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Emergency Medical Dispenser

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Abstract
Automation is a field that deals and overlaps with electronics, artificial engineering and computer science, engineering. Collaborative services of doctors and machines have always been a great challenge in today's world. The dataset for this model is collected through a survey. A model well trained on this data is seen as a good fit that could be then used to serve medical assistance to people using cloud and IoT. By periodically collecting patient's clinical data on their own and transferring them to physicians located in remote sites allows patient's health status regulation and response provision in a better way. In this model we are using Naive Bayes machine Learning algorithm for diagnosing. This type of telemedicine system guarantees patient control while reducing costs. The proposed system will be very useful in rural primary health care centres. Proposed system architecture is based on the combination of, web services, and the autonomic computing paradigm to manage data in home-based tele monitoring scenarios.

Keywords: *Cloud, IoT, Telemedicine, Robotics*

I. INTRODUCTION

In today's scenario the death rate is increasing, people at the age of 40 to 46 die due to various types of health problems the major reason for this is self-prescribed medication and people are prone to improper medication because the hospital charges and the treatment cost are very high. In case of any simple illness say cold, cough or fever people often don't visit hospitals they just go to a nearby pharmacy and take tablets. Figure 1 shows the statistics percentage of people using self-prescribed medicines for different diseases. The pharmacist often prescribed a strong dose of medicine to the patients without knowing the health history of the patient. These strong dosage medicines will often have its own side effects. Another major problem is the time management for the doctors. This also can be used for live streaming.

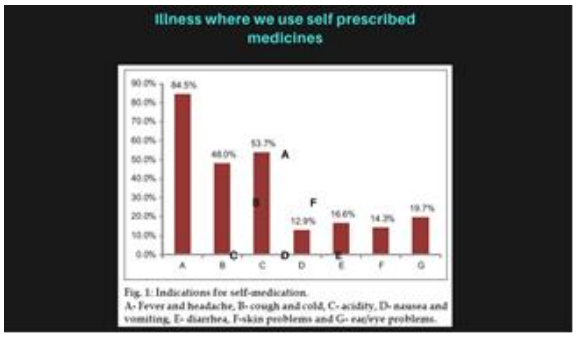

Figure 1.Survey report on import medications

II. LITERATURE SURVEY

In this section the existing system works related to drug dispensing and other assistive devices are discussed. Pharma-Botics [1] at University of California dispenses medicines. It dispenses medicines without knowing the entire medical history of the patient. It is of high cost. There are many types of Smart Bands [2] today which measures the heart-beat pulse and the number of footsteps walked. Another related work is Pepper Robot [3] which can function by helping in triage needs, schedule appointments, guiding the patients, interrupt patterns in labs in proper medical view.

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Flashes its speech on the screen in case of inefficient clarity. ROBEAR [4] is founded by Riken and Sumitomo Riko. This robot is used mainly in Japan in nursing homes and houses. This robot is like a giant, gentle, cartoon-shaped bear. It has actuators with a very low gear ratio, that enables joints to move very fast and perfectly accurately. It is used for raising a patient from a bed to a wheelchair and also provides grip for the patient, while standing. It allows tender movement and ensures that the robot carries out power-intensive tasks such as lifting patients without harming them. Da Vinci Surgical Robot [5] was an initiative made by the American company, the System is a computer-enhanced surgical robot designed controlled by the surgeon to assist with complex surgery, it mimics the surgeon in hand and wrist movements. The above-mentioned existing systems have different drawbacks in different aspects. The main disadvantage is that it does not know the entire medical history of the patient and also are very expensive. Major problems such as surgery cannot be treated.

III. PROPOSED SYSTEM

Outline of the major steps involved in design and implementation of the proposed system is described below.

Step 1: AI programs can use information from the real world accomplished through robotics to improve their execution. Machine Learning involves manipulating objects in the real world. AI and ML have programs for classifying data. Hence a combination of these two can manipulate the entire world. Here the major innovation is that an RFID is used to fetch the patient's medical details and biometric system is used to authenticate the users.

