Advances and Applications in Mathematical Sciences
Volume 20, Issue 2, December 2020, Pages 269-277

CHATBOT AS AN INNOVATION OF MACHINE LEARNING

SAKSHAM BHAMBRI, MUSKAN AHUJA, VISHAKHA SEHDEV and ANKIT VERMA

Department of IT
IITM Janakpuri
Delhi, India
E-mail: saksham1999274@gmail.com
ahujamuskan22@gmail.com
vs4821@gmail.com
prof.dr.ankit@gmail.com

Abstract

Artificial Intelligence in today's era is a very challenging discussion. Today it involves the development of those machines which have intelligence of their own and from which they can help a whole community. In this paper, we are going to learn about the new approach of Artificial intelligence which has the concept of connecting to different users in different ways according to the needs of the user. These systems are commonly known as Chatbots (or Chatterbots). Chatbots present a new way for the users to interact with the Systems. A Chatbot will allow a user to ask different questions in the same manner that they would ask a human and the chatbot will answer those questions as if an expert is present inside the machine or the system and he is the one who is answering your queries.

I. Introduction

Nowadays when we look around us, we see that we are surrounded by different types of machines or software. We see that all things around us now have a very minimal requirement of human interaction. Some of these systems can even operate on their own without any human interaction, these types of systems are powered by the AI (Artificial intelligence). Chatbots are the small version of an AI. A chatbot is a software that is

2010 Mathematics Subject Classification: 68T01, 68T27 and 68T40
Keywords: Chatbot, Turing Test, Virtual Assistant.
Received May 25, 2020; Accepted August 5, 2020

developed to solve the queries of users on different platforms. In simpler terms, a chatbot is like a virtual companion who can start a conversation with you, crack some jokes, can laugh at your jokes, can solve your queries, can order food for you, can call a cab for you, can tell you anything you want to hear or can hear anything you want to say [1]. Today's chatbots are so advanced that they can even hear what you want to say, they can convert your speech to text and then can perform any action you want then to, now you didn't always have to type.

Chatbots have been proven very good for the users as well as the companies. Now companies didn't have to hire a whole lot of a department for solving the queries of the users, now a single chatbot software can do this task, Now chatbot can directly connect you to respected officer of the department in which you have a query, now the middle man is not necessary, and this thing benefits both the user and the company.

A. Tasks of Chatbot

Chatbots work on a simple principle that they hear the query of the user and then search the keywords of that query in their database and then generate an appropriate response for that query. In this process chatbot mainly performs 2 most important tasks:

1. User request analysis

2. Returning the response

User request analysis: This is the main task performed by the chatbot. In this, the system analyzes the user request and searches that request in the stored database with the help of the keywords in the request. This process is very complex because if the system makes a mistake in understanding the keywords then the response of the request will be different and not enough for the user. Chatbot user interface is shown in fig. 1.

Returning the response: In this task, chatbot collects the best response for the query asked by the user from the database and displays it on the screen [2].

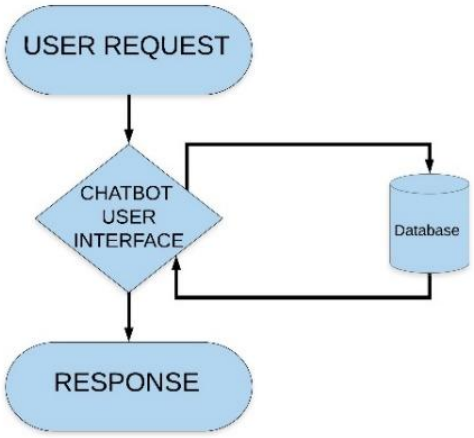

Figure 1. Chatbot User Interface.

B. Turing Test

This is a basic test developed to analyze the performance or the intelligence of a chatbot. This test was proposed to check whether a machine can think like a human or not, a system can be successfully said that it has an AI when that system can give responses like a human being.

In this test, we need an expert human being to give answers side by side the machine which we are testing for the intelligence, and an examiner who has a set of questioners which he is going to ask from the machine and the expert and we are going to check the responses from both the machine and the expert and then we are going to compare them and see that if the chatbot can give human-like answers or not [3]. Figure 2 is sowing the Turing test.

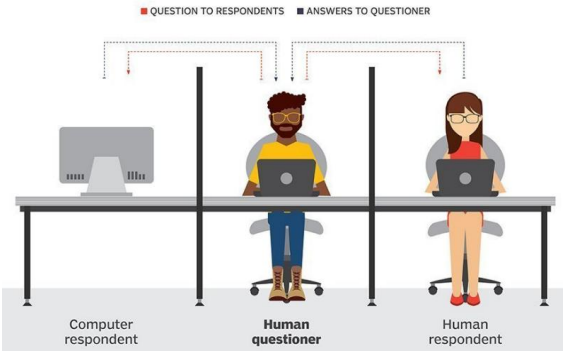

Figure 2. Turing Test.

