

A Survey on Chatbots

A Brief Analysis of Chatbots

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Abstract— A chatbot is a computer program aims to make a conversation between both human and machine. The chatbot can also act as a service to be used in various platforms such as messaging apps and virtual assistants. The chatbot has evolved a lot in decades starting from an amusement to performing serious tasks. A lot of design factors are to be kept in mind while constructing a chatbot in order to make it user friendly and accurate. A chatbot can be classified into various types based on its domain, model and conversation type. The chatbot technology continues to face a wide variety of challenges and has to strive to fulfil the expectations.

Keywords—Chatbot; Virtual assistant; human-machine interaction;

I. INTRODUCTION

A chatbot is a service, powered by rules and sometimes artificial intelligence, that you interact with via a chat interface. A chatbot can be deployed on various platforms such as mobile apps, web apps, messaging apps, personal assistant and what not. It's job to provide human like interaction and assistance to the user. The best chatbot in the world would be one in which the user would not be able to differentiate it from an actual human being. A chatbot can interact with users in various formats such as text, speech and actions. Chatbots is one of the hottest topics out there. Tech giants like Microsoft, Amazon, Google, Facebook have been competing to roll out better chatbots everyday.

II. HISTORY

The history of chatbots starts from the time when the humans felt the need to interact with machines as they do with humans. Back in 1950, the pioneering British computer scientist Alan Turing published his famous article Computing Machinery and Intelligence: the revolutionary proposal behind it was the so called Turing Test, a parameter for intelligence. This criterion depends on the ability of a computer program to impersonate a human and its behaviour in a real-time conversation with a human interlocutor, with the goal of convincing the human into thinking that he is faced with another person. Chatbots began as a source of amusement but it soon found its application in commercial areas. Since then, various people have been trying to build chatbots with human like capabilities.

The first attempt into this was ELIZA(1966), which was a natural language processing computer program which used pattern matching to generate responses based on the immediate user input[1]. ALICE (1995) Standing for Artificial Linguistic Internet Computer Entity, it is a natural language processing chatterbot[2]— inspired by Joseph Weizenbaum's classical ELIZA program. However, the program was unable to pass the Turing test, as even the casual user will often expose its mechanistic aspects in short conversations.

Then came Smarterchild(2001), which was distributed across global instant messaging and SMS networks.

Jabberwacky(2005) learns new responses and context based on real-time user interactions, rather than being driven from a static database.

In 2016, Facebook launched a Messenger platform which allows developers to create bots that can interact with Facebook users.

During the same time, Microsoft released an artificially intelligent chatbot named Tay which was shut down when it began to post offensive tweets through its Twitter account.

Today, we have IBM Watson, Apple's Siri, Google Now, Amazon's Alexa and Microsoft's Cortana which shaped the way we look at today's chatbots.

In today's world, chatbots are all around us, ranging from our devices to smart homes and what not. Chatbots help users to interact with the machine world in a better and more intuitive way. In earlier days, there was no graphical representation for human-machine interaction. Now, we can't imagine machines with a graphical user interface. In the same way, chatbots is the next milestone in human-machine interaction.

