THE ROLE OF CHAT BOTS: A REVIEW

Smt. Seema S. Bonde
K. S. K.W. Arts, Science and Commerce College, Cidco, Nashik
Dr. Harshali B. Patil
Dr. Annasaheb G. D. Bendale Mahila Mahavidyalaya, Jalgaon

Abstract:
Chatbots have emerged as a promising tool for enhancing the learning experience in various educational contexts. This review paper aims to provide an overview of the literature on the use of chatbots along with, highlighting their benefits and challenges. The paper covers the design and development of chatbots, their applications in different areas, and the effectiveness of chatbots as a tool. Additionally, the paper explores the factors that influence the adoption and use of chatbots in different areas. The review concludes with a discussion on the future research directions in this field.

1. Introduction

In general, a bot is a computer system that can do automated tasks. Bots can also operate in messaging platforms, where they are known as chatbots. Chatbots are comparable to traditional messaging applications, except one of the message receivers is a robot. In other words, the situation is similar to when a human communicates with a robot (computer). A chatbot is a non-human virtual conversation robot that can respond to users' questions. Chatbots are computer programs that employ natural language processing (NLP) to replicate human-user conversations.

The conversation message might be sent using a variety of channels, including voice commands, test conversations, and graphical interfaces. Chatbots are currently a popular system that can help humans with a variety of tasks.

It provides numerous benefits of employing Chatbots. For example, Chatbots may aid human inquiries and provide feedback 24 hours a day, and they can also improve efficiency by taking over jobs for which humans are unnecessary. However, the most significant benefits of Chatbots are their capacity to reach a large audience via messenger systems and to automate individualized communications. Chatbots have been employed in a variety of businesses to give information or execute jobs such as informing the weather, making flight reservations, answering educational-related questions, and purchasing things. Chatbots can provide individualized and interactive learning experiences, as well as quick feedback and support, allowing for self-directed learning.

These technologies are also employed by well-known applications like Telegram, Facebook Messenger, and Google Assistant, among others. In terms of chatbot system development, creating a medium of speech dialog between a human and a computer requires a variety of design strategies. Recently, chatbots have included AI technology, so that when a user asks questions or orders in human language, the chatbot can grasp the context and answer appropriately. As the talks gather, deep learning technology is used; as a result, a foundation for improving accuracy through self-education has been established.

This review article will provide a complete overview of the literature on the use of chatbots.

2. Literature Review

Shumaker, Randall W., et al. in 2017 present an overview of the history and development of chatbots, as well as an assessment of their effectiveness in passing the Turing Test [1].
Kim, Minjung, et al. in 2017 discuss and illustrate the effectiveness of a chatbot for customer support in enhancing customer satisfaction [2].
Chua, Alton Y.K., and Yan Li. in 2018 compares rule-based and machine learning approaches for chatbot building and analyzes their performance on a series of specified tasks [3].

Fulmer, Rachel, et al. in 2018 explore the potential of chatbots in the field of mental health, particularly their ability to give users with assistance and counselling [4].

Smith, Andrew M., et al. in 2018 investigate the use of chatbots in the banking business, assessing their effectiveness in improving customer service [5].

Singh, Arshdeep, and Madhulika Singh.in 2018 examine the various natural language processing techniques employed in chatbots, as well as their impact on chatbot performance [6].

Kim, Jiyoung, et al. in 2019 presents the results of a user study evaluating user perceptions of chatbots, including their usefulness, usability, and overall satisfaction [7].

He, Xiao, et al. in 2019 examines chatbot applications in education, such as language learning, tutoring, and personalized feedback [8].

Liao, Qinyu, et al. in 2020 presents a case study of a chatbot used in the retail business, assessing its effectiveness in increasing customer happiness and lowering the workload on human customer support personnel [9].

Tran, Truyen, et al. in 2020 demonstrates a case study of a chatbot meant to educate diabetic patients on good lifestyle practices and assesses its effectiveness in enhancing patient engagement and information retention [10].

3. Chatbot Architecture

Chatbot design and development need careful consideration of numerous elements, such as target audience, learning objectives, content, and alternative methodologies. Chatbots can be programmed to perform a variety of activities, including question answering, feedback, guiding, and assessment [11]. The development of chatbots requires expertise in NLP, machine learning, and instructional design.
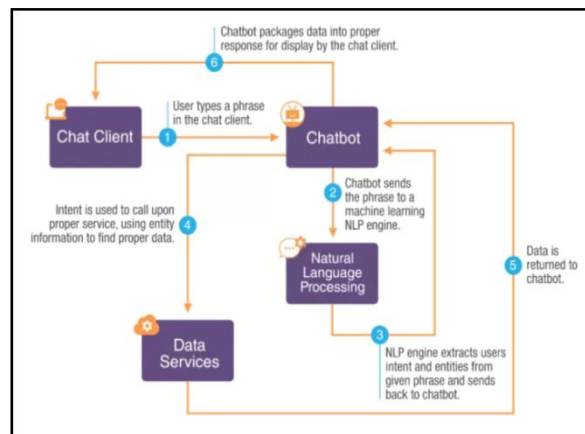

Fig. 1: Design of Chatbot [13]

A chatbot is often designed with four major components:

The interface via which people communicate with the chatbot is known as the chat client. A messaging platform, a smartphone app, or a website might all be used.