II. Structure and functions of a Chatbot

A. Introductory Screen

This is the welcome screen of the application we are using to interact with the chatbot. This introduces the user to the virtual expert (chatbot) and stores some common details like name, date of birth, address, etc. for future conversation in the database

B. The Chat Interface and Manager

This is the region where we start the conversation with the chatbot and ask our query to which the program finds and displays the most appropriate response from thousands of rules and regulations stored in the database.

C. The Database

The database is an organized, manually created list of every possible reply of a query or question asked by the user. A good chatbot covers a vast range of queries for a better understanding of different scenarios given by the user [4]. For a chatbot to last long in the industry it is necessary that it has more than one reply to the same kind of questions for different users according to their needs. The database is the brain of the chatbot.

D. Productivity Application

A chatbot is good if it provides the solutions of the different question but a chatbot is advanced if it is embedded with different productive applications like calculator, notes, alarm and many more. The first application produced in a chatbot was a calculator. The user just had to type the mathematical expression and the program run that expression and produce the correct answer. Nowadays a chatbot can do a lot of productive work like booking a cab for you or ordering food from the nearest store and many more.

E. Ambiguity Handling

Sometimes a chatbot has to face some situations in which it couldn't be able to produce a correct response for the user's query. At this point, ambiguity handling comes into play. It produces a solution with no relevant

data present in the database. Those solutions could fit in a wide range of contexts.

F. Data Handling

When we start interacting with the chatbot it asks some basic questions about the user like his name, gender, location, date of birth, etc. which is stored for the future references or for modifying its answers to reply an appropriate response for the specific user [5]. This all is done with the help of data function programming in the chatbot software.

G. Error Handling

This function of the chatbot comes into play when the user tries to ask some logically wrong questions. This function is capable of handling all those errors and continue to operate in that environment.

III. Fundamentals of Intelligence

If we are talking about the structure or functions of the chatbots then we have to start thinking about it from the basics. We need to think about the basic fundamental properties of intelligent machines. These properties are:

A. Arithmetic

The power to produce arithmetic answers is nowadays a common function of most of the chatbots. Nowadays chatbots can even solve some complex mathematical equations in no time.

B. Comparison, Logic, and Reasoning

A chatbot can become more intelligent if it has the ability or strength to apply logic and reasoning in real case scenarios given by the user [6]. Nowadays chatbots can perform these functions with the help of the principals of Boolean algebra.

C. Learning, Heuristics, and Memory

These days chatbot has a special feature to recollect past incidents memory and learn new things or gain experience from these incidents, this is the main feature of an intelligent system. Heuristics is the ability to learn new things and gain experience from the past, this feature is now being

implemented in the new systems.

D. Senses

We humans have a gift of a very effective and efficient set of senses. It helps us to know about the environment we are surrounding ourselves with. Some of the animals also have this gift of senses [7]. If we give the ability to a machine to sense its surroundings and do work according to that then that machine can become an intelligent brain to work. But as of now, it is not possible, or we can say that someone hasn't found a way to that till now.

E. Perception

This is the process by which we intercept the messages provided by our senses. This is the process by which we hang our creativity into intelligence. It is the biggest dream of AI to have the perception of machines.

F. Consciousness

This is the most difficult property to define in an intelligent machine [8]. It is very difficult to be implemented in a machine. With this property comes a very question that "how can we add consciousness in an abiotic system or a non-living machine".

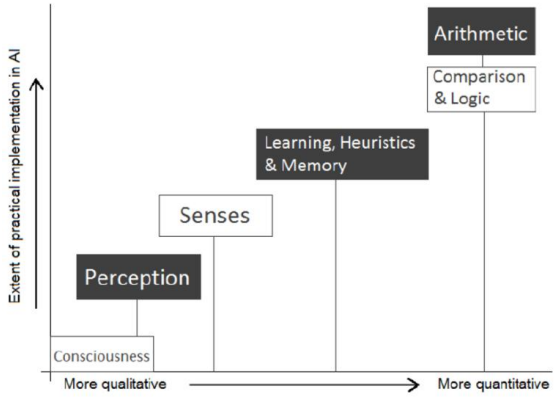

Figure 3. Fundamentals of Intelligence.

IV. Redefined Machine Intelligence

In this part, we are going to learn about the different types of intelligence machine we have studied and how they are categorized in different categories.

