

AN IMPLEMENTATION OF INTELLIGENT MEDICINE RECOGNITION AND REMINDER SYSTEM USING IOT

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ABSTRACT

It is a frequent observation that people give more preference to their work and other material things than taking care of their health. If smart, working adults can forget taking proper medications, the situation can only be worse for our parents and grandparents. Often they forget to take their medications or take overdose of it, resulting in further health deterioration. Our system aims to reduce this problem by reminding patients about their medications and showing them the correct amount of medication to take. It is a combination of physical and digital reminder that will be helpful for people of any age, but is specially helpful to old people who forget taking their medications.

Keywords: Home Health Care; Dementia, Remote Monitoring; Medicine Reminder

INTRODUCTION

Our smart medicine reminder system is designed for, but not restricted to, helping old people in taking care of themselves in taking their medications at the correct time and in the correct amount. It has been observed that people in general neglect their health and give preference to other things than taking their medicines. This is also the reason they forget to take their prescriptions on time. Many health maintenance organizations, health practitioners and medical researchers have realized that increased use of patient reminders can significantly increase the treatment of chronic illness and delivery of medical services to the patients who need it. Several organizations have themselves started implementing the patient medicine reminder system in the health care field and it is currently being implemented in several hospitals in the western countries to see if the method reaps any benefits. It is known throughout that Over The Counter (OTC) medication taking

patients should take prescriptions in a limited or prescribed quantity at the respective times they are supposed to take their medications. However, many patients and specially old people, do not take their medicines in the correct quantity. They either take overdose of medicines thinking it will help them heal faster, or they fear the doctor has prescribed a larger quantity than required and take under dosage of medicines. The former leads to several disastrous health implications while the latter delays the treatment of the patient[15][16][17] and in women cases, allows the illness to spread further requiring further treatment. Furthermore, some patients are so occupied with their day-to-day activities that they just forget to take their medications. This is particularly true for old patients who have to take more than one medicine at more than one time in a day. Setting alarm clocks is a tedious task which patients are too lazy to set again and again. If asked about what time people have to take their medicines, many forget to answer the correct times or remember whether they have already taken the medicine in the day already. Elderly people specially face this problem because of their degrading memory and in severe cases, forget that they have already taken their prescription and retake the same medicine 2 or 3 times in the same duration. This may not be harmful for lighter medicines, but for some strong and concentrated medicines, it can have further harmful effects to the body. This is exactly where our medicine reminder system can help. Our system takes up the prescription details from the user such as the duration of the prescription, the names of the medicines, the times they are to be taken and the amount of each medicine which is to be taken. After all this data has been entered, our system will remind the user at the prescribed time of which medicine is to be taken in form of a mobile notification and a physical reminder. The patients can leave taking medicines to just our app.

Whenever the time for the medicine is up, they will be notified and they only have to take their prescriptions during that time, and no other time. If implemented properly, this will drastically decrease overdose of medicines due to forgetfulness and the patients will also be reminded to take their medicines[15][16][17].

LITERATURE REVIEW

Min Chen et al., [1] developed techniques for predicting the diseases with the help of machine learning. They can propose new techniques based on the machine learning concept with the help of convolutional neural network. They proposed new method as multimodal disease risk prediction (MDRP) for predicting the chronic diseases. By using MDRP methods chronic diseases are effectively predicted .with the help of structured and unstructured data they can predict the diseases. They use machine learning and deep learning algorithms for prediction. In that machine learning algorithm such as k-nearest neighbor, naive Bayesian and decision algorithms and deep learning algorithm convolutional neural network used to predicting the diseases risk. MDRP algorithm process the datasets into two parts as training set and testing set which is train and test the data respectively for better prediction of diseases with good accuracy. By using this technique predict the whether the patient have a chronic diseases or not. The predicting accuracy of proposed algorithm is 94.8% with the high speed of predicting the diseases. But with the help of convolutional neural network it is difficult to determine window size of data and it can't handle the sequential data.

