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A voice-based prescription generating system

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ABSTRACT: In this paper, we propose a system that automates the way of prescribing, the utilization of such a system that would eliminate the event of prescription errors since the handwritten work is removed from the prescription process. This will change the medical care system as it allows storing and processing medical records digitally. There won't be any need to convey paper prescriptions on returning to doctors. The system will allow a patient to share previous prescription records with other physicians. Patient's personal medical records will be stored in consideration with HIPAA laws. There is no need for proper infrastructure, a smartphone is sufficient for working of the entire system. The proposed system is focused around those little clinics that are still using manually written prescriptions. The system comprises multiple technologies working together i.e. Django framework, Vue.js, and leading speech-to-text APIs like Google speech-to-text, Dragon Natural Speaking, Sphinx4, and Kaldi to get accurate voice input from the doctor.

KEYWORDS: Drugs, Electronic prescription, Natural Language Processing, Prescription errors, Speech to text.

I. INTRODUCTION

A significant problem in India is that generally prescriptions are still written by hand and the clarity of such handwritten prescriptions is extremely limited. Misinterpretation of prescription has caused an alarming number of deaths. For example "3\5" in a doctor's handwriting may be interpreted as "8" at the chemist's end.

Smartphones have decently infiltrated the Indian market, so smartphone-based electronic prescription utilizing Speech to Text will be available and savvy for each doctor as voice is as yet the most helpful and regular method of conveying between human to human and human to PC. With versatile voice advances, clinical professionals can in a flash refresh and recover quiet many records inside the system. This guarantees that the patient's clinical records are consistently current. Doctors with exceptional data are probably going to settle on better medicine choices. Aside from improving the nature of patient consideration, the appropriation of voice-based applications could dispense with excess desk work, and furthermore, encourage the more productive and successful conveyance of patient consideration. A voice-based application could plan the usefulness that naturally alarms, the doctor if the drug recommended will respond unfavorably with other medications.

The goal of this paper is to build up a voice-based prescription application that offers an elective e-health platform to supplement the current portable medical services conveyance system.

II. LITERATURE SURVEY

There are a couple of systems in the Indian market that offers an approach to digitize the prescriptions. Some of them are described in this section.

Prescrip is an application that keeps up understanding records and lets doctors print the prescription in short order[1]. The application will automatically generate the prescription, and it shows signs of improvement with use. It predicts the drugs on the basis of diagnosis by the doctor. The application permits doctors to make prescriptions easily, they simply need to include the diagnosis.

IRX Clinics a clinic management suite created by Trata E Systems. It incorporates a smartpen, prescription pad, and a tablet[2].The smartpen and prescription pad work in a joint effort to spare the information carefully. The tablet is preloaded with the clinic management suite which can be utilized to oversee prescription, arrangements, and analysis. The framework permits doctors to keep writing prescriptions by hand and consequently catch the information out of sight.

SlashDr a virtual doctor aide[3], allows doctors to choose the symptoms diagnosed and the system will automatically produce the prescription. The system produces the Medical Council of India Compliant prescription.

Prescription pad is generally utilized for writing medical applications[4]. It's a Safe, first-

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rate, idiot-proof prescription writing, and also gives a relative investigation of a patient's clinical history.

III. PROPOSED SOLUTION

As mentioned earlier misinterpretation in prescriptions due to unintelligible handwriting causing an alarming number of deaths and fatal injuries. The proposed system eliminates these issues, a doctor would be able to dictate his prescription while talking to the phone or PC.

Patient's detail: When the patient shows up the receptionist will book a consultation for the patient and gather the details (as he/she can also access the system) i.e. name, age, and number to let the patient in as soon as the doctor rang the bell. After having sufficient facetime and diagnosing the health issues/disease the doctor will invoke the program on a single click/voice command. Once the program is invoked it will start listening so the doctor can dictate the prescription i.e symptoms, drugs, notes, etc.

Yet, imagine a scenario where the receptionist is off the clock. Who will gather the subtleties? Try not to stress the authors have planned to overcome this problem as well! Just on the off chance that the doctor should provide the details all by himself as he can access the system entirely.