A. Performance Factor

The performance factor of a machine is a technique to measure the intelligence of a machine and to categorize it in a different category [9]. This performance factor judges the machines on the terms of the fundamental properties of intelligence they possess. Its value ranges from 0 to 1. Today almost all the chatbots show the performance factor in the range of 0.3 to 0.5. A “Completely Intelligent System” will possess the performance factor of 1.

B. Partially Intelligent Systems

If a machine or system has some of the above fundamental properties listed in heading "fundamentals of intelligence" than that system is known as a partially intelligent system. For example, today all the chatbots we have seen in our life or we have studied all are partially intelligent systems because they didn't possess all these fundamental properties [10]. They have some properties like arithmetic, learning, Heuristics, Memory, comparison, etc. even the highly advanced robots of today's time have partially intelligent systems, as today we didn't possess complete power on the fundamental properties of intelligence.

C. Completely Intelligent Systems

If a machine or system has all the above fundamental properties listed in the heading “fundamentals of intelligence” than that system is known as a complete intelligent system. These types of systems will show the true strength of AI.

V. Future Scope

In near future, we can hope that the chatbots of that time would be more advanced, more interactive, will have more stable AI platform to work all the necessary things. Chatbots will have more developed user interface to interact with the user. In future we can have the chatbots who can

understand the queries of the users more efficiently. Chatbots will overcome many language barriers, they will be able to learn new words other than the one they usually repeat, they will gain more experience.

VI. Conclusion

In this paper we have learned that chatbots can do a lot of things which a human can do and how they are very beneficial to user, They can think like human, they can solve different queries of human faster than us, they can sense things like in which environment they are being used, who is using them on a daily basis, etc.

On the other hand, they are beneficial to company also, they can help the company as being their customer support, they can provide solutions to customers queries or can direct their call to respected departments without any interference of any human. Now we can get fast solutions for our errors. now they didn't have hire a whole department just to clarifies the doubts of the users these can now be done with help of the chatbot

As we have seen above nowadays chatbots are getting intelligent day by day, they are learning with their own mistakes and are becoming a member of our virtual society. Now they are not treated as a system or a software, they are treated as an individual entity.

In this generation when everything we do or think is going in a virtual reality then it is necessary that we should have a friend in this virtual reality who can hear our problems and give us meaningful solutions or can talk to us on a daily basis, can ask about our routine, can help us in our daily needs, etc. Chatbots are the virtual friend we need for this task; they can do all of this work without even complaining about anything.

References

[1] A. T. Fiore, S. Leetiernan and M. A. Smith, Observed Behavior and Perceived Value of Authors in Usenet Newsgroups: Bridging the Gap, In Proceedings of the CHI 2002 Conference on Human Factors in Computing Systems (2002), 323-330.

[2] A. Verma and J. S. Prasad, Performance Enhancement by Efficient Ant Colony Routing

Algorithm based on Swarm Intelligence in Wireless Sensor Networks, International Journal of Wireless and Mobile Computing (IJWMC) 12(3) (2017), 232-238.

[3] A. Verma and J. S. Prasad, Optimum Path Routing Algorithm using Ant Colony Optimization to solve Travelling Salesman Problem in Wireless Networks, International Journal of Wireless and Mobile Computing (IJWMC) 13(2) (2017), 131-138.

[4] F. Sebastiani, Machine learning in automated text categorization. ACM.

[5] F. Sebastiani, Machine learning in automated text categorization. ACM Computing Surveys 34(1) (2002), 1-47.

[6] K. S. Eklundh and C. Macdonald, The Use of Quoting to Preserve Context in Electronic Mail Dialogues, In IEEE Transactions on Professional Communication, 37(4) (1994), 197-202.

[7] K. M. Colby, Simulation of Belief systems, In Schank and Colby (Eds.) Computer Models of Thought and Language (1973), 251-286.

[8] K. S. Eklundh, To quote or not to quote: setting the context for computer-mediated dialogues, In S. Herring (Ed.), Computer-Mediated Conversation. Cresskill, NJ:Hampton Press, 1998.

[9] P. Tarau and E. Figa, Knowledgebased conversational Agents and Virtual Story-telling, In Proceedings 2004 ACM Symposium on Applied Computing, 1 (2004), 39-44.

[10] T. Joachims, Making large-scale SVM learning practical, Advances in Kernel Methods-Support Vector Learning, MIT-Press, 1999.

[11] T. Joachims, Optimizing Search Engines Using Clickthrough Data, In Proceedings of the ACM Conference on Knowledge Discovery and Data Mining (KDD) (2002), 133-142.