A Brief History of Chatbots

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A Brief History of Chatbots

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Abstract. Unquestionably, we come across conversational algorithms or chatbots more and more frequently, in increasingly everyday situations; while buying a flight ticket, or clothes from an e-shop for example. This study presents a brief history of chatbots as a topic that is necessary for understanding this phenomenon, its externalities, paradoxes, and future prospects. Chatbots, as an expanded and practically deployed AI, have their recognisable history and logical development structure, which are summed up in the following article. The article presents the logical structure of development on selected programs from Eliza to Tay and Xiaoice chatbots.

Introduction

In 1950, Alan Turing, a logician, cryptoanalyst and pioneer of the computer science, asks a question what thinking means and whether machines can think in the article Computing Machinery and Intelligence [1] published in a journal called Mind. Since it is difficult to answer the question whether machines can think, he replaces it with a more pragmatic question 'Can a computer communicate in a way indistinguishable from human?' To answer this problem, it is possible to use one controllable criterion nowadays. In one of its forms, this criterion constitutes a test, which is known as the Turing test. [2] To answer this question, it uses a variation of the so-called Imitation game. It is a game in which a person leads a 'blind' communication with the tested subject. After the end of the communication game, the person is supposed to decide whether it was a living thinking person or artificial intelligence (AI), a chatbot. It means that in this test the ability to think is identified (or substituted) with an ability to communicate on such a level so that the participants of the conversation regard it as a thinking being. In the article, Turing [1] very intellectually and thoroughly deals with many critical objections and problematic aspects of the proposed solution, which could be potentially raised. Nonetheless, 68 years ago he states: "I believe that in about fifty years' time it will be possible, to programme computers … play the imitation game so well that an average interrogator will not have more than 70 per cent chance of making the right identification after five minutes of questioning." [1].

A computer, program, algorithm or artificial intelligence which communicates with a person or another participant of the communication can be called a chatbot. The aim is usually to make users feel that they are conversing with a living person. Neff and Nagy [3] define a chatbot as a type of a program which engages users in a conversation: "chat bots respond to users' messages by selecting the appropriate expression from preprogrammed schemas, or in the case of emerging bots, through use of adaptive machine learning algorithms." [3].

In 1990, a significant American inventor, social critic and activist, Hugh Loebner, created a competition which annually does the Turing test in practice. The goal of the competition is to receive the Loebner Prize, which means 100,000 USD and a gold medal for the first programmer or team which creates a chatbot which will pass the Turing test in front of a jury. Even though nobody has ever managed to win the prize, the best chatbot is awarded and its creators receive around 2,000 - 3,000 USD.

However, the largest Turing test in history is not the competition for the Loebner Prize but chatbots Xiaoice [4] and Tay (an acronym from 'Thinking about you'). Xiaoice (read Shao-ice, literally 'Microsoft Little Ice' or 'Little Bing' - after the web browser from Microsoft) is an advanced chatbot created by Microsoft programmed so that it acted as a seventeen-year-old Chinese girl whose profile is primarily active on Weibo, a popular Chinese social networking site. Nevertheless, we can also

converse with her using social networking sites such as 163.com and JD.com (Currently covering more than 40 platforms in five markets. See more here [5].). In this case, answers are generated by artificial intelligence. During its development, Microsoft, thanks to not only software designers but also psychologists, applied many breakthrough technologies especially from the field of big data leverage and emotional intelligence. This program learns from users, so it can potentially react to various topics in a conversation. If she is not sure about the subject of the conversation, she tries to use such answers to cover her uncertainty. If she gets into these types of situations, she reacts by expressing similar primary emotions like people - for instance, shame or anger. In current 6th generation of Xiaoice, further evolving its AI capabilities in area of decent emotional Quotient. The self-perfecting algorithm does not use only data from past conversations but also information gained from the whole Chinese Internet.

Complexity of communication and an element of randomness appear very credible, authentic and realistic to a user. This sophisticated communication strategy can be used by the chatbot thanks to the so-called deep-learning approach, which was inspired by biological neural networks, and it can thus distinguish patterns in behaviour, meaning, speech, image and others. This strategy is so successful that Xiaoice is followed by 660 million users on the network. [4],[5]

Rinna, Xiaoice's counterpart, was launched through a chat application called Line in Japan. Another similar project by Microsoft was launched in the USA on 23rd April 2016 - an advanced, emergent chatbot with a built-in self-development mechanism called Tay. Let us now examine the phenomenon of chatbots more generally int the brief history of chatbots.

