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E-Health Bot to Change the Face of Medicare

Tushar Tanmay, Akanksha Bhardwaj and Shilpi Sharma

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Tushar Tanmay[1] ,
Department of CSE,ASET
Amity University
Noida , UP India
tushar1712singh@gmail.com[1]

Akanksha Bhardwaj[2] ,Shilpi Sharma[3]
Department of CSE,ASET
Amity University
Noida , UP India
akanksha431@gmail.com[2]
Ssharma22@amity.edu[3]

Abstract— **Chatbot or conversational bot is a tool to ease the communication between human beings and computers. When someone talks to a chatbot, it seems as if you are talking to an actual human being. Chatbots carry out conversation in auditory and textual manner. Chatbots work on the principles of Artificial Intelligence and are automated devices. Their response is based upon the input of the user. They analyze the request, identify intent and entities and then compose their reply which may be data from the database or an API (application programming interface) call. These devices are trained with the help of actual data. The device matches the questions asked by the user to the best suitable answer using tools and models of machine learning. Chatbots seem to be self-sufficient after they go live but human intervention is very crucial in its configuration, training and implementation. Since the database for outputs is limited, it is possible that chatbot encounters an unknown query which is to be solved by a human being. However, chatbots do hold an advantage over human beings as they are available 24/7 and have access to huge amount of information. These chatbots use API for providing response to different requests of the user. This paper proposes the idea of a new chatbot which will assist the users with their medical needs, the Medicbot. This chatbot will be able to perform multiple functions with the combination of various Artificial Intelligence forms such as semantic understanding and natural language processing. Medicbot will be operated with the help of a virtual assistance (serves the purpose of a personal assistant) known as Medico.**

Keywords— *Artificial Intelligence, Machine Learning, Chatbot, Natural Language Understanding*

I. INTRODUCTION

The preference to chatbots for the development of the new device is also supported on economical grounds as they are much cheaper than human resources. They cost almost little to nothing.

These bots are artificially intelligent bots which are designed to self-learn when they are put to use. [1] The method comprises the steps of attempting to match the received input message with a node in the conversation data structure of the chatbot. [2] They have a lot of applications in the day-to-day world such as texting people, making to-do lists, playing songs, ordering things, etc. A lot of these applications will also be used in the e-health bot. The bot can be asked to make a list of all the medicines which are to be carried on an upcoming trip. You can ask the bot to make a note for giving a reminder to pick-up the ordered medicines from the store.

These bots are easily approachable and give an instant response but they often give instant answers only to easy questions. One of the major drawbacks is that even the highly artificially intelligent chatbots are not capable of cognitive perception. Their abilities are limited to certain extent and which makes human intervention very crucial. Once the e-health bot encounters a query it cannot answer, it transfers the conversation or the request to a human executive. For example, if you ask a weather bot 'Will there be a hail storm tomorrow?' it will answer but if you ask it 'Will I need an umbrella tomorrow?' it may not be able to respond to your query. A range of new chatbot architectures have been developed, such as: MegaHAL (Hutchens, 1996), CONVERSE (Batacharia et al., 1999), ELIZABETH (Abu Shawar and Atwell, 2002), HEXBOT (2004) and ALICE (2007).

The most important component of a bot is the voice recognition where it takes the noise from our mouth and converts it into words and sentences. [3] These chatbots look for key phrases and then try to match them with predefined actions in order to come up with a reply. Other important technological factors are the natural language processing which is the analysis and the synthesis of the natural language and machine learning which is a prominent method of data analysis. NLP has different steps of functioning namely-sentiment analysis, tokenization, named entity, normalization and dependency parsing. A chatbot mainly has four layers-presentation layer (user communicates with the chatbot), service layer (API's), data access layer (exchange of data between database and chatbot) and database layer (information stored as in calendar). At the same time, we have also focused on the creation of database and training of the chatbot using natural language processing.

Medical needs are growing day by day and to successfully counter it, we need to get associated with the latest

technology. The e-health bot makes perfect sense in an era of competition where people don't have time and are required to be reminded of their medicinal and dietary requirements. Artificial intelligence has forms that are being feared but chatbots are not one of them. They need to be embraced for improving conversational experiences.

The e-health bot has various enhanced features which bring ease and comfort to the people for the purposes of taking medicines on time, taking appropriate diet, ordering medicines, booking medicines, finding alternate medication, services during a medical emergency, etc.

