A 3d Based Virtual Medical Assistant

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***Abstract*—The proposed idea is to create a virtual health care assistant system using latest and advanced software that can diagnose the disease and provide basic details about the disease before consulting a doctor. The virtual bot can interact with the user in human understandable languages and can be used to provide any suggestions and other essential details required. The application provides text (or) voice assistance so that you can communicate with virtual bot to provide a user-friendly and to create a website in order to make an appointment with a doctor based on the symptoms and details entered by the user. Virtual assistant provides information about type of disease you are suffering from based on user symptoms and provides details of doctor to visit. Displaying the details respective to user disease based on the categorization of disease as major or minor, the analgesics and also provides food recommendation that means which type of food you have to take. The virtual bot will clarify the user symptoms with series of questions and the confirmation of symptoms will be done.**

I. INTRODUCTION

Now a days, health care is extremely necessary in our life. Today's people are busy with their works reception, workplace works and additional addicted to web. They are not involved regarding their health. So, they avoid to travel in hospitals for little issues.it may become a significant drawback. The main purpose of the scheme is to build the language gap between the user and health providers by giving immediate replies to the Questions asked by the user. Today's people are more likely addicted to internet but they are not concern about their personal health. They avoid to go in hospital for small problem which may become a major disease in future. Establishing question answer forums is becoming a simple way to answer those queries rather than browsing through the list of potentially relevant document from the web. Many of the existing systems have some limitation such as There is no instant response given to the patients, they have to wait for the expert's acknowledgement for a long time. Some of the processes may charge amount to perform live chat or telephony communication with doctors online.

The purpose of this project is to provide assistance to the user using the chatbot and web based virtual reality (vr) bot which in this case is the NLP (Natural Language Processing) bot along with AWS (amazon web services) based vr bot which are integrated to the website. There are a number of applications which are already in the society which are similar but they are not as efficient as our application and can be accessed using just the internet. The purpose of choosing the virtual medical assistant is the social responsibility that we have and can offer to this nation. Health care is significant part of any community. The virtual medical assistant will help improve the health conditions of the user and provide real life like experience at the same time.

1.1 Problems with Existing System

Many of the existing systems have live chats through texts and some limitation such as there is no instant response given to the patients who have to wait for expert's acknowledgement for a long time. Some of the processes may charge amount to perform live chat or telephony communication.

1.2 Proposed System

The proposed system provides a text-to- text(or) voice conversational agent that asks the user about their health issue. The user can chat as if chatting with a human. The bot then asks the user a series of questions about their symptoms to diagnose the disease. It gives suggestions about the different symptoms to clarify the disease. Based on the reply from the user the accurate disease is found and it suggests the doctor who needs to be consulted in case of major disease. The system remembers past responses and asks progressively more specific questions in order to obtain a good diagnosis. The system uses an expert system to answer the queries. User can also view the available doctors for that particular disease. This system can be used by

the multiple users to get the counselling sessions online. The data of the chatbot stored in the database in the form of pattern-template. The bot will provide analgesics and food suggestions that means which food you have to take based on the disease.

1.3 Scope of the Project

Virtual health care assistant can be used as the complete health care solution which solves inefficiencies in current system with automated solutions across various systems and domains. These intelligent programs are able to detect symptoms, manage medications, and assist chronic health issues. They guide people rightly for serious illness and also assists them in scheduling appointments with professionals. AI and healthcare are converging to enhance the patient and provider experiences and are extremely useful in case of emergencies, or doctor unavailability. Chatbots' role is always acceptable to be in improving the job of healthcare experts, instead of replacing them. Hence, the advantages of using chatbots in healthcare are uncountable. They can eliminate costs dramatically and boost efficiency, reduce the pressure on healthcare professionals, and enhance patient results.

For once, medical chatbots reduce healthcare professionals' workload by reducing hospital visits, reducing unnecessary treatments and procedures, and decreasing hospital admissions and readmissions as treatment compliance and knowledge about their symptoms improve.