R.Tamilarasi et al., [2] proposed a system for predicting hearth diseases with the help of data mining techniques. In medical science large amount data is generated from patient clinical reports other patient symptoms. Data mining is used to handle that large amount of data with the help of classification and clustering. They studied different data mining techniques that can useful to predict the heart diseases. Such data mining classifiers technique are used for effective and efficient heart diseases diagnosis. In that they use various attributes and decision tress method for predicting diseases. Data mining techniques are used to analyze the data from different dimension and identify their relationships. For predicting the diseases they uses data mining algorithms like

decision tree algorithm, naive bayes algorithm, neural network algorithm, k- nearest neighbor algorithm with the classification of diseases. This data mining techniques helps to healthcare professional for diagnosis of heart disease with better accuracy. Proposed system accuracy is 85%. But some disadvantages of data mining techniques like they are lazy

Darcy A. Davis et al., [3] proposed the method for predicting the diseases which is based on patient medical history. They propose a CARE, collaborative Assessment and Recommendation Engine which depends on the medical history of patient. They use the IDC-9-CM codes to predict the diseases risks. This method is used for predicting the chronic diseases. In that they also describes a Iterative version of CARE, as ICARE which is incorporates ensembles concepts, but those approach did not have positive capacity of prediction. CARE system can do the prediction based on the vector similarity, inverse frequency and clustering with the medical data of patients. In that IDC-9-CM is the 3-digit code, which represents the small group of similar or related diseases of patients. CARE framework is used explore the border history of diseases suggestions related to previous unconsidered concerns about the prevention. But CARE system generates prediction on only feature visits of patients based on medical history.

Feixiang Huang et al., [4] developed a system for predicting the diseases by using data mining techniques with the healthcare information. For that they apply data mining process which predicts the hypertension of patient by using the patient medical records. In that 9862 sample cases are studied. This sample is extracted from the real word information system databases. That information system databases contain 309383 medical records is used to generate diseases prediction. For that prediction data mining techniques are used such as naive Bayesian and RJ-48 classifiers. In that WEKA data mining tool is used to generate those data mining techniques. Confusion matrix is used to represent the performance of naive Bayesian algorithm. In that they use a simple approach of considering the present or absents of diseases in medical history of patient. Accuracy of proposed system is 83.5%.

Abhishek Rairikar et al., [5] proposed prediction model for predicting the heart diseases with the data mining techniques. In that they uses a different

more numbers of patients attributes, such as gender, blood pressure, cholesterol like other some attributes for predicting the heart diseases. Healthcare industries produce massive volume of data which is forms of numbers, text, images, and charts. Data mining provides the various classification methods like K-nearest neighbor, decision tree, CART, C4.5, J48 and so on. In this system three different data mining classification techniques such as K-nearest neighbor, decision tree and naive bayes are used to analyze the datasets. K-nearest neighbor classification and regression methods are used to pattern reorganization and decision tree are used to build the good decision. But the KNN algorithm is lazy algorithm, where the functions are only locally approximated and also in that need to determine values of parameters of previous neighbor.

Saurabh Pandey et al., [6] developed efficient way to predicting the diabetes of patient by using the bio medical signal data with the help of artificial intelligence techniques. This system gives brief overview of diagnosis of diabetes using patient medical bio signal data. In that they use the artificial intelligence approach like ANN, Fuzzy for fixing the wide variety of issues in different application of area [18][19]. They propose the suitable approach for prediction of diseases based on the dietetics bio medical signal data. Workflow of the methodology is like feature selection as symptoms of diseases then building the datasets with data homoscedasticity after that training and testing of datasets are done by using AI techniques. For the simulation result they use the algorithm which is developed by using MATLAB for detection of diabetes. For that datasets are used with the number of input value which is selected by using regression analysis. In that they use the 768 input samples in diabetes datasets. After that gives the value of regression coefficient which shows the output dependency of every input sample that gives the prediction of diseases. For accurately representing the statistical properties of real time data which is does not possible to predict diseases.

Dr.B.Srinivasan et al., [7] studied the data mining techniques for efficiently predicting the diseases in healthcare sectors. They can introduce the various data mining techniques which are useful in medical fields for better decision making related to the diseases. In medical filed huge amount of data produced like the patient details, diagnosis history

and varies medications, such data is used to predicting the diseases by using data mining approaches. They introduce the data mining knowledge discovery for converting the low level data to high level data knowledge. For that data cleaning, data integration data selection, data transformation pattern evaluation, knowledge representation such steps are required. In that they studied various data mining technique like as, Bayesian classifiers, decision tree, support vector machine and artificial neural networks for predicting diseases. They discussed about various diseases like Eye diseases, Cancer, Heart diseases, Diabetics, etc. Data mining based prediction systems reduce the cost and human effects but they are time consuming and lazy learning methods.

ParithoshKhubchandani et al., [8] proposed a system based on artificial intelligence and probabilistic model for medical prediction. Prediction is the important factor in the medical domain. In that they can use the artificial intelligence for decision making in medical filed to predicting the diseases. This system can generate the important data for the evolution of diseases diagnosis. Therefore main advantages of artificial intelligence are it creates tools that should better work than human. In that they present the new approach suitable for medical prediction which is based on the probabilistic modeling. When the information is large and complex the system uses this approach. Knowledge based approach cannot handle the large or complex data, so probabilistic approach is used to medical prediction. The statistical approach associates a probability each output of medical data for that bayes theorem is used for prediction. By using this system physicians can focus on important activities of patients. Some result of technique take more time to evaluation and some computations are complex that is effects on the other factors of prediction.

Smita .T et al., [9] developed an efficient algorithm for predicting the diseases with the help of multidimensional data. Main objectives of this system create a easy, fast, effective approach for diseases prediction. They introduced new hybrid algorithm for diseases identification and prediction by using data mining techniques. New algorithm is diseases identification and prediction (DIP) it is combination of decision tree and association rule. This is used for doing prediction of some diseases in particular area. Also it is shows the relationships

between the different parameters of diseases. For that they use data mining approach for extracting the information which is previously not known. It also used for analyzing the information for prediction. This research work is based on different data mining approach on the multidirectional data analysis. For that they uses the common data mining models for prediction, such as Association rule, decision tree, clustering, classification rule and various statistical data mining tools. For DIP decision tree and Association rule which construct the Apriori principle. Apply the statistical mining techniques in cluster analysis for extracting the data. DIP predicts the diseases only on multidimensional data. The result is represented in graphical format.

Anandanadarajah Nishanth et al., [10] proposed a new method for early detection of the chronic kidney diseases by identifying the important features from the datasets. Chronic kidney diseases (CKD) are the not know those medical testes of patients are take for the other purposes that is useful for the diseases. In that they use the kidney dataset for identifying and detecting the kidney diseases. In that dataset various attributes are preset like the blood sugar, blood pressure, specific gravity, Albumin. Serum, blood glucose and so on. In this paper they use the different techniques for the detection like CSP and LDA. CPA is the Common Spatial Pattern and the LDA is the Linear Discriminant Analysis which is identifies the important attributes and detects the chronic kidney diseases. In this paper classification methods is used for the identifying the attributes of diseases. This analysis contains the albumin, haemoglobin, specific gravity, haemoglobin, with the serum like important features for early detection of kidney diseases. With the Linear Discriminant Analysis get the 98% accuracy of chronic kidney diseases.

Fatma Taher et al., [11] proposed a system for detecting the lung cancer by sing artificial neural network and fuzzy clustering method. Lung cancer is the common cause of death of people among the world because its symptoms are appears at only advanced stage. There are many techniques such as x-ray, CT scan, MRI is available for diagnosis of lung cancer but they are very expensive and time consuming. These systems solve the problem effectively with the help of artificial network and fuzzy clustering. For that they use a segmentation process which detects the lung cancer early stage.

In that two segmentation techniques are used that is Hopfield Neural Network (HNN) and Fuzzy C-Mean (FCM). Hopfield Neural Network (HNN) it is the one of the artificial neural network which is used for image segmentation. Those propose the segmentation process for both black and white and colour images. HNN can very sensitive and it can detect the overlapping classes of images. Fuzzy C-Mean (FCM) is for fuzzy identification and pattern recognition which is based on the distance criteria. This algorithm contains a predefined numbers of inputs and gives the clusters of outputs. For input they can takes the number of image dataset of diseases and applies the both algorithm and gives the prediction on that image data. But this system is gives the result only on image datasets which requires more numbers of image datasets.

BLOCK DIAGRAM:

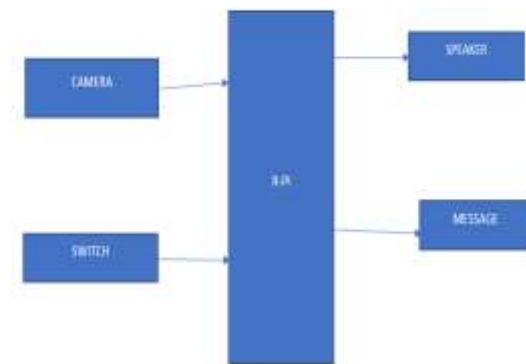


Fig.: Block Diagram Of MEDICINE RECOGNITION SYSTEM FOR CHRONIC PATIENTS

After studying and analyzing all the above existing popular applications based on Android mobiles, some major findings noticed which reduce their popularity.

A. Findings in existing systems:

1. Users have to enter the name of the tablet/capsule manually everytime. It cannot be added automatically.
2. Users have to enter the quantity/dose of the tablet/capsule manually everytime. It cannot be added automatically.
3. Users have to enter the reminder about the times of dosage manually i.e. 2 or 3 times in a day.
4. Users have to manually select the duration of the reminder.

5. They are not facilitating anything regarding the original prescription. Everything needs to be done manually. We need an app which can reduce a lot of the manual work and automate stuff. Also the existing systems have some major drawbacks. Those drawbacks are as follows:

B. Drawbacks of existing systems:

1. Reminders cannot be set automatically. There is a need for manual work in setting the reminder.
2. A lot of time is consumed in manually setting the reminders.
3. They don't facilitate storing the original prescription.
4. The possibility exists for the existing systems to hang down due to the manual work involved.

IMPLEMENTATION

The medicine reminder system will have one duty and that would be to remind the user that he is due for taking the medicine. We are trying to make sure that the user never forgets to take the medicine and hence we do the reminder in three ways. One is that we have visual indicator which would be the light. We also felt that if a person is not sitting close to pill box he may not notice the lights hence we have also added a buzzer which will give a auditory indication that the medicine needs to be taken. In the case that patient is outside, we have a mobile reminder app which will remind using mobile notifications for that time. The mobile application can be installed in the android devices. It will add recurring events to the mobile's calendar and will alert the user when he has to take the medicine with the list of medicines and it's prescribed dosage.

CONCLUSION AND FUTURE WORK patients, including 480 million elderly people in the world today, suffer from a variety of diseases. In the treatment of multiple chronic diseases, many drugs are needed, and physiological functions decline. Cognitive ability is reduced, possibly causing patients to take the wrong medicine. Therefore, elderly people have become a high-risk group for adverse drug events. To solve the problem of taking the wrong medicine, in this paper, we have successfully developed an intelligent medicine recognition system named ST-Med-Box based on deep learning technology. This system can recognize drugs and deliver recognition results in a systematic and practical way. The chronic disease

drug recognition rate of the proposed system reaches 96.6% or higher; thus, it can help patients to take their medications more safely and securely. The proposed system can automatically provide notifications stating the names of drugs and indicating medication times to address the problem of lapses in human judgment. Moreover, the proposed system incorporates a cloud-based database to provide patients with additional integrated information services. As a result, when using the proposed system, chronic patients do not need to worry about forgetting to take their medicine. They need only download the proposed Android-based mobile device app and scan the QR codes on their medicine packages to store the corresponding medication information. Then, they can access related services, such as medication reminders and records. Consequently, the proposed system can effectively reduce the problem of drug interactions caused by taking incorrect drugs, thereby reducing the cost of medical treatment and giving patients with chronic diseases a safe medication environment. In our future work, we will cooperate with a pharmacy to train the system on more drugs. We will first ask pharmacies to apply to participate in our research and identify a suitable pharmacy with which to collaborate. As the pharmacy continues to provide us with chronic disease drugs for testing, we will continue to perform deep learning training to continuously improve the recognition accuracy of the system. The medicine reminder system is a useful resource for those who need technological help in completing or need help in working through day-to-day tasks and taking care of their health. It is a smart and organized system that is designed with helping the elderly people in our homes, but we have not put any restrictions that stop an everyday user from using the system. Anyone can need medical attention and normal people forget taking their prescriptions as well. The Ardumed feature will help them out in regulating their medications. It can also help a working person with a busy schedule by sending him a notification on the device he uses full day, his laptop. Thus there is no restriction on the user base for our system. For the future work we have decided to add a confirmation from the user whether they have taken the medicine or not. If they haven't taken the medicine the information will be send to the doctor and he can reschedule the further medicine reminders according to the new schedule..

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