The contribution of Machine Learning to a chatbot is that it makes it efficient in not giving pre-planned answers and try to understand what the user actually wants. For example, a user might inquire "what's been going on in London lately?" and the chatbot might answer with the latest BBC News headlines for London. This type of chatbot learns from all the conversations it has recorded in the past to improve accuracy and understanding over time to serve the user in a better way. The need of conversational agents has become acute with the widespread use of personal machines with the wish to communicate and the desire of their makers to provide natural language interfaces (Wilks, 1999). Chatbot testing is an important process for checking if it can be allowed to go live or not. [6] A test suite contains a library of conversational transcripts. The most important cases need to be run with attention to the edge cases. When the testing is carried out, happy paths are identified. Happy path is the test case where the chatbot behaves as per the expectations of the user. When these test cases fail, it is known that there is some trouble and investigation is required.

II. LITETURE REVIEW

The functioning of the e-health bot seems to be very easy but they are supported by complex programming. [1] Based on our study of the literature, there is no published work describing the use of online communities like forums for automatic chatbot knowledge acquisition. Existing automated chatbots have mainly acquired their knowledge from human annotated database. A new interface after the Graphical User Interface is the referred to as Conversational User Interface. But interestingly it has been found that a chatbot has the ability to provide solutions to all the queries that it encounters when in use with a common interface. There is not much urge to get familiar with new gestures, UI elements or navigation.

The chatbots can be made functional without any previous training. They can go live and then they start learning the appropriate responses to specific user queries. The chatbots are use-case driven and it is preferable for a chatbot to have a personality so that it is more familiar for the people to converse with the chatbot. [7] Human-Computer Speech is gaining momentum as a technique of computer interaction.

The description of the e-health bot seems give a picture that running the device is not a complex job but in reality, the handling of cognitive services and their coordination is a very

tough job. [8] It is important to think about scalability, extensibility and the maintenance of the bot. Due to these reasons, serverless architecture holds an important place at this moment. The function sequences used and the coordination between these functions is termed as serverless architecture. This is used by the chatbot to interact with the external services. [9] They provide conversational output in response, and if commanded, can sometimes also execute tasks.

The chatbots are constantly progressing and we have three different types of chatbots at this moment. They are menu/button based, keyword recognition based and contextual (contextual being the latest one). [10] Menu/button-based bots are the most elementary type of chatbot. A lot of selections have to be made before the bot arrives at the final answer. The keyword-recognition bots are better than the menu based and they can actually listen to what the users type and then they try to respond appropriately. The most advanced type of chatbots are the contextual chatbots. They utilize technologies like Machine Learning (ML) and Artificial Intelligence (AI) to remember what did they converse with a particular user to learn and get better with time. For example, if the user wants to order a pizza, it will remember what are the preferences of the user by referring to the last ordered pizza. [11] A Chatbot is implemented using pattern comparing, in which the order of the sentence is recognized and a saved response pattern is acclimatize to the exclusive variables of the sentence.

III. METHOLODOGY

Chatbot is a relatively new technology in the field of artificial intelligence. Before taking up this topic, it was important to analyse what features can be added to them so that they are beneficial to us in the modern world.

It is important to have a brief idea about the various technologies that have been used in building a chatbot in order to effectively propose one. The implementation of AI tools have very specific roles in enabling various features of a chatbot.

The medicbot is loaded with a lot of new concepts which are not yet present in a chatbot. It has been specifically designed to help people in meeting their medical needs. It has a personal assistant named Medico which interacts with the user and provides appropriate responses to their questions. The Medicbot does not involve much human interaction once it goes live.

The thorough study of the available literature will help us to understand the limitations and reach of the ability of a chatbot. This will help us to avoid presenting unrealistic ideas which may be possible years later but surely not now. The Medicbot can cater the demands of the people in the present scenario. The working of a chatbot has been shown below:

1.You send the chatbot a message about going somewhere.

2.Using NLP, the machine tries to understand what the user wants. NLP is categorized into following categories:

2.1 Sentiment Analysis: Learns if the user is having a good experience or the chat should be forwarded to a human.

2.2. Tokenization: NLP divides a string of words into tokens that are useful for the application.

2.3. Named Entity Recognition: Looks for categories of words like the name of the product, etc.

2.4. Normalization: Processes text to find common spelling mistakes, typographical errors that user might intent to convey.

2.5. Dependency Parsing: Looks for objects and subjects to find related phrases that users might try to convey.

2.6. Now the data goes into decision engine where it asks you at what time do you want to go out.

3.The natural language generation converts turned structured data into text.

4.These arrays of messages go into the messaging backend and are presented to you in the form of a question. When you answer, the bot now analyses data stored in its database to provide you with the best response.

IV. RESULTS

A. Medicbot: It is a chatbot which assists people in dealing with their medical needs. The personal assistant configured in the MEDICBOT has been named "MEDICO". It will initiate communication in two ways: chatbot-human being conversation and chatbot-chatbot conversation.