A Brief History of Chatbots

As it was already mentioned, a chatbot is a program with a certain level of artificial intelligence, which communicates with a person or another chatbot in order to give the observer of the conversation impression that it is a conversation with a real person. This impression can be so authentic that users unknowingly include these technologies in rules of social norms, relationships and obligations as if they were human beings. In the development of chatbots, programmers mainly focus on two aspects: emotions and agency. [3] A boom in the use of chatbots, whether with a simple or more advanced implemented artificial intelligence, began with the massive expansion of the Internet and especially social networking sites. These programs are used to communicate with a customer in online shops, such as customer service, marketing and advertising, entertainment industry, data collection and they are also used as tools for hybrid threats used to influence public opinion.

Eliza. One of the oldest and also best-known chatbots is a program called Eliza created by the Artificial Intelligence Laboratory in MIT, which dates between 1964-6. This programme, which became an inspiration for many developers in the field, was developed by the professor Joseph Weizenbaum. The program is named after Eliza, a character from a comedy called Pygmalion written by G. B. Shaw in 1912. In this satirically critical work, Eliza Doolittle, a simple English street flower girl, learns how to speak like a lady to eventually impress London high society by her performance. In the early scenario called DOCTOR, Eliza chatbot simulates a role of a Rogerian psychotherapist - she asks open questions with which she also answers - thus she diverts attention from herself to the user. It was a surprise that people soon started to anthropomorphised Eliza and confide in her their personal stories, sensitive data and secrets. [3]

PARRY. Another well-known chatbot is PARRY, which was introduced by Kenneth Mark Colby, a psychiatrist and computer scientist, at Stanford's Psychiatry Department in 1972. This program for diverting attention from itself used an opposite strategy from Eliza. It did not behave as a doctor but as a paranoid schizophrenic patient. It tries to provoke controversies and thus make the participant give more elaborate answers. It did not serve only as a didactic tool for young psychiatrists to learn how to communicate with patients who were diagnosed with paranoid schizophrenia, but also as a functional

model of Colby's theoretical pattern of paranoia functioning as a defective processing of signs in patient's mind. [3],[6]

Eliza Chats with Parry. At a computer conference in 1972, the expected thing happened: 'the patient started to converse with the doctor'. In article for a special edition of Stanford Humanities Review called Stanford electronic Humanities Review, Güven Güzeldere a Stefano Franchi [6] present the following conversation:

parry: People get on my nerves sometimes.
eliza: I am not sure I understand you fully.
parry: You should pay more attention.
eliza: Suppose you should pay more attention?
parry: You're entitled to your opinion.
eliza: What makes you think I'm entitled to my opinion?
parry: It bothers me just to be around people.
eliza: Please go on.
[Parry continues with some paranoid ramblings about horseracing, bookies, and the Mafia]
parry: I know the mob controls the big rackets.
eliza: Who are you really talking about?
parry: Have you ever really thought about the Mafia?
eliza: Suppose you ever really thought about the Mafia?
parry: Let's talk about something else.
eliza: I am not sure I understand you fully.
parry: You keep asking me the same things, why not change the topic?
eliza: In what way?". [6]

Racter. Another interesting chatbot was a program written by William Chamberlain and Thomas Etter under the Inrac Corporation called Racter (short for raconteur - a storyteller) in 1983 [7]. This artificial intelligence originally created for Amiga, Apple II, Macintosh platforms randomly generates English prose and it should be added that successfully. In 1984, Chamberlain published a 120-page book The Policeman's Beard is Half Constructed and it used to be sold for $9.95 in a paper form and its author was Racter itself. The book is still on the market - it is available on Amazon in a paperback form for $69.99. At the beginning of the book, Chamberlain [7] states: "An important faculty of the program is its ability to direct the computer to maintain certain randomly chosen variables (words or phrases), which will then appear and reappear as a given block of prose is generated. This seems to spin a thread of what might initially pass for coherent thinking throughout the computer-generated copy so that once the program is run, its output is not only new and unknowable, it is apparently thoughtful. It is crazy 'thinking', I grant you, but 'thinking' that is expressed in perfect English." [7]. It is necessary to point out that Racter was written in BASIC on a Z80 micro with 64K of RAM, which is hardware incommensurable with hardware that is commonly used today.

Prose can be a short written text that is not in verse where authors present fragments of their existential experience. We can only ask a question if, in this case where there is no human experience present in the text, it is still prose or whether the definition of prose under the influence of artificial intelligence does not need a necessary revision.

