliver it. |
| STEP 5. Medicines are delivered according to the doctor suggestion to the user from the medicine dispenser by stepper motor |

The Cloud service providers supply data storage on demand to store the health records and other useful information. The body area network is connected to machine to provide various clinical parameters of human body. The overall machine will be connected to a common centralized monitoring station to provide networking facility and to monitor and control the machine.
3.0 MATERIALS AND METHODS

3.1 OUTER COMPONENTS

3.11 LCD Screen display
LCD is a display module and used a wide range of applications. These modules are preferred over seven segments and other multi segments LEDs. And the data registers stores data to be displayed on the LCD.

3.12 RFID Card reader
Each user has unique RFID card. With that unique card shown to the RFID reader slot means then doctor will know the basic profile of the specific user.

3.13 Body Area Network
Body area network is a wearable computing device with real time updates of medical record using Internet. BAN provides health related information about the user such as blood pressure, sugar level to doctors in online using sensors interfaced in BAN.

3.14 Camera
Camera is mainly used to communicate with Doctor in case of need for the user through videoconferencing.

3.15 Microphone and Speaker
To communicate with the doctor, we need microphone to speak and speaker to hear the voice of Doctor and also to know about the machine alerts.

3.2 INNER COMPONENTS

3.21 CPU
It controls, process and monitors the overall functions of the machine. Operating System and other required Software are installed in the memory of the CPU.

3.22 Medicine dispenser
Medicine dispenser consists of slot and stepper motor. When the prescribed medicines is about to deliver it is check out through the respective slot. It monitors and notifies the journal with the delivered medicines to update the count of medicines in the database.

3.23 Network / Internet
The Wi-Fi can be used to connect each machine to cloud and it is provided with authentication, message integrity, data confidentiality by making use of IEEE 802.11i standard WPA2 (Wi-Fi Protocol Access 2).

3.24 Respiratory Sensor
To monitor the respiration, the slot will be in the shape of face where nozzles are provided with the microphone which will be sense the respiratory issues.

3.25 Heartbeat Sensor
The finger is placed between LED and LDR. The emitted light is sensed by LDR and the resistance value depends upon the amount of light emitted. The value is pre-set in the inverting input the amplified value is compared with pre-set value if any abnormal condition occurs it will generate an interrupt to the controller.

3.26 Temperature Sensor
LM35 is the sensor which we used for measuring temperature, by pressing that sensor it displays the reading in form of degrees. The advantages of this sensor were compared to other sensors is low cost, high sensitive.

3.27 Microcontroller
The PIC 16f877a features 256 bytes of EEPROM memory, self-programming, two comparators, 8channels of ADC converters and a universal asynchronous receiver transmitter(USART) and range of voltage is from 2v to 5.5v and temperature range of -40 degree to 125 degree.

3.28 DC stepper Motor
The electrical motors are continuous actuators that convert electrical energy into mechanical energy. DC motor is the most commonly used actuator for producing continuous movement and whose speed of rotation can easily be controlled.

It is made up of number of drawers which stored the medicine and drawer moves with the help of stepper motor. In drawer spring mechanism is used to come medicine strips forward therefore it very easy to buy a medicine for a customer and it is safe.

4.0 RESULTS AND DISCUSSION

This project is mostly adopted by government as it includes tablet cost. when user come near to the machine then that user has to show their unique RFID card in the RFID reader then it will indicate the authenticate user’s basic profile like name, age, gender and other parameters. After the recognition of
profile sensors will turn on and user can update their respiratory, heartbeat, temperature values from the respective sensor slots.

Parameters like Heart Rate and Temperature has been measured out using sensors. In this proposal we included the two basic parameters temperature and heart rate, which is very necessary if any patient attempts for primary medication. The sensors which we used in our research work were highly sensitive and low cost. LM35 is the sensor which we used for measuring temperature, by pressing that sensor it displays the reading in form of degrees. The advantages of this sensor were compared to other sensors is low cost, high sensitive. Heart Rate is measured through IR sensor by transmittance type. Once finger is placed in between the two photo sensors the pulse reading is displayed in LCD here, we used 15 sec for pulse count it means for 15 sec 20 is the heart rate once it is multiplied by 4 we get heart rate for one min. We developed a simple mechanical setup with 3 stepper motors and 3 storage pipes for medicine storage & delivery.

Doctors get connected to the AMM network through their personal computer or laptop. The Doctor should get authorized by registering his details like name, qualification, experience, area of specialization and other personal details. The authorized Doctor will login with user ID and password. The Doctor will login into the AMM network only if the password and the face recognition match the Doctors list in the database of cloud. Once the doctor logs in, he is connected with all the AMM’s in his network. Any patient who wishes to consult him contacts him through videoconferencing and medicines are prescribed. The physician is provided with the details of the medicines available in that particular machine with its expiry date too. After the patient makes the payment for the prescribed medicines, the Physician delivers the medicine to the patient. The expired drug in that particular machine will be notified to the physician to avoid delivering it.

Fig 4.1 Block diagram of patient vital science monitoring

Fig 4.2 stored all health data in the cloud

For respiratory sensor, the user have to keep their face in respiratory slot and take around 5 to 7 breath means with that time gap doctor will knowing the issues related to respiration problems, by that tablets related to specific problems can be released from the dispenser box. We used JAVA platform for software side for fingerprint access and for medicine delivery. SKYPE is provoked with java for achieving video conferencing, when finger print is accessed; a new TAB will open as video call. Once pressing that video call SKYPE will be opened here we can chat with doctor.
5.0 CONCLUSION

The drastic need for health care, doctors and medicine will be satisfied by automated medical machine. This device can be placed in highways, rural areas and even around the city for the easy access of medicines with help of Doctor’s prescription in an effective way. It uses telemedicine and cloud computing technology for its functioning. Since cloud is emerging technology in providing services in many areas, research and improvement can be made in machine using cloud and its services. Thus machine will make access to medicine easy, quick and simple, which in many cases, may even save lives.

6.0 FUTURE SCOPE

This study focuses on the design and implementation of A NFC Operated MEDICINE Vending Machine that can dispense different medicine through dropping a specified Medicine by taking the reference of keypad. There are different types of medicines in a machine. The machine accepts money through RFID tag and will not accept any other type of money. Once the tag has been detected, the machine automatically dispenses the right medicine. The automatic medicine vending Machine will cater the needs of the customers with no further human intervention required. The machine is user-friendly and is very simple to operate. The customers will only have to deal with the NFC tag to be dropped to the machine which will correspond to the medicine to be dispensed. With this, labour cost will be minimized and it will also give entrepreneurs the opportunity to attract more customers with this innovation.

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