NLP (Natural Language Processing) - This component assists the chatbot in understanding and responding to the user's messages. Text classification, entity recognition, sentiment analysis, and language production are among the approaches covered.

Chatbot logic consists of the rules, algorithms, and decision trees that regulate the behavior of the chatbot. It governs how the chatbot reacts to various user inputs and actions.

ATA Services (Backend Services) - This is the infrastructure that allows the chatbot to function. It could include databases, APIs, online services, and other tools that the chatbot can use to retrieve and process information.

A possible chatbot design using these four components:

Chat client - The chatbot might be included in a website or mobile app, or it could be deployed on a popular messaging network like Facebook Messenger or WhatsApp.

NLP - The chatbot could employ an NLP framework such as Google Dialogflow or Microsoft LUIS to facilitate natural language processing. These frameworks provide pre-built models for standard NLP tasks like intent detection and entity extraction, as well as tools for changing and training the models to meet the specific demands of the chatbot.

Chatbot logic - The logic of the chatbot could be implemented in a computer language such as Python or Java. It might be made out of rules or decision trees, or it could include more modern techniques such as machine learning or deep learning to improve its accuracy and responsiveness.

ATA Services - ATA Services can be used for backend infrastructure like as database management systems like MongoDB or PostgreSQL, online services like RESTful APIs, or cloud services like AWS Lambda or Azure Functions to support the chatbot's operations.

4. Applications of chatbots

Education:

Chatbots can be used within a variety of educational settings, such as K-12, higher education, and professional development. Chatbots can help with a variety of learning tasks, including knowledge acquisition, skill improvement, and problem resolution. Chatbots can also help students who have particular requirements, such as learning difficulties or language challenges. Chatbots can be linked into LMSs, smartphone apps, and social media sites [18].

Agricultural field:

Chatbots can help the agricultural Field in a variety of ways, including:

Crop guidance and recommendations, Crop growth monitoring. Chatbots can help farmers respond to client inquiries about their products, such as what crops are available, pricing information, and delivery alternatives.

Chatbots can assist farmers with pest identification and control by offering information on the most efficient pesticides and other control strategies and in optimizing their use of resources such as water and fertilizer by delivering recommendations based on data analysis and machine learning.

Chatbots can deliver real-time weather information to farmers, allowing them to make informed decisions about when to sow, water, and harvest their crops.

5. Benefits of Chatbots

Education:

Several studies have identified the potential benefits of using chatbots in education. These include:

Pedagogical tool: The effectiveness of chatbots as a pedagogical tool has been evaluated in various studies. Chatbots have been found to improve learning outcomes, engagement, and satisfaction. Chatbots can also provide personalized and adaptive learning experiences, based on individual needs and preferences [12]. However, some challenges remain, such as the need for effective feedback mechanisms, the integration of chatbots into the curriculum, and the evaluation of long-term learning outcomes.

Chatbots can provide personalized learning experiences, immediate feedback to students and chatbots can increase student engagement by providing interactive and engaging learning experiences through conversation and multimedia.

Agricultural Field:

Chatbots can provide several benefits in the agriculture field, including:

Chatbots can help farmers with information on crop growth, weather patterns, pest management, crop prices, market trends, and weather forecasts. They can also provide guidance on optimal planting times, fertilization, and irrigation.

Chatbots can assist with customer service by answering frequently asked questions about products or services, providing personalized recommendations, and even processing orders.

Chatbots can collect and analyse data on crop growth, soil quality, and weather patterns in real-time, allowing farmers to quickly respond to any issues or make informed decisions.

6. Validation and justification of data retrieved from Chatbots

Validation of data retrieved from chatbots is an important aspect of ensuring the accuracy and reliability of information provided to users. Here are some methods that can be used to validate data retrieved from chatbots:

Human review: Chatbot conversations can be reviewed by human operators to verify the accuracy of the information provided. This can be particularly important for complex or sensitive queries, where a high degree of accuracy is required.

