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AN ANALYSIS OF CHATBOT DESIGN TECHNIQUES

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ABSTRACT

Conversational systems as a medium of communication between humans and computers have made significant progress recently. This interplay between humans and computers has paved the way for massive natural language processing methods. A chatbot is a computer program that enables people to communicate with computers using natural language. Chatbots are extensively utilized in a variety of fields, including business, education, healthcare, and many more. Chatbot design and development entails a wide range of methods. As a result, we provide an overview of the methods used to build Chatbots in this article. A few examples of chatbot design are also covered in order to provide a better knowledge of how chatbots operate and what kind of methods are available for developing chatbots. With the fast advancement of chatbot technology, it is anticipated that it would be able to supplement human limitations and increase productivity.

KEYWORDS: *Artificial Intelligence, Chatbots, Natural Language Processing, Robot, Technology.*

1. INTRODUCTION

In general, a bot is a computer system that can execute automated tasks. Bots may also be used in chat platforms and are referred to as Chatbots. Chatbots are identical to regular messaging apps, with the exception that one of the message recipients is a robot. To put it another way, the scenario is similar to when a person is talking with a robot (computer). Voice commands, test conversations, graphical interfaces, and graphical widgets may all be used to deliver the discussion message[1].Chatbots are a popular technology these days, and they can help humans with a variety of tasks. There are many benefits to utilizing Chatbots, including the ability to aid human inquiry and provide feedback 24 hours a day, as well as the ability to increase efficiency by taking over activities for which people are not required. The capacity to reach a large

audience via a messaging system and the ability to automate customized messages are the two main benefits of Chatbots. Chatbots have been employed in a variety of sectors to provide information or execute activities such as forecasting the weather, making airline bookings, answering educational-related questions, and completing purchases. Telegram, Cortana, Slack, WeChat, Facebook Messenger, Google Assistant, and Siri are just a few of the popular apps that utilize these technologies[2].

In terms of Chatbots system development, many distinct design approaches are used to establish a medium of voice communication between a person and a machine. According to pattern matching, clever script, chat script, Artificial Intelligence Markup Linguistic (AIML), and language trickery are some of the most common design approaches used by developers. The most common method, however, is pattern matching, in which the bot matches sentences to terms in a pre-defined vocabulary. As a result, the purpose of this article is to examine several kinds of Chatbot design. In this article, there are additional examples of Chatbots systems. At the conclusion, the results are reviewed and conclusions are made[3].

Chatbots are intelligent systems that use artificial intelligence (AI) and natural language processing (NLP) techniques to communicate with users. It effectively interacts with people and responds to their questions. Organizations, government associations, and non-profit organizations are the most common users of dialogue/conversation operators. They are often communicated by financial institutions, such as banks and credit card companies, as well as organizations such as online retail outlets and new enterprises. These conversational experts are used in a wide range of businesses, from tiny start-ups to large partnerships. There are many code-based and interface-based chatbot development solutions on the market. However, they lack the flexibility and agility needed to develop genuine conversations. “Amazon's Alexa, Microsoft's Cortana, and Google's Google Assistant” are among the most popular intelligent personal assistants. These experts' components are limited. Currently, chatbots are built using rule-based methods, basic machine learning algorithms, or retrieval-based techniques, however they do not provide satisfactory results. This article offers a critical examination of chatbots, with current methods thoroughly examined and debated.

1.1 Background:

1.1.1 Chatbot System:

Chatbots, often known as Chatterbots or Chatter Robots, are computer systems that can interact with humans through messaging apps. They are capable of comprehending various questions posed by humans. They can also detect the difference between words with various meanings, such as emoticons. They must have a broad vocabulary of discussion among individuals in order to obtain the highest quality of Chatbots interaction[4].Chatbots may seem to be ordinary chat apps, but they also include an application layer, a database, and APIs (Application Programming Interfaces) running in the background. The user interface is the interface that allows for simple communication with the user. While Chatbot is simple to use, it is difficult to accomplish in the background. The majority of chatbots save conversation logs, which are used by developers to better comprehend user demands. The logs are then utilized to enhance the discussion with the Chatbot. With the assistance of machine learning, the chatbot matches the query from the user. For example, if the user asks, "Show me the university program list" or "I need the program list," both imply the same thing. By providing the identical result, the developer may teach the

Chatbot to comprehend both queries. The Chatbot is being taught, according to by analysing hundreds of records from human conversations. The program will get more intelligent as more logs are added.