1.4 Architecture Diagram

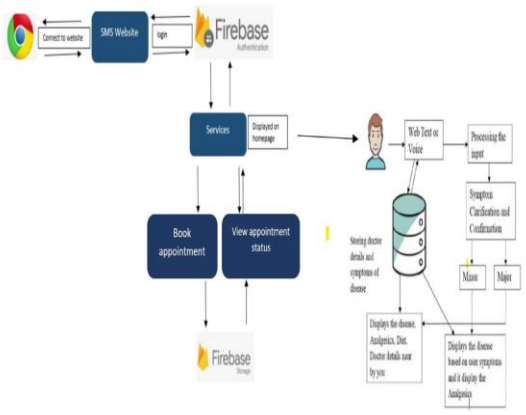

Fig 1.4 – Architecture of Application

Previously chat bots solely supported a single adjacency pair, also known as a one-shot conversation. However, modern chatbots can sustain multiple adjacency pairs, remembering states and contexts between conversations and have the capability to associate data in different adjacency pairs which is related. This is the ability of the bot to preserve the conversation. A chatbot consists of four main parts: front- end, knowledge-base, back-end and corpus which is the training data. The front end is accountable for enabling communication between the bot and the user. The NLU utilizes Artificial intelligence methods to identify the intent and context of the user input. An appropriate response is generated from the user's intent. The knowledge base defines the chatbot knowledge, which is created within the NLU and supported by the back-end, the back-end applies the domains corpus to produce the knowledge base. Input can be supplied to the chatbot in the form of text or speech. The Input is sent to the dialog management system which is the NLU in this case, which determines an appropriate response and amends the chatbots state accordingly to carry out the required action. The chatbot will produce text and speech responses in the form of both text and speech.

II. RESEARCH METHODOLOGY

2.1 Natural language processing:

Natural language processing involves the reading and understanding of spoken or written language through the medium of a computer. This includes, for example, the automatic translation of one language into another, but also spoken word recognition, or the automatic answering of questions. Computers often have trouble understanding such tasks, because they usually try to understand the meaning of each individual word, rather than the sentence or phrase as a whole. So for a translation program, it can be difficult to understand the linguistic nuance in the word _Greek 'when it comes to the examples _My wife is Greek 'and It's all Greek to me', for example Through natural language processing, computers learn to accurately manage and apply overall linguistic meaning to text excerpts like phrases or sentences. But this isn't just useful for translation or customer service chat bots: computers can also use it to process spoken commands or even generate audible responses that can be used in communication with the blind, for example.

Summarizing long texts or targeting and extracting specific keywords and information within a large body of text also requires a deeper understanding of linguistic syntax than computers had previously been able to achieve.

We are using three algorithms to implement making health care chatbot using nlp technique

1.n-gram algorithm

2.TF-IDF (term frequency-inverse data frequency)

3.Cosine similarity algorithm

2.1.1 N-Gram algorithm:

In the fields of computational linguistics and probability, an n-gram is a contiguous sequence of n items from a given sample of text or speech. The items can be phonemes, syllables, letters, words or base pairs according to the application. The n-grams typically are collected from a text or speech corpus. When the items are words, n-grams may also be called shingles Using Latin numerical prefixes, an n-gram of size 1 is referred to as a "unigram"; size 2 is a "bigram" (or, less commonly, a "diagram"); size 3 is a "trigram". English cardinal numbers are sometimes used, e.g., "four-gram", "five-gram", and so on. In computational biology, a polymer or oligomer of a known size is called a k-mer instead of an n-gram, with specific names using Greek numerical prefixes such as "monomer", "dimer", "trimer", "tetramer", "pentamer", etc., or English cardinal numbers, "one-mer", "two-mer", "three-mer", etc

Example.

Field	Unit	Sample sequence	1-gram sequence	2-gram sequence	3-gram sequence
Vernacular name resulting Markov model			Unigram 0	Bigram1	Trigram 2
Protein Order of sequencing	amino acid	… Cys-Gly-Leu-Ser-Trp …	…, Cys, Gly, Leu, Ser, Trp, …	…, Cys-Gly, Gly-Leu, Leu-Ser, Ser-Trp, …	…, Cys-Gly-Leu, Gly-LeuSer, LeuSer-Trp, …
DNA sequencing	base pair	…AGCTTCGA…	…, A, G, C, T, T, C, G, A, …	…, AG, GC, CT, TT, TC, CG, GA, …	…, AGC, GCT, CTT, TTC, TCG, CGA, …
Computational linguistics	word	… to be or not to be …	…, to, be, or, not, to, be, …	…, to be, be or, or not, not to, to be, …	…, to be or, be or not, or not to, not to be, …

Table 2.1.1 N-GRAM EXAMPLE TABLE

2.1.2 TF-IDF (term frequency-inverse data frequency):

Term frequency (tf):