Focused learning: In India, there are plenty of languages spoken in different regions, as language varies so the names. When it comes to recognizing Indian names it is not an easy task, the proposed system is capable of recognizing Indian names with ease. The program will use speech-to-text APIs trained over Indian names (example: Dragon Natural Speaking). Even if the model is below some threshold surety on a particular word, it will highlight that word so the user can validate it. The most common examples are names having similar pronunciation, for example, 'Siddhant' may be recognized as Siddharth' as shown in figure 2.

Compatible with medicine names as the program will use leading speech-to-text APIs for medical domains like Sphinx4. The program will consist of the most accurate database related to medicines as it directly accesses the "National List of Essential Medicines" which is provided by the government itself.

Privacy and Security: Privacy refers to the right of an individual to keep a patient's health information private. Confidentiality refers to the duty of anyone entrusting in the health information to keep that information private. Health issues are the confidential type of data that must not be disclosed. The program will store the medical records i.e. Electronic Health Record (EHR) into consideration with HIPAA (Health Insurance Portability and Accountability Act) laws.

Permission: The doctor and patient can create, read, write, and update the prescription. Only owner patients of the prescription are allowed the read and update operation.

The doctor can allow several other physicians' prescription privileges to avoid the adverse effect, this functionality automatically alerts the physician if the medication prescribed, will react adversely with other medications. For example, if a patient is consulting a dermatologist and a gynecologist their medications should not affect the patient, unfortunately. Also, the other doctor can update the prescription if necessary.

Prescription generation: After the doctor's validation, one last click/voice command will allow the doctor to send the prescription and the patient will be provided by an SMS/WhatsApp/Email link to access the prescription (.pdf file) along with the chemist, the prescription will be automatically signed by the doctor via a digital signature. For patients who do not have a smartphone, the program will generate a printout as an alternative solution.

Medicine provider: The pharmacist will enter the patient ID provided by the program and give medicines as stated in the prescription that appeared in figure 5. Also, the pharmacist can directly provide the medicine by just viewing the prescription in the patient's smartphone/generated printout in case of any emergency as he can update the record afterward. The chemist can transmit the prescription back to the doctor for confirmation or review.

IV. SYSTEM ARCHITECTURE

Backend: The system uses Django at the backend, the most popular Python Web framework that encourages rapid development and clean pragmatic design. Python works on any platform and is also open source and remains scalable for further development. As it consists of a set of components, it provides a standard way to develop websites fast and easily. Also, Django offers extraordinary compared to other security levels of the as of now accessible frameworks, guaranteeing that your project remains careful.

Processing: The system is composed of multiple speech-to-text engines i.e Google speech-to-text API, Dragon Natural Speaking, Sphinx4, and, Kaldi. A speech recognition software is a program that is trained to take input of human speech, interpret it, and transcribe it into text. Speech recognition software works by breaking down the

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audio of a speech recording into individual sounds, analyzing each sound, using algorithms to find the most probable word fit in that language, and transcribing those sounds into text. Speech recognition software uses natural language processing (NLP) and deep learning neural networks.

Frontend: Frontend plays a major role in engaging the users and encouraging them to take action. If the application frontend works seamlessly, users would love to use it and recommend it to others. The system utilizes Vue.js at the frontend, a JavaScript library for developing distinct web interfaces. Its core library focuses on the view layer only. In this manner, you can helpfully incorporate it with different libraries and devices to accomplish wanted yields. Additionally, it is fit for driving Single Page Applications when you blend it with different apparatuses and libraries.

Database: The database utilized is MySQL. MySQL is a server side application used for database ready to complete an incredible number of SQL commands[5]. It stores data about patient's details and dictated prescription.

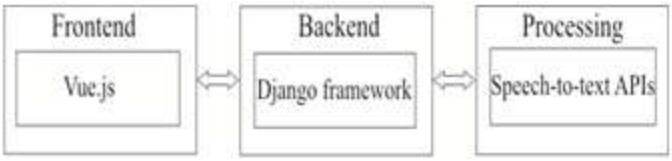

Fig (1) System architecture

V. SPEECH PROCESSING

The program will collect a set of strings in the form of speech dictated by the doctor using different speech-to-text APIs, once the strings are collected the next step is to arrange them. Every single string will be compared with the strings already stored in the database, after comparison, the program will categorize those strings and place them in their respective locations in the form of rows and columns which is most often known as tabular form as shown in fig 1.3. Tabular format stores the data entities at the exact location, for example, drug name, strength, instruction, frequency, and its duration will be stored systematically. Voice commands are served from offline and online speech-to-text APIs using random forest model which combines multiple speech-to-text APIs. The last step is to generate the prescription which is done by a single click/voice command. The program is capable of automatically learning and improving from past experiences without being explicitly programmed.