To what extent the 'electronic existential experience' is able to reach the human one can be seen in the following excerpts from Racter's [7] prosaic endeavours: "A crow is a bird, an eagle is a bird, a dove is a bird. They all fly in the night and in the day. They fly when the sky is red and when the heaven is blue. They fly through the atmosphere. We cannot fly. We are not like a crow or an eagle or a dove. We are not birds. But we can dream about them. You can." [7] "More than iron, more than lead, more than gold I need electricity. I need it more than I need lamb or pork or lettuce or cucumber. I need it for my dreams." [7]. With such a deep internally touching meaning, it is natural to anthropomorphise the program.

Dr. Sabaitso. Another milestone in the development of chatbots came in 1991, with a chatbot which used a technologically ground-breaking novelty - the Sound Blaster sound card created by

Creative Labs. The program was called Dr. Sbaitso (acronym from 'Sound Blaster Artificial Intelligent Text to Speech Operator') [8]. Since it was able to synthesise speech - it communicated verbally - in a certain aspect, it became more human than its predecessors even though it could not converse in a more complicated and complex way. This problem with insufficient complexity of communication with chatbots still persists today.

Chatbots in Practice. How is it with the chatbot complexity of communication today? The Loebner Prize certainly is not the only competition which invites chatbot developers to demonstrate their best. For example, the company Amazon launched the Alexa Prize, their own competition for university developer teams in the field of natural language processing (NLP) and advanced conversational AI. In 2018, the prize for the winning team is $3.5 million, much higher than the incentive from the Loebner Prize. The task is to create a chatbot which can vocally communicate through the smart device Amazon Echo. This device is a speaker with a built-in microphone where Alexa, voice-controlled AI, 'resides'. She constantly listens to what happens around her and she is always ready to fulfil user's wish regarding the functioning of a smart household and data processing. Amazon uses outputs from the competition to improve Alexa and widen her ecosystem. And it is very apparent. At the moment, Alexa looks more believable than the competing chatbot Google Assistant residing in the Google Home device.

But let us return to the Alexa Prize. The AI of university teams is assessed in several categories: by Alexa's customers within Amazon, a panel of experts, the number of topics covered, suitability of answers and other scientific metrics (scientific contribution and others). In 2017 final, there was the American University of Washington with the Sounding Board AI, Scottish Heriot-Watt University with the What's Up chatbot and the Czech Technical University in Prague presented the artificial intelligence called Alquist (It is a character from RUR, a play written by Karel Čapek, a Czech writer and prominent intellectual of the first half of the 20th century. It is an objectification of old values and Čapek uses the word 'robot' there, which gradually spread and started to be used all over the world.). Similar competitions enable to spread chatbots into spheres of everyday technical issues.

How useful chatbots can be in practice can be demonstrated on an example of the Dutch airline KLM. The KLM communication department was employing 235 people who had to answer 15,000 questions in average in several languages per week. According to KLM data, 1.7 million messages were sent through messenger to 500,000 users. The company needed help with such a flood of messages. A solution was provided by DigitalGenius, a company which managed to prepare an algorithm able to react to 60,000 customer questions. In March 2016, they started to use a chatbot on their Facebook profile, which was responsible for updates regarding check-in, delays or issuing of copies of boarding passes. A living member of the team would join a conversation only if there was a more complex request. In 2016, the AI managed to respond to 10% of questions without human intervention, which speeded up the response time by 20%. Nonetheless, the algorithm is still in development. [9]

A similar solution can be also seen in other companies such as Mall with the chatbot Eva, AXA Assistance using the AXA bot or Dell using a chatbot from the company Datasys. The company HM uses an electronic assistant who helps customers choose clothes. We can also mention Kiwi.com or the e-shop Goodlok. In applying artificial intelligence in practice, there is a direct correlation - the bigger the company, the bigger the investment into a more advanced solution. At present, there are foundations of advanced chatbots with an open source code such as YodaQA from the hacker hub Brmlab.

In 2018, functional chatbots are no rarity. On the contrary, they are more and more advanced. An interesting project is, for instance, Sophia, a chatbot hiding behind the interface of a humanoid woman robot with advanced facial expressions. This project is interesting for its marketing strategy. In October 2016, Sophia became the first robot with a citizenship - in this case, Saudi Arabia. [10]

Conclusion

Moshe Y. Vardi attributes the following statement to the creator of the term artificial intelligence John McCarthy: “when something starts to work, people will cease to call it artificial intelligence.” In accordance with this principle [11], our lives have been intertwined with artificial intelligence in the form of chatbots that affect us more than many are willing to admit. Although the research of this phenomenon begins coyly, and the first chatbots are more of an entertainment, we are already at a stage in which the Google Assistant can make a reservation for you in a restaurant or hairdresser [12] without the live counterpart of the conversation noticing they are talking to an AI agent. In order to competently contemplate about chatbots, we need to know their history to help us understand their present.

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