When building a model with the goal of understanding text, you'll see all of stop words being removed. Another strategy is to score the relative importance of words using TF-IDF. The number of times a word appears in a document divided by the total number of words in the document. Every document has its own term frequency.

$$tf_{i,j} = \frac{n_{i,j}}{\sum_k n_{i,j}}$$

Inverse Data Frequency (IDF):

Because the term "the" is so common, term frequency will tend to incorrectly emphasize documents which happen to use the word "the" more frequently, without giving enough weight to the more meaningful terms "brown" and "cow". The term "the" is not a good keyword to distinguish relevant and non-relevant documents and terms, unlike the less common words "brown" and "cow". Hence an *inverse document frequency* factor is incorporated which diminishes the weight of terms that occur very frequently in the document set and increases the weight of terms that occur rarely.

The log of the number of documents divided by the number of documents that contain the word ***w***. Inverse data frequency determines the weight of rare words across all documents in the corpus.

$$idf(w) = log(\frac{N}{df_t})$$

Documents	I	am	suffering	from	Fever	headache
Document 1	0.2*0=0	0.2*0=0	0.2*0=0	0.2*0=0	0.2*0.301=0.012	0
Document 2	0.2*0=0	0.2*0=0	0.2*0=0	0.2*0=0	0	0.2*0.301=0.012

Table 2.1.2 TF-IDF EXAMPLE TABLE

2.1.3 Cosine Similarity:

Cosine similarity is a measure of similarity between two non-zero vectors of an inner product space that measures the cosine of the angle between them. The technique is also used to measure cohesion within clusters in the field of data mining.

- Cosine similarity=AB/|A||B|.
- Chat Bot COSINE SIMILARITY DISTANCES

Introduction on Chat bot techniques There are two main technique involved in chat bot to understand the user input such as Pattern matching and Intent classification. Types of response: Static Response: The simplest way is to have a static response, with eventually a list of variants, for each user input. These static responses could be templates, such as ―John is located in <Location details>‖, where <Location details> is a variable computed by the chat bot. Dynamic Response: A different approach would be to use resources, such as a knowledge base, to get a list of potential responses, and then score them to choose the better response. This is particularly appropriate if the chat bot acts mainly like a question answering system. Generated Response: If you have a huge corpus of examples of conversations, you could use a deep learning technique (Recurrent Neural Network) to train a generative model that, given an input, will generate the answer. You will need millions of examples to reach a decent quality and sometimes the results are going to be unexpected, but it could be interesting.