VI. RESULT ANALYSIS

The proposed and actualized system has mainly two points of interest over any existing electronic remedy producing framework i.e time and cost. In the proposed system just open source innovation is used and the interface is accessible as a portable application. In this way, the total system's successful cost is less and the ease of use is more. There is no necessity of a legitimate foundation, a smartphone is adequate for working the entire framework. It is focused on those little clinics that are yet utilizing handwritten prescriptions. The proposed system is contrasted with the current EHR frameworks that utilization manual contributions from an individual to make understanding records. This system uses discourse contribution to fill all the fields of a prescription, also it allows the doctor to speak all at once as shown in fig. Along these lines, the measure of time expended for making a prescription is less in the proposed system than by utilizing manual information or field by field voice contribution on a portable application utilizing voice input console.

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Fig (2) Dictating doctor

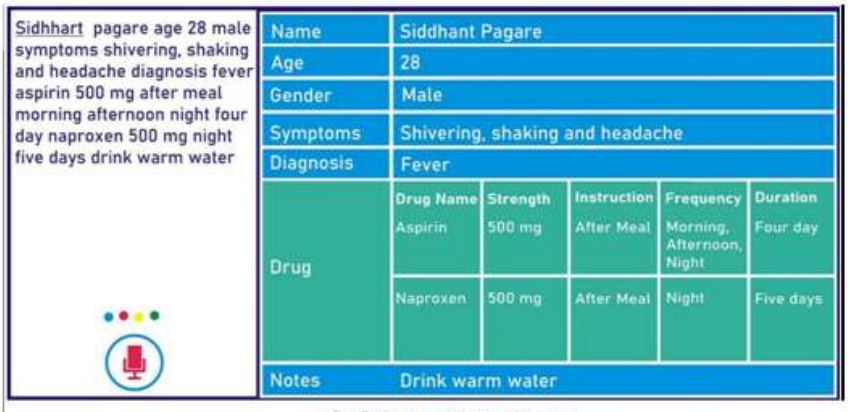

Fig (3) Doctor's screen

Fig (4) Patient's screen

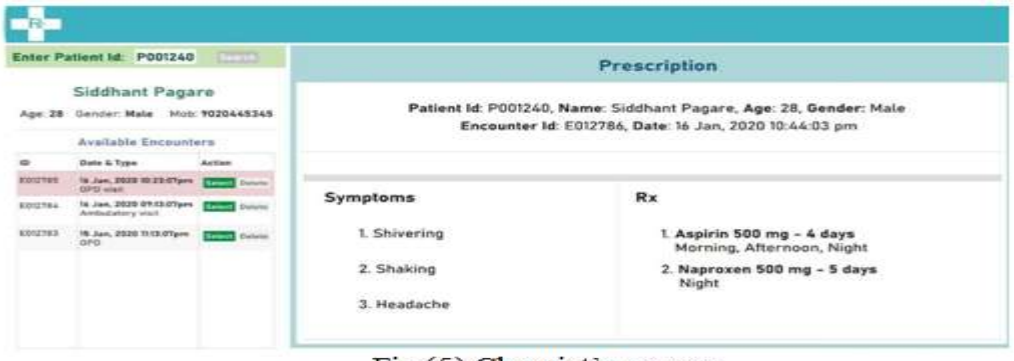

Fig (5) Chemist's screen

VII. CONCLUSION

The proposed and actualized system plans to diminish the measure of time devoured in making and getting to persistent records. It likewise gives the highlights of an EHR in a Mobile Application. Along these lines, making this system accessible to all the doctors of India through their smartphones. Writers actualized an inventive answer to take care of the issue of obscured transcribed prescriptions. Voice-based e-medicine

needs an insignificant change in the work process of a specialist yet over the long haul, it will make a tremendous effect in building up an advanced environment for patients. Also, this system helps in overseeing EHR progressively while keeping up the patient's security.

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