1.1.2 The Use of Chatbots:

The chatbot system is extensively utilized in a variety of fields. Chatbots are utilized in the education, healthcare, and business sectors, especially for marketing purposes, because to their versatility. For example, Facebook (Facebook Messenger), Google (Google Assistance), Apple (Siri), and Microsoft have all integrated Chatbots into their system environments (Cortana). Facebook, for example, has developed Facebook Messenger with the help of the Chatbot system. The Chatbot may help the business by acting as an automated client responder.

Aside from that, the chatbot system is also utilized in the area of education. According to a chatbot may serve as an intelligent teacher for online students. The Chatbot has the capacity to analyze natural language, which contributes to dialogue accuracy. When the discussion flow is correct, Chatbot becomes a useful educational tool. Chatbot, for example, may simultaneously answer problems and provide assistance to 100 students on an individual basis. In the healthcare sector, Chatbot are utilized to help healthcare professionals in providing assistance to patients through computer and application media. For example, the AI-Chatbot [9] acts as a conversational assistant to help people stick to health-promoting behaviours over time. In this instance, the bot acts as a bi-directional conduit between the healthcare professional and the user, advising the user on good eating habits, physical activity, food preparation, and buying to prevent the user from gaining weight.

However, recent study indicates that chatbot systems are widely used in industry, particularly for marketing purposes. Collect. Chat, for example, is an interactive chatbot designed to collect consumer data on a company's website. This chatbot may be used to gather information about product orders, surveys, client inquiries, registration, and reservations, among other things.

1.2 Review of chatbots design:

1.2.1 Chat.io:

This Chatbot technology aids companies in communicating with customers via various services in one system. It may also be linked to Facebook Messenger, allowing administrators to communicate with Facebook users. The Chatbot has a modular architecture that allows it to be connected with a website, app, native mobile app, or web-based application. The Chatbot was created using an artificial intelligence technology, which allows it to anticipate text suggestions and then give intelligent responses based on the conversation history.

1.2.2 Collect. chat:

This chatbot is used to provide marketing services. Collect. chat is a chatbot system in which the operations are focused on widget interactions with user inquiries rather than artificial intelligence. One of the benefits of utilizing a Chatbot is that it may convert a visitor into a client and engage them in a discussion without requiring them to fill out many forms. It made advantage of widget interactivity, in which visitors choose one of their goals by clicking on one of the many choices.

1.2.3 Cleverbot :

Cleverbot is an online chatbot that is similar to the one seen above. Cleverbot is a Cleverbot, an artificially intelligent chatbot. Rollo Carpenter, a British AI scientist, created it in 1997 as a chatterbot online application. Cleverbot's responses aren't hard-coded in any way. Instead, it learns from human input gathered throughout the discussion. When a user enters text, the system searches for all instances of that same phrase that match the input. It reacts to user input by determining how the user reacted to that input. This Cleverbot is also accessible on the Android and iOS platforms for mobile devices.

Cleverbot, in essence, responds to human questions by learning from past human replies. The user will enter their inquiry into the text field, and the system will search for any keywords or precise phrases that fit the query. Cleverbot will react to human after searching through its stored dialogues to see how human has previously responded to that input. Cleverbot has been updated to utilize GPU (Graphics Processing Unit) serving methods. A graphics processing unit (GPU) is a specialized electrical circuit designed to operate and change memory quickly in order to generate pictures and frame buffers for display. The portion of the engine that powers Cleverbot, as well as its API, is now accessible in the market for all developers.

1.3 Chatbots Design Techniques:

1.3.1 AIML

It is a fundamental method for utilizing markup language developed by Dr. Richard S. Wallace, which is widely utilized by developers. The primary goal of the AIML language is to convert conversational modeling into a stimulus response mechanism. This method is also known as frequent tagging. Because AIML does not require professional knowledge of a particular programming language, it greatly simplifies the creation of chatbots.

1.3.2 Pattern matching:

It is a method that many chatbots use. Essentially, this method used a matching pattern to produce suitable responses to user queries based on matching categories such as basic statements, natural language, or semantic meaning of the questions.Model of personal history, prefabricated answers, no logical conclusion, typing mistakes, and exciting key strokes are four common linguistic tactics. This approach in Chatbots utilized sentences, phrases, or paragraphs to provide diversity to the knowledge base, making it more believable.

1.3.3 Chatscript:

It is an authoring script, similar to cleverscriptthat helps developers create chatbots. When there are no matches in AIML, this method is employed. The focus of this approach is on providing the optimal syntax for constructing a reasonable default response[5].

1.3.4 Parsing:

It is a method of analyzing text or a string of symbols using either natural language or computer language. In addition, parsing is a method used in computational linguistics to break down a phrase or another collection of strings into its constituent components, which may include semantic or other information. This method made advantage of Phyton NLTK's NLP capabilities, such as trees.

1.3.5 SQL and relational databases:

These are a relatively new approach in chatbots for ensuring that bots remember past interactions. The SQL-based chatbot method was utilized to improve the capabilities of the chatbot's keyword and pattern matching by offering more storage options and increasing process speed[6].

1.3.6 Markov Chain:

This is a method for creating answers that are more relevant and, as a result, better. This method works by calculating the probability of letters or words appearing in a textual data collection.

1.4 How Chatbots Works:

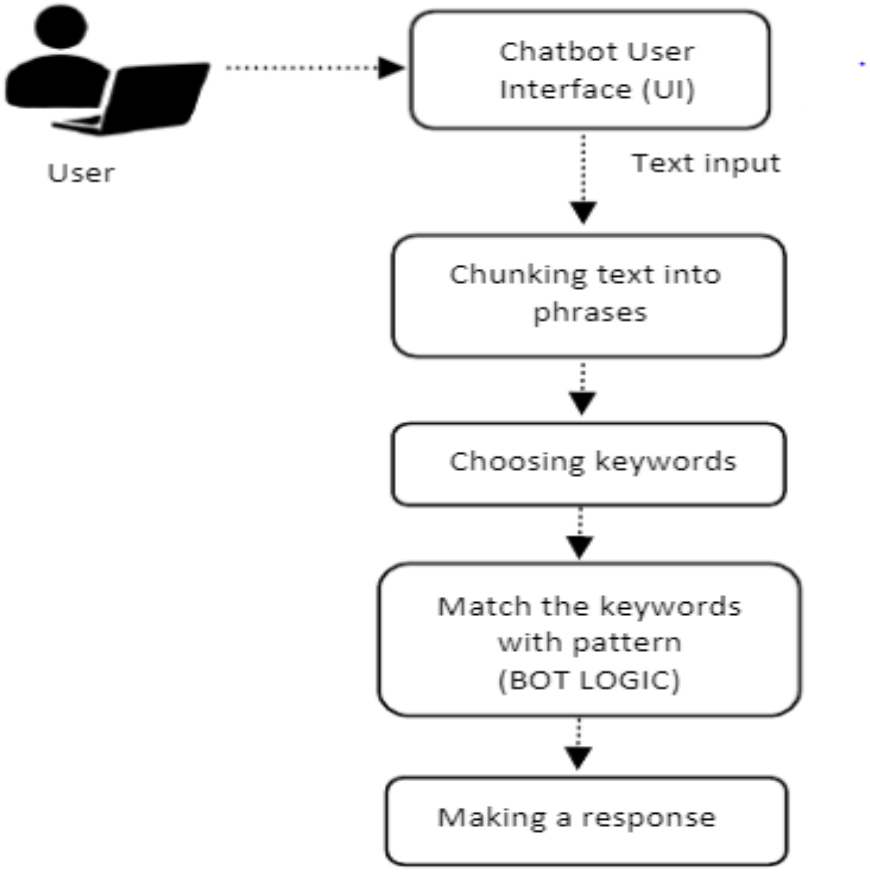

Figure 1: representation of several processes included in functioning of chatbot.

Figure 1 represents several processes included in functioning of chatbot. To begin, the user needs have access to a computer in order to utilize the chatbot user interface (UI). On the chatbot's UI, a text console will emerge, allowing users to enter text into the console. Second, the text supplied by the user in the form of a phrase will be chunked. The practice of dividing text into distinct words for tagging is referred to as chunking. The chunking procedure produces a number of significant phrases that will be utilized in the matching process later on. In the matching process, these sentences will serve as keywords. Finally, the chunking process' keywords are matched

with the chatbot system's pattern. BOT LOGIC refers to the process of matching keywords to patterns. The chatbot system's output is the programmed answer, which may be any other text or a template online form.