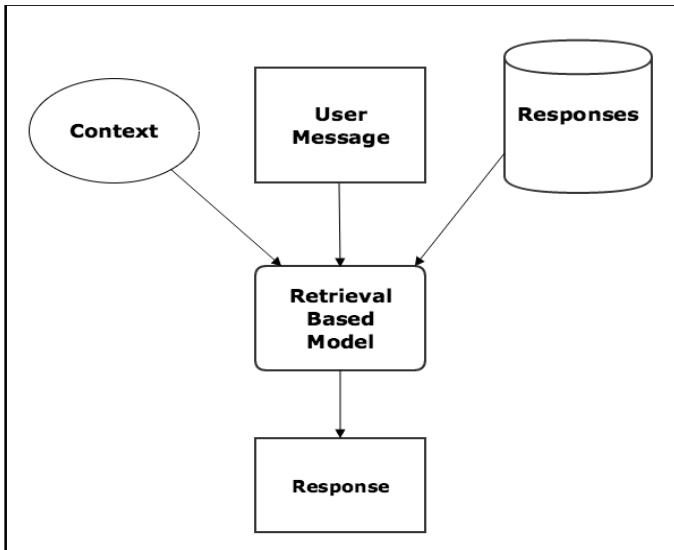
III. CLASSIFICATION

There are three basis of classification of chatbots

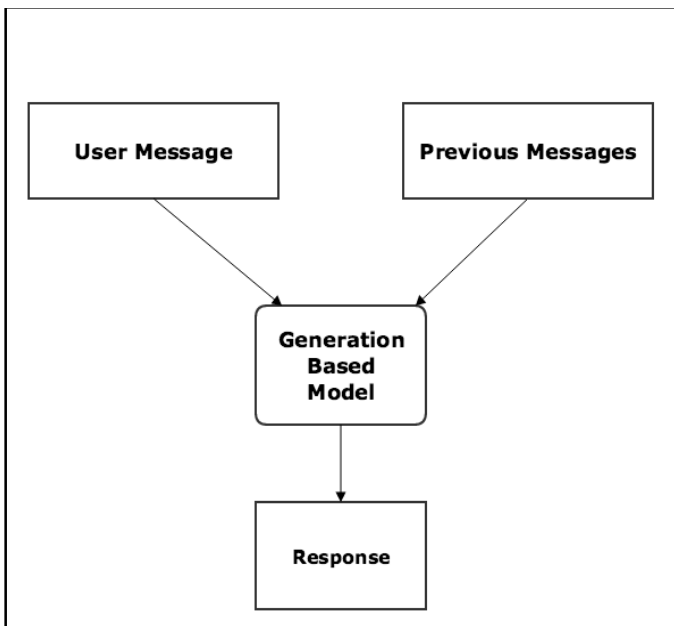
1. First classification is based on the type of conversation- Short-Text conversation chatbot and Long-Text conversations chatbot [3]. Short-Text conversations chatbot are based on creating a single response from a single input. For example, the chatbot receives a specific question which it replies with specific response. Long-Text Conversations chatbot are based on managing long conversation threads with multiple threads. Customer support conversations are generally of this type.
2. Second classification is based on the domain type- Open Domain chatbot and Closed Domain chatbot[4]. Open Domain Chatbots don't really have a well defined goal or

direction. They can cover a wide variety of worldly topics. Conversations on Twitter or Reddit are of this type. Closed Domain Chatbots are limited to a certain space of inputs and responses. They have a certain direction and goal to achieve. Shopping assistants and customer support bots are good examples of closed domain chatbots.

3. Third classification is based on the type of model on which the chatbot is based upon- Retrieval based chatbots and Generation based chatbots [5]. Retrieval based chatbots use of large database of predefined responses based on the input and context. These type of bots don't make any grammatical mistakes but their responses are limited.



Generation based chatbots generate new responses from scratch. These bots are more human like but are harder to train.



IV. DESIGN ASPECTS

1. Knowledge Base : The knowledge base means the data, information which should be their in chatbot. The knowledge is of two types: Generalised Information and Business Specialised Information. The Basic knowledge is the information about the bot example : " What's your name?", "Who created you?", "What's the weather?" Etc. The Business- Specialised information is the information related to product or service information.
2. Visual Look of the Bot: Many times, we judge a book by its cover. So the visual look of the bot is an important factor in chatbot designing [5]. The image should be given to a chatbot so that it attracts user to chat with the bot. It increases the interest chatbot and they feel that are talking to a human only. A chatbot can have a video sequencing look of a person or a cartoon character.
3. Form of Implementation on website: In order to facilitate user navigation on websites, Chatbots are often used as virtual assistant. Virtual assistants appear in the form of floating window, a built-in window, and a pull-out side tab. These forms help the chatbot buyers to easily facilitate these chatbot on their websites. The best combination used is built-in window and pull-out side tab for the implementation of chatbot on the website.
4. Speech Synthesis Unit: The conversion of text to speech module is one of the important factor of designing the bot. Usually the voiceless chatbot does not gain the trust of the user. Different voices like conversational agents voice or human voice can be used with speech synthesised unit.
5. Presentation of knowledge and additional functionalities by chatbots: The presentation in which the chatbot tells the information to the user is the most important. The user don't like typing manually so the chatbot sends the embedded links of the pages which user wants and user can easily click on it and get navigated to the page. The Help and Info button are also present which guides the user in better way and makes it easy for the user it.
6. Conversational Abilities, Language Skills and Context Sensitiveness: The conversational abilities of the chatbot is basically how well the chatbot is able to converse with the user. A good chatbot should not be prompted by the user, it should be able to remember the user's previous conversation so that it can reply in the context of the user query. It should have good language skills means it should be able to take complex input from user, if it does not understand user input, it should ask for clarifications and give some suggestions.
7. Personality Traits: Chatbot should have a rich personality. It should have some emotions so that users believe that it is not interacting with the computer program. The users should be able to trust the chatbot
8. Personalisation options:The chatbot should be customisable by the user I.e. The users should get the option of changing the gender of the Chatbot, the