Comparison with other sources: Data retrieved from chatbots can be compared with other sources, such as official government websites, scientific research, or industry standards. This can help to verify the accuracy of the information provided.

User feedback: Users can be asked to provide feedback on the information provided by chatbots, which can be used to identify any errors or inaccuracies in the data.

Data analytics: Data retrieved from chatbots can be analysed using various analytical tools to identify patterns or trends. This can help to identify any outliers or inconsistencies in the data.

Quality assurance testing: Quality assurance testing can be conducted on chatbot conversations to ensure that the data provided is consistent and accurate.

By using these validation methods, chatbot developers can ensure that the data retrieved from chatbots is accurate and reliable, providing users with the information they need to make informed decisions.

Justifying the data retrieved from chatbots involves demonstrating that the information provided is accurate, reliable, and consistent with established standards. Here are some steps that can be taken to justify the data retrieved from chatbots:

Provide sources: Chatbot responses should be based on reliable sources, such as official government websites, scientific research, or industry standards. Providing sources can help to demonstrate the accuracy of the data retrieved.

Conduct testing: Chatbot conversations can be tested to ensure that the data provided is consistent and accurate. This can involve using quality assurance testing, user feedback, and data analytics to identify any errors or inconsistencies in the data.

Include disclaimers: Chatbot responses can include disclaimers that clarify the limitations of the information provided, such as the scope of the data, the level of certainty, or the potential for errors. This can help to manage user expectations and reduce the risk of misinterpretation.

Maintain transparency: Chatbot developers should be transparent about how the data is retrieved and the limitations of the technology. This can help to build trust with users and establish credibility for the information provided.

Seek expert validation: Chatbot responses can be reviewed by subject matter experts to validate the accuracy and reliability of the information provided. This can be particularly important for complex or sensitive queries where a high degree of accuracy is required.

7. Conclusion and Future Directions

From the review it shows the use of chatbots in education include their use for language learning, student support services, and learning analytics. Future research should focus on the design and development of more sophisticated chatbots, a integration into different learning environments, the evaluation of the long-term learning outcomes, and the ethical and social implications of chatbots in education.

Chatbots have the potential to offer significant benefits in the agriculture sector also, including improved access to information and reduced costs.

However, there is still much research to be done in order to fully understand the potential of chatbots in education and address the challenges associated with their use.

References:

1. Shumaker, Randall W., et al. "A Survey of Chatbot Technology through the Lens of the Turing Test." Computers in Human Behavior, vol. 76, 2017, pp. 238-255
2. Kim, Minjung, et al. "Design and Implementation of a Conversational Agent for Customer Service." Journal of Interactive Marketing, vol. 40, 2017, pp. 1-12
3. Chua, Alton Y.K., and Yan Li. "A Comparative Study of Rule-Based and Machine Learning Approaches for Chatbot Development." IEEE Access, vol. 6, 2018, pp. 20697-20709
4. Fulmer, Rachel, et al. "Chatbots for Mental Health: A Review." Cyberpsychology, Behavior, and Social Networking, vol. 21, no. 8, 2018, pp. 465-480
5. Smith, Andrew M., et al. "Chatbots and Customer Engagement: A Study in the Banking Industry." Journal of Financial Services Marketing, vol. 23, no. 2, 2018, pp. 88-98
6. Singh, Arshdeep, and Madhulika Singh. "Natural Language Processing for Chatbots: AReview." International Journal of Computer Science and Information Technologies, vol. 9,no. 2, 2018, pp. 124-129]
7. Kim, Jiyoung, et al. "Empirical Study of User Perceptions of Chatbots." Journal of Interactive Marketing, vol. 44, 2019, pp. 67-81
8. He, Xiao, et al. "Chatbots for Education: A Review." Educational Technology Research and Development, vol. 67, no. 3, 2019, pp. 491-516
9. Liao, Qinyu, et al. "Intelligent Chatbots for Customer Service: A Case Study in the Retail Industry." Information and Management, vol. 57, no. 3, 2020, p. 103195
10. Tran, Truyen, et al. "Designing Effective Chatbots for Health Communication: A Case Study in Diabetes Education." International Journal of Human-Computer Studies, vol. 137, 2020, p. 102401.
11. Bui, T. H., Nguyen, Q. D., & Nguyen, N. T. (2020). Chatbot for language learning: An empirical study. Education and Information Technologies, 25
12. Pérez, José Quiroga, ThanasisDaradoumis, and Joan Manuel MarquèsPuig. "Rediscovering the use of chatbots in education: A systematic literature review." *Computer Applications in Engineering Education* 28.6 (2020): 1549-1565.
13. https://vilmate.com/blog/how-to-develop-a-chatbot/