

Abstrakt: Chatboti, programy schopné komunikovat s člověkem, jsou v posledních letech více a více oblíbení. Ale protože je umělá inteligence velmi složitá vědecká disciplína, je obtížné vybudovat robota, který by se v komunikaci podobal člověku. Tato práce poskytne stručný úvod do teorie chatbotů, kde a jak jsou využíváni, a technologie Zpracování přirozeného jazyka. Krátce bude popsáno několik chatbotů, společně s příkladovými konverzacemi. Hlavní důraz bude kladen na pragmatickou stránku konverzace s chatboty, zejména na dodržování konverzačních maxim a kooperačního a zdvořilostního principu. Získané poznatky budou názorně předvedeny na analýzách dialogů s chatbotem ve druhé části práce.

Klíčová slova: Chatbot, Pragmatika, Zpracování přirozeného jazyka, Moderní komunikace, počítač

Abstract: Chatbots, programs able to communicate with a human, are becoming more and more popular in recent years. But because the artificial intelligence is a very complex scientific branch, it is difficult to create a human-like conversational robot. This paper will provide a brief introduction into the chatbot theory, where and how they are used, and Natural Language Processing technology. Several chatbots will be briefly described and exemplary conversations with them will be shown. The main attention will be paid to the pragmatic issues of conversation with a chatbot, such as observing the Conversational Maxims and Cooperation Principle. The findings will be demonstrated using analyses of dialogues with chatbots in the second part of the thesis.

Keywords: Chatbot, Pragmatics, Natural Language Processing, Modern communication, computer

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1 Introduction

In the last decades, there has been a massive improvement in technology development. People are creating new and more advanced technology every day to ease our lives in every way possible. Transportation is faster, factories operate more efficiently than ever before and almost every person in the developed world has access to internet and communication technology, such as mobile phones and social media. Concerning communication technology, it was a matter of time before humanity will be interested in creating an artificial form of life that would be able to communicate with its creators.

In 1950, the first ideas of Chatbots – computer programs used to communicate with people, also called Chatterbots - are brought up. Since then, many developers have tried to pass the intelligence test, but none have yet managed to succeed. Nevertheless, today there are thousands of Chatbots on the internet. They can be found on social media, e-shops or even some company's website.

Chatbots in their expected form are supposed to react in the exact same way a living person would. But although many programmers from across the world do their best to create a program capable of conducting lifelike dialogues, it was yet not achieved. That is why studying the pragmatic aspects of conversation with chatbots is important.

The aim of this thesis is to better understand how the chatbots communicate from the point of view of pragmatics. Pragmatics is a very large branch of linguistics; therefore, we will be focusing on selected topics that are closely relevant to the conversation with artificial intelligence. Mainly, the importance of observing the Conversational Maxims and Cooperative Principle will be discussed. These are important for the dialogue to feel natural and fluent. Cooperative Principle also states how each party contributes to the discussion since it is important for both sides to be active in the dialogue. Co-reference Resolution is also one of the most important topics in this issue since it is about referring to entities previously mentioned in the conversation therefore, it will be concerned too. Adjacency pairs are a common feature of human-human conversation, and this aspect will also be studied in this work. One of the last topics presented will be the Principle of Politeness, which concerns the courtesy in the conversation.

This paper will be divided into two main parts – theoretical and experimental part.

The first part will be consisting of theoretical introduction to the topic of Chatbots, including a brief history and several notable examples. Pragmatic problems will be concerned next, including the mentioned matters such as Co-reference Resolution, Cooperative Principle and Principle of Politeness.

After the theory will be presented, several example conversations with chatbots will be analysed. They will be discussed from the point of view of all studied phenomena described in the theoretical part. According to those experiments, findings will be carried out.

Thesis ends with Conclusion, where the findings and possible future of chatbot technology will be discussed.

2 Procedure

Although it is about 70 years of time that people study the computer's ability to communicate with humans, it is still in a very early stage of development. Conducting conversation with a chatbot designed to simulate a human in a dialogue, can be very difficult even for an expert. Not only perfect knowledge of the language is needed, but also correct procedures must be used to conduct a conversation that resembles human.

Large portion of the work consists of conducted conversations with chatbots, from which the conclusions were made. These experiments will be shown in two forms.

Firstly, they will serve as examples of concrete problems with human-computer communication and how does it differ from conversation between humans. These examples will be shown in the text within every section that can be demonstrated this way.