B. Set-up: When you set up the Medicbot, it asks you for your phone number. This phone number is verified and will be used by the medicbot for textual conversation. It then suggests you to add your medicinal requirements which have been discussed in the enhanced features. This welcome message may also contain links (in the form of blocks) to take the user to enhanced features. An illustration of the
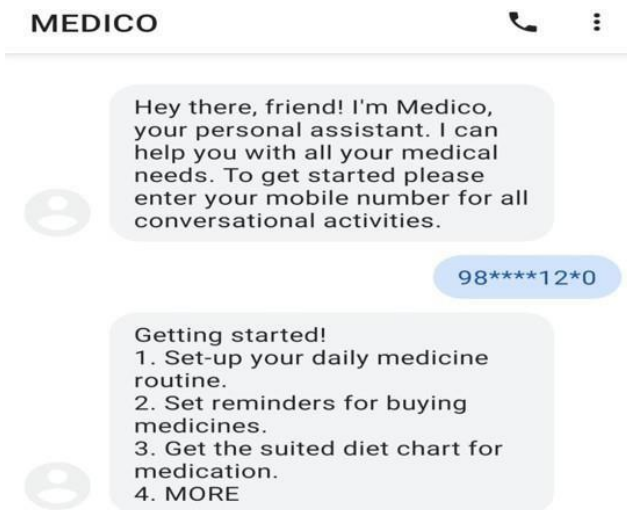
welcome message is given in fig.1.

Fig.1. Welcome Message

C. Enhanced features of 'Medicbot':

1. Providing information about daily medicine routine:
   a. Medicbot will remind you about what medicine you need to take and at what time according to the schedule that you have set. It will also tell you how many medicines are you supposed to take. The reminder will be both through a voice message and a text/ WhatsApp message. An illustration of the reminder is given in fig.2.
   b. Medicbot will send a reminder one day prior to the date on which your medicines will get finished. One needs to reply to this warning message else an alarm will be triggered by the medicbot.
   c. It can also be asked about the diet which would suit the medication that a person is currently taking.

Fig.2. Medicine Reminder

2. ORDERING MEDICINES: Each chatbot will have a unique customer ID for ordering medicines. You will have to login as shown in fig.3.
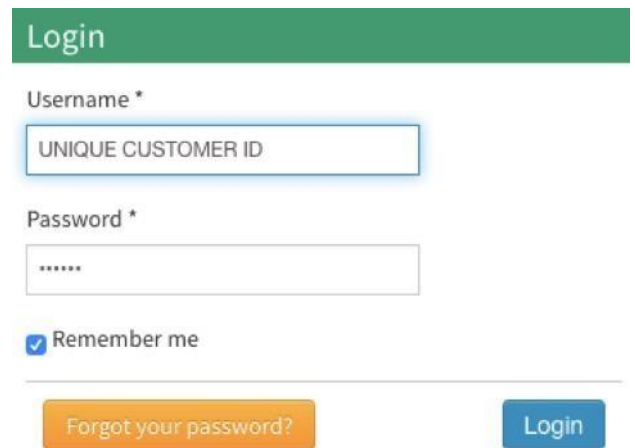

Fig.3. Customer ID

You need to enter the name and quantity of the required medicine. The Medicbot will automatically find the stores which have the stock of the required medicine. One can then filter the stores according to the price at which they sell or the distance at which they are located. This information will be updated on a real-time basis as shown in table 1. You can click on the above-mentioned stores for their ad- dresses and contact details. The medicbot will launch Google Maps and initiate an action using Google Maps API.

For e.g. If the user chooses Sharma Medico from the above given options then the user can access the map on a mobile phone/tablet as given in fig.4.

If the chatbot is unable to find stores that have the required medicine, it can suggest alternate medication with the same salts. This feature may also be used by poor people who cannot afford a particular medicine and are looking for alternatives at a cheaper price.

- The Chatbot will converse with Chatbot of the seller and schedule a pick-up time using a free slot from your Calendar with the help of Google Calendar API.
- The Chatbot can also share your location with the store which will deliver you the medicines. During this sort of home delivery, you will also be required to ask Medico to upload a picture of the prescription as shown in fig.6.

The Chatbot can also automatically reorder medicines after a specific time period (for chronic diseases). The user will need to give the Chatbot a one-time command.

3. Other features:

- APPOINTMENT: This feature helps people in setting up appointments with the right doctor and also informs them about the pre-appointment and post-appointment actions. It can be done as shown in fig.7.
- EMERGENCY: You can call the ambulance using your chatbot if you see somebody in distress. The Chatbot will respond as shown in fig.8.
- D. Creation of a database: It is a very important topic that is needed to be discussed in order to store data for enabling the above-mentioned enhanced features. To create a database, MySQL will be used. It supports a number of data types for numeric, dates and string values. Using forward engineering, SQL scripts can be automatically generated from the logical database model which can be executed to create the physical database.