chatbot should remember the username, the user should be able to view the older conversation, The chatbot should remember the history of webpages viewed by the user. [7]

- Emergency Responses in Unexpected Situations: Sometimes users try to test the patience of the chatbot because of that they pass derogatory statements and sometimes mentally abuse the chatbot so in that case chat bot should be able to respond properly. It should give diplomatic and smart replies to the user. [8]

V. USES

The chatbot is evolving technology these days. Every business want to stand out, have the best customer service, these chatbots are being implemented in almost every field. As the technology is evolving day by day, the humans want things that makes work easy. That is what the chatbot do.

The following uses of the chatbot

- The chatbot are being used in E-commerce and all other websites. In E-commerce they help user to buy the products easily by displaying the products images in form of cards.
- The chatbot can act as a guide on the website which gives the user the guidance of the website.
- The chatbot can be used to answer the frequently answered questions.
- The chatbot can act as a tutor who can teaches the student through the tutorial and takes the exam too
- The chatbot can act as a doctor on healthcare websites, helping the user with their medical issues.
- The chatbot can also suggest the user the recent trends in fashion and can guide what to wear with each dress, in short it can fashion assistant.
- It can book the movie ticket, give review for the movie, tell genre etc. It is the movie chatbot
- It helps in social issues. The people can raise their voice for the issues going around the globe through the bot and can interact with the same kind of people having same opinion.
- It can act as a weather forecast also and can help user by telling the weather forecast.
- It can book flight, train, bus tickets for the user by being the travelling bot.
- The money manager chatbot. It helps the user to manage its financial expenses.
- It can help order food from different restaurants by displaying it on one program.
- It can help in sports. The bot can give the knowledge and information about the variety of sports
- It can be fitness bot by training different exercises and yoga.
- The news chatbot displays the important news and the news of the user entertainment.
- It is used in media and entertainment industry.

VI. CHALLENGES

- Spellchecking and Content Formatting- The user input must be checked for spelling mistakes and should be converted into certain format such as uppercase or lowercase before analysing it in order to make the responses appropriate.
- Punctuation- The punctuation marks such as question marks or exclamation marks play an important role in generating more human like responses.
- Library of Responses or Training Corpus- The library of responses in case of retrieval based chatbots or the training corpus in generation based chatbots isn't exhaustive but should be large enough to produce variety of responses.
- Sensitive Information- A chatbot which is interacting with many users should not reveal sensitive information of one user to another user. This happens generally in the of generation based
- chatbots which produces responses based on previous chats.
- Grammatical Rules- The response generated by the chatbot should be grammatically correct and free from errors.
- Diverse Responses- The chatbot should be able to produce a wide variety of responses for same kind of inputs in order to make more human like interaction.
- Coherent Personality- The chatbot should maintain a certain self details consistent even if they are asked many times.

User: Which city are you from?
Chatbot: I am from Chennai.
User: Which state are you from?
Chatbot: I am from Andhra Pradesh.

Fig.- A common case of Incoherent Personality.

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