2.2 Control flow of bot

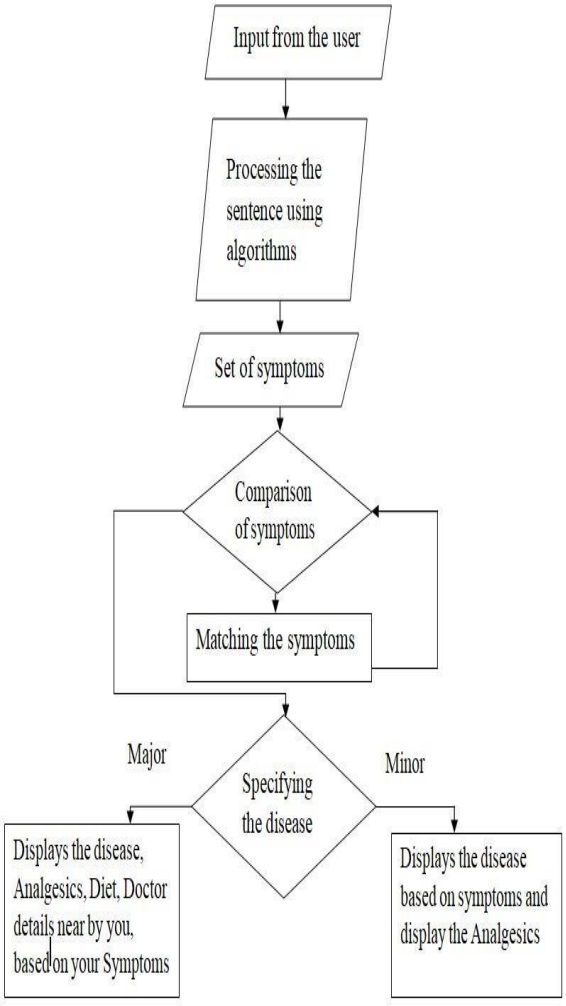

Fig 2.2: Data flow diagram of chatbot

III. OUTPUT SCREENSHOTS

3.1 Layout of Python Chatbot

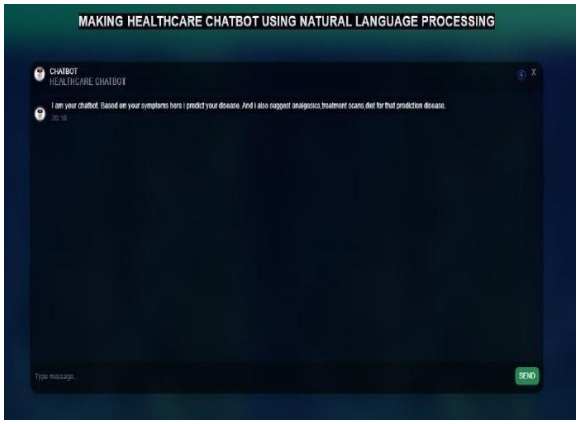

Fig 3.1 - Layout of Python Chatbot

3.2 Natural Flow of the Bot

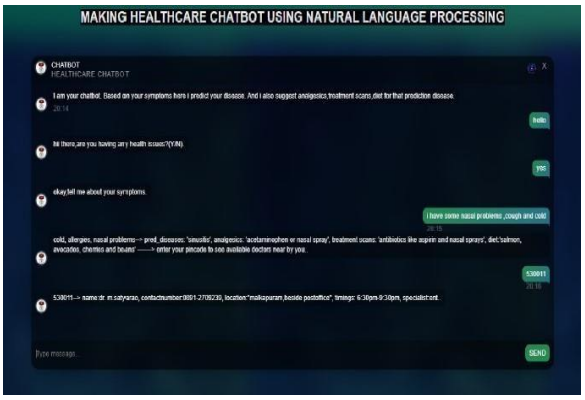

Fig 3.2 – Natural Flow of the Bot

3.3 Layout of AWS Sumerian

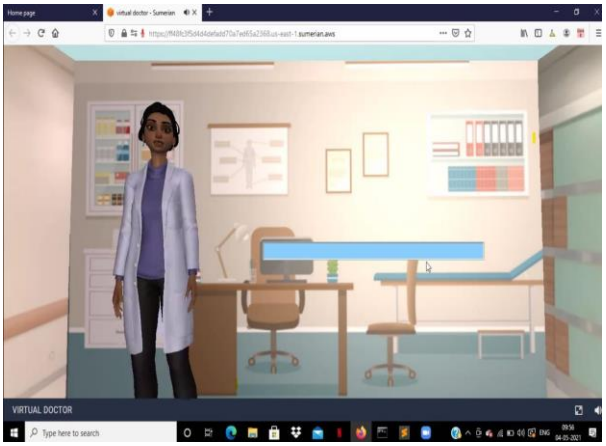

Fig 3.3 – Layout of AWS Sumerian

3.4 Website Home Page

Fig3.4 – Website Home Page

IV. CONCLUSION

Chatbot is great tool for conversation between human and machine. The application is developed for getting a quick response from the bot which means without any delay it gives the accurate result to the user.

It is concluded that, the usage of chatbot is user friendly and can be used by any person who knows how to type in their own language. Chatbot provides personalized diagnosis based on symptoms. From the review of various journals, it is concluded that, the usage of Chatbot is user friendly and can be used by any person who knows how to type in their own language in mobile app or desktop version. A medical chatbot provides personalized diagnoses based on symptoms. In the future, the bot's symptom recognition and diagnosis performance could be greatly improved by adding support for more medical features, such as location, duration, and intensity of symptoms, and more detailed symptom description. The implementation of Personalized Medical assistant heavily relies on AI algorithms as well as the training data. At last, the implementation of personalized medicine would successfully save many lives and create a medical awareness among the people. As said before, the future era is the era of messaging app because people going to spend more time in messaging app than any other apps.

A text-to-text diagnosis Bot engages patients in conversation about their medical issues and provides a personalized diagnosis based on their symptoms. Hence, people will have an idea about their health and have the right protection.

Thus, medical chatbot has wide and vast future scope. No matter how far people are, they can have this medical conversation. The only requirement they need is a simple desktop or smartphone with internet connection. The efficient of the chatbot can be improved by adding more combination of words and increasing the use of database so that of the medical chatbot could handle all type of diseases. Even voice conversation can be added in the system to make it easier to use.

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