Fig.4. Maps

Table 1
Description of filtering data on the basis of distance

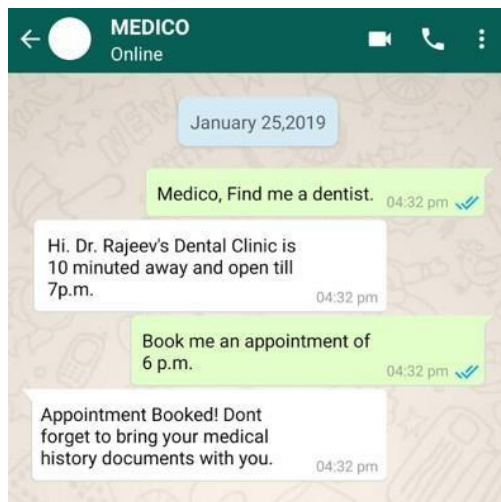| MEDICBOT		
NAME OF THE MEDICINE SEPTRAN	QUANTITY 20	
FILTER: DISTANCE ___*___		PRICE____
NAME OF STORE	PRICE	DISTANCE
Sharma Medico	Rs. 250	1.1 kms
Raj Healthcare	Rs. 270	1.3 kms
Apollo Hospital	Rs. 240	1.6 kms
Nursing Home	Rs. 255	1.8 kms
UPDATED – 11.09		

Fig.5. Prescription

Fig.6. Appointment

Fig.8. Emergency Services

E. Impact of machine learning in effective functioning of medicbot: Artificial Intelligence Markup Language (AIML) is used to write patterns and is one of the most important steps of building a smart chatbot. Machine Learning classifies intent (category of the input) of the user. Scikit-learn is a ML library which helps in the execution of ML algorithms. These algorithms (e.g. Multinomial Naïve Bayes) are used to ease the management of the classifier which classifies by referring to the training data or libraries. By using these equations and algorithms we are looking for word matches so that we do not have to identify every pattern. A class with highest term matches is produced as output but it does not mean that it is a match. Tokenization (breaking the sentence such as: "Have a good day." to 'have', 'a', etc.) and stemming (reducing words to their stem such as: 'good' to 'go') are the two main steps. Once intent is classified, you get the output of the number of sentences of training data. Additional attributes can also be added which the chatbot can respond once the intent is clear. Data in structures need to be organized so that they can be worked algorithmically. For example, the stem for good is go so that it matches stems of going. Algorithms should be abstracted so that they can be used easily. Although a trained neural network is less code than a comparable algorithm but there are many ML issues where an algorithm provides us better results.

V. CONCLUSION

The E-health bot will therefore be very helpful for people who have to take multiple medicines at various times and often miss it due to their busy schedule. It shall save time and energy as it would re-order medicines for you on your behalf. It shall work as a medical assistant.

Gradually with the help of artificial intelligence, deep learning and machine learning, the chatbots will start learning by discovering patterns in data as that would further ease the process as even if you forget your prescription, you can ask your chatbot that which medicine was I taking for hypertension.

The challenge that lies with us is how to improve service (a bot is really well trained if the user does not identify that he/she is actually talking to a robot), increase engagement and business. Most importantly, the organisations need to understand what these chatbots can do and how do they work. This will convince major health care companies to engage with the initiative and make it globally accessible. These are real information gathering tools as they can reach out to mass audience more effectively than a human can.

The bot would also cater the problem of shortage of manpower in the emergency services. An ambulance will reach without you having to explain the situation to another human being. Manpower is low and no more lives will be lost due to this very reason. Hence, the information highlighted in this report explains that a bright future can be expected from the chatbots in the coming future.

VI.   FUTURE SCOPE

As per the trends, the artificially intelligent chatbots will witness an increase in the costumer-based services. This will have an impact on the successful implementation and efficient performance of the e-health bot. The e-health bot is a personalised chatbot. There aren't many chatbots of this type available at the moment and that too in the Medicare section. These chatbots offer services almost similar to the ones which are provided by the human beings. The development of NLO will also boost the technological advancements in the field of bots as it can serve a wide range of customer base all day around without any issues.

Another area of interest after the development of E-health bot after it comes live would be its integration with other smart devices such as watches, smart phones, televisions which is widely popular and is known as "Internet of Things". The e-health bot would also be able to give correct analysis of the huge data after it goes live. Automatizing data analysis would help the e-health bot serve the people in a better way. The only thing which has not yet been achieved is a fluid conversation with an AI whether by text or by voice. This shall require ongoing optimization. It is easy to make a bot but only when you understand predefined keywords and decision

trees. So, a bot can still get confused very easily and all of this has to be tackled with in the coming future.

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