Step 2: Artificial intelligence is used to make the machine learn about the problems and symptoms said by the patient. The machine will understand the problems said by the patient and will prescribe the medicines according to the patient's medical history and the current problem.

Step 3: A copy of the prescription will be sent to the patient's mobile number. If the prescribed medicines are available the medicines will be dispensed through a Med box. In case of any emergency or critical situation the robot will advise the patient to visit the doctor. This will be able to reduce the death rate which is caused by self-prescribed medicines.

IV. METHODOLOGY

In this section the major modules used for building the proposed system are discussed.

A. Patient Data Collection and cloud data Storage

In this module, Biometric system is used as an additional step of verification to verify the users.

For every patient based on the requirement ,the vital parameters of the patients like temperature, pulse rate and the respiration readings will automatically get stored in the cloud platform which can be used at any time .The sample patients data stored in the cloud for different parameters is shown in Figure 2 and Figure 3 In this graph the x-axis represents the date at which the readings are taken and x' represents the threshold value of each sensor. The threshold energy of the respiratory sensor ranges from RThreshold = 1,.RThreshold = 10

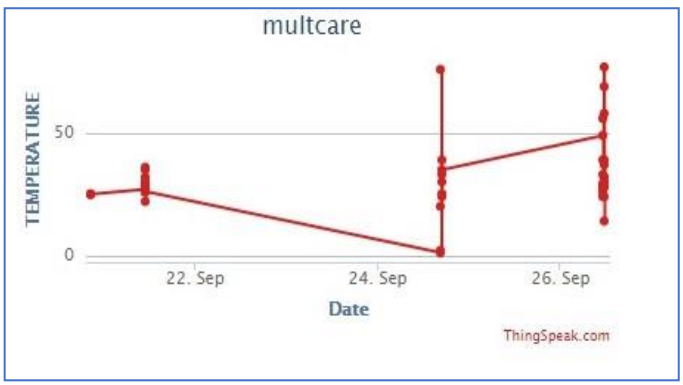

Figure 2.Sample patient's temperature readings in cloud storage

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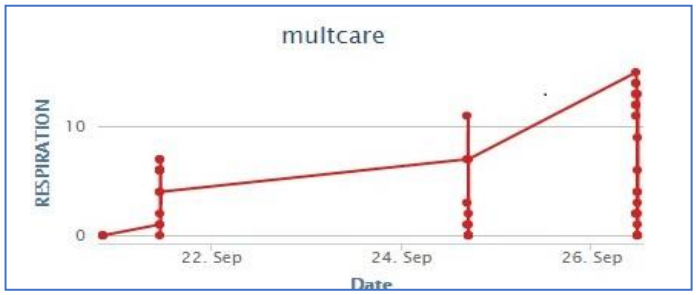

Figure 3.Sample patient's respiration readings in cloud storage

B. Diagnosis And Dispensing The Medicine

The disease can be identified by analysing the symptoms and using the readings of different sensors such as temperature sensor, respiratory sensor through machine learning. In the proposed system IoT technology is used to dispense the medicines that are prescribed by the robot in relevance to the symptoms and the medical history of the patients. A copy of the prescription will be sent to the patients linked mobile number. First the patients will be asked to answer the questions and according to the sensor reading and the answers said by the patient's relevant medicines below will be prescribed.The patients will be provided with a questionnaire about their health conditions. Figure 4 shows the questionnaire prepared for collecting the data and preparing the training model. According to the current health status the diagnoses will be done. For each patient request machine learning algorithm Naïve Bayes is applied for the common disease prediction in the proposed system. Working of the Naïve Bayes algorithm is given below

Naïve Bayes Algorithm for common disease prediction

It is a well-known classification algorithm that is commonly used in medical diagnosis purposes. The Naïve Bayes Probabilistic model can be put as

$$p(Ck|x1 \ldots,xn)=(1/Z)\, p(Ck)\, \pi n\, i=1\, p(xi|Ck) \quad (1)$$

Step 1: Consider T be the tuple. It contains attributes they are X= (x1, x2… Xn) etc. Here the attributes we are considering are temperature, pulse rate and respiratory of a patient.

Step 2: Let K be the number of classes for prediction (c1, c2, …. Cn). If you want to predict x values among two probability classes that is p(ci/x) and p(cj/x). Then the values of p(ci/x) should be the maximum.

Step 3: Create the Likelihood table.

Step 4: Calculate the prediction by using the naïve Bayesian equation.

Step 5: For the prediction of X variable which has the highest probability for the prediction of disease.

Step 6: Stop

If the patient answers "severe" for all the questions then the doctor has to be consulted. The questionnaire consists of five questions with three options namely No, Mild and severe. Considering the response from the patient medicines will be prescribed. q1, q2 and q3 represent the question numbers respectively.

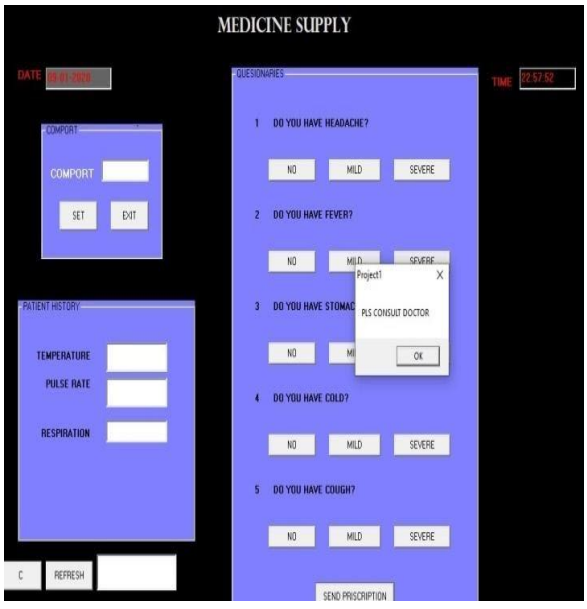

Figure 4.Sample Questionnaires

C. Healthcare Centre:

When the machine identifies the situation of the patient to be critical or severe it displays the list of doctors nearby that location with their

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specializations, rating and their contact details. A network will be formed so that the doctors online can have a check on the medicine begin prescribed and dispensed.

D. Live Streaming:

This can be helpful in knowing the health conditions of people living far away from us. This device can also be attached with the stretchers in the ambulance so that the current status of the patient reaches the doctor earlier and this would save time and medication can be started as soon as possible.

V. IMPLEMENTATION AND RESULT DISCUSSION

We are here taking the readings from three sensors namely temperature, pulse rate and respiratory and will be updated in cloud. Here for building the proposed system we will be using all these sensors; cloud is created for storing all the information. The GSM is used to send a copy of the prescription to the patient's mobile number. A sample med box is constructed to show how the medicine will be dispensed.

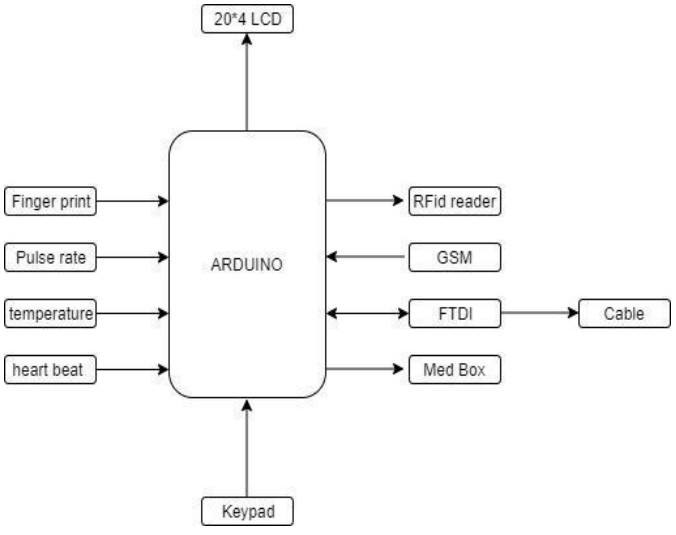

Figure 5. Block diagram of the proposed system

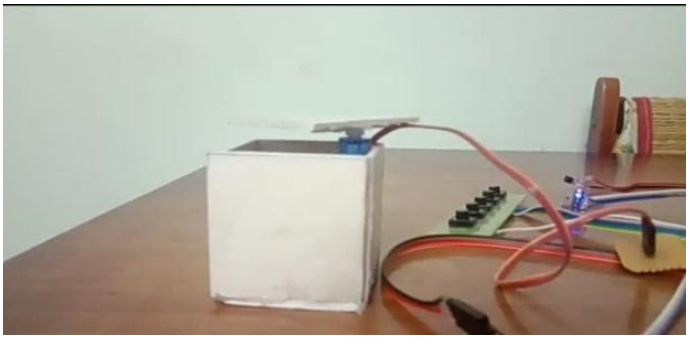

Figure 6 Prototype of the module implemented

Figure 6 shows the working model of the proposed system**.** Fig 7 and 8 represents the output of the model i.e. what medicine will be prescribed to the patients taking their medical conditions into consideration. According to the patient's current situation the robot prescribes the medicine.

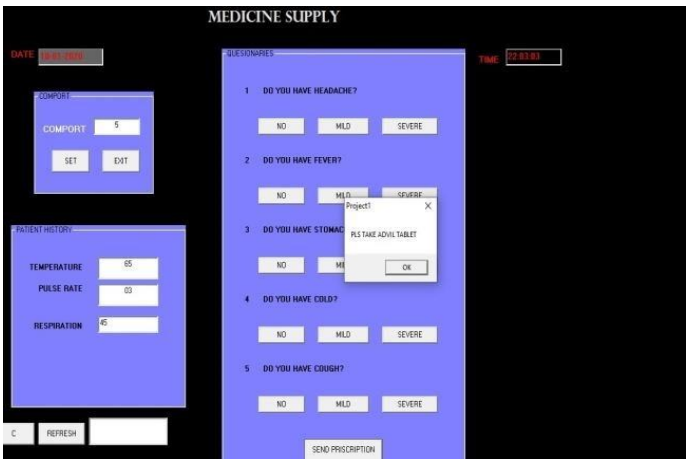

Figure 7. Based on the condition Advil tablet is prescribed

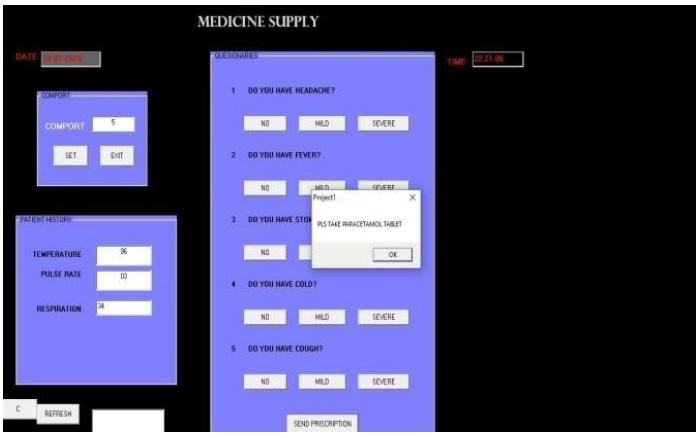

Figure 8. Based on the condition Paracetamol tablet is prescribed

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VI. CONCLUSION AND FUTURE WORK

In the proposed system an emergency medical dispenser is designed to prescribe proper medicines for common people. The proposed system is capable of analysing the patient's health condition and suggesting suitable medicines for common health problems. The main aim of the system is to restrict the users from self-medication. The proposed system would surely prove to be helpful in army training centres, railway stations, rural and under developed areas, malls and in areas where there is limited medical facilities. This can reduce the death rate which is caused by self-prescribed medicines. In future it is the proposed system that can be extended to address other diseases prediction and also connecting the patients with the nearby doctors.

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