2. LITERATURE REVIEW

Dahiya M. presented review of chatbot in which he discussed hownowadays, chatbots are quite popular and gaining popularity as a computer communication tool. Some programs are clever enough to react in a human-like manner. A Chatbot is a kind of software like this. The design and construction of a Chatbot system are the topics of this article. We'll also look at another scenario in which Chatbots may be helpful, as well as the methods utilized to create one[7].Atwell E et al. discussed Trials and outputs of ALICE chatbot in which they discussed how a chatbot is a conversational agent that uses natural language to communicate with users. There are many chatbots accessible to service in various areas. Chatbots, on the other hand, have a manually-coded knowledge base in their brains. This article gives an introduction of the ALICE chatbot, its AIML format, and our experiences using a corpus method to create various ALICE prototypes automatically. Along with detailing the various corpora we utilized, a description of created software that transforms readable text (corpus) into AIML format is provided. Our tests showed that viable prototypes may be created without the use of advanced natural language processing or sophisticated machine learning methods. These prototypes were used as aids for learning new languages, visualizing corpora, and answering queries[8].

Marimuthu K et al. discussed Comparative study of cloud platforms to develop a chatbot in which they discussed how There were bots before there were chatbots: The development of a chatbot ushered in a new age of technology: the conversation service era. A chatbot is a virtual person that, with the aid of interactive textual conversion skills, can successfully communicate with any human being. There are many cloud-based platforms available today for developing and deploying chatbots, including Microsoft bot framework, IBM Watson, Kore, AWS lambda, Microsoft Azure bot service, Chatfuel, Heroku, and many others, but each technique has its own set of drawbacks, such as built-in AI, NLP, conversion service, programming, and so on. This study compares all cloud-based chatbot systems, taking into account factors such as built-in AI, setup time, completion time, complexity, and so on. Finally, the comparison will reveal which cloud platform is the most efficient and appropriate for creating chatbots[9].

Miner a et al. discussed Psychological, relational, and emotional effects of self-disclosure after conversations with a chatbot in which they discussed how Abstract Giving another individual personal knowledge has positive emotional, relational, and psychological consequences. When people think they're talking with a machine rather than a person, such as a chatbot that can mimic human-to-human interaction, the results may be harmed, improved, or equal. In discussions with a fictitious chatbot or human, we looked at the downstream consequences of emotional vs factual disclosures. Whether participants believed they were revealing to a chatbot or a human, the consequences of emotional disclosure were the same. This research adds to our knowledge of disclosure and how technology affects it, bolstering the case for media equivalency as a key mechanism for the repercussions of revealing to a chatbots[10].

3. DISCUSSION

A chatbot is a dialog-exchanging system that generates a meaningful and empathic dialogue between a person and a machine by processing natural language input, which may be in the form of voice or text, and responding in the same language and expression as the human. These inputs of speech from users may be analysed and intelligent answers from such system engines can be obtained to build up a human-like interaction utilizing various Natural Language Processing (NLP) methods using the python library, Natural Language Tool Kit (NLTK). The chatbot utilizes a fantastic algorithm to mimic a genuine human while having a restricted vocabulary. The chatbot can help you discover an entertaining companion and assist you in times of need. If a user asks a question to the chatbot, it will respond with a recommendation based on that query.The responses are relevant to the user's questions; nevertheless, if the user finds his answer to be incorrect, it will display a default message and alert the administrator. The method employed here has sophisticated reasoning built in and is intended to improve user interaction. This paper discusses several aspects of chatbots.

4. CONCLUSION

The majority of individuals are drawn to human-like systems. Many users are unaware that Chatbots may provide feedback in the form of text and voice commands, but that they can also provide interactive information via graphical interaction or graphical widgets. The primary advantage of utilizing chatbots is that they may reach a large audience even from a far distance using just messaging applications. Aside from that, these automated human-computer conversational platforms are beneficial in that they offer efficient service in a variety of fields, allowing humans to be served in a variety of ways.The reviews in this article have addressed a number of publications that have focused on chatbot design. Initially, we discussed the chatbot system and its applications in a variety of areas, including education, healthcare, and business.

Following that, we explain how certain chatbots are designed in today's market. The evaluation is based on the design effort, features, user interaction, and user interface. Finally, we demonstrate how the chatbot system works in general by presenting the chatbot system operations. Chatbots are a novel way to automate the delivery of personalized messages to users. If chatbots are properly developed and deployed, they may be used to increase user engagement and offer a positive user experience between humans and the field they serve. Designing and deploying chatbots, on the other hand, is not as simple as it may seem. Chatbot technology is rapidly evolving, with many enhancements and new functionality being introduced on a regular basis. The creation of chatbots should be meticulously planned, and selecting the right platform tools is critical since it may improve the chatbots' efficacy and efficiency.

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