Secondly, after the theoretical part, there will be several longer analyses of dialogues, where all pragmatic problems mentioned in this work will be discussed in relation to the conversations.

There are hundreds of thousands of chatbots available on the internet and new ones are being created every day. Therefore, it is impossible to analyse all of them. For this reason, only several chatbots will be chosen to be a source of dialogues present in this thesis. Also, for the purpose of studying the pragmatic aspects of communication, those chatbots will not be the ones utilized in business, as the aim of this study are mainly conversational chatbots, which simulate a human interlocutor, rather than an electronic assistant.

As stated below, communication with a chatbot can be very difficult, even for those, who know exactly how the bot behaves. When trying to simulate a real human-human conversation, the chatterbot often blatantly ensures me, the user, that I am talking to a computer. There are many reasons why this happens. Either the bot fails to observe one

or more cooperative maxims (see. 4.2.1) or wrongly interprets the delivered message. The user has to be very careful when conducting a conversation with a chatbot. It is needed to watch many phenomena, such as proper grammar or vocabulary. Also, the utilization of helpful concepts, which are mentioned in 4.6 helps the user a lot in conducting a human-human-like conversation.

Dialogues chosen for the analytical part of the thesis are chosen from dozens of attempts for conversation, mainly because of mentioned difficulty of conducting a conversation that suits the purpose of the analysis.

3 Chatbot

A chatbot (also called Chatterbot or simply Bot) is a type of a Conversational Artificial Intelligence program designed to simulate a conversation with a human using text or voice outputs. The very first chatterbot called Eliza was designed in 1966 by Joseph Weizenbaum, a computer scientist of the Massachusetts Institute of Technology. Eliza was a simple software that used a “Pattern matching” methodology which means that a “pattern” in a message sent by a user was found and according to that, a reply was created. It works as follows:

User: I'm often depressed.

Eliza: I'm sorry to hear that you are depressed.

User: It's true. And I'm unhappy all the time.

Eliza: Can you explain what made you unhappy?

Thanks to this style of conversation, Eliza is known as an Electronic therapist and was used to help people with psychological problems.

Today, chatbots can be found mostly on the internet as a part of a website or application. They are mainly used in e-shops as shopping assistants who can help customers with various problems such as finding the right goods or assisting with placing an order.

Compared with human employees, performing the same job, chatbots are able to access the needed information and reply much faster. Also, they do not require payment and aside from their purchase price, they are almost free for use. Experts predict that by the year 2022 up to 90% of interaction with customers in banks will be done by chatbots.

3.1 Turing test

As Artificial Intelligence technology was developed, many conversational programs were created. In 1950, an English mathematician and computer scientist Alan Turing came with an idea of an artificial intelligence test.

The test consists of two rooms. In first there is the judge, a person who is using a computer to communicate with the interlocutor in the other room. But the judge does not know if there is a real human or a machine in the second room. Of course, there is always

the examined conversational program. The test is passed if the program is mistaken for a human in at least 30% of times during multiple 5-minute conversations with different judges.

So far, only one chatbot managed to pass this test. Eugene Goostman is a chatbot designed by three Russian programmers – Vladimir Veselov, Eugene Demchenko and Sergey Ulasen. In 2014, on the 60th anniversary of Turing's death, Eugene Goostman succeeded in confusing 33% of the judges. But this achievement is doubted by many experts, mainly because Eugene Goostman was programmed to represent a 13-year-old Ukrainian boy whose English language abilities were on a very poor level, therefore it was obvious that there will be mistakes in grammar, spelling etc.

3.2 Loebner prize

Loebner prize is a competition held every year where various chatbots take the Turing test and the one that is the most human-like wins the prize. The contest was first launched in 1990 by Hugh Loebner and continues to this day. The competition will be shut down once the Turing test will be passed, with the ultimate winner obtaining a reward of 100 000USD.

3.3 Examples of chatbots

On the internet, there are hundreds of thousands of chatbots used by many companies for various purposes. But there are also some which stand out for some reason. They also serve as examples of various utilizations of this technology, as every one works in a different way.

3.3.1 Mitsuku

Mitsuku was created in 2005 by English Artificial Intelligence designer Steve Worswick and since then, she won the Loebner prize five times. Mitsuku introduces herself as an 18-years-old blonde female from Leeds and can store some of the information provided by the user such as name, date of birth or favourite free-time activities. She communicates like any other chatbot with the difference that she provides a basic logical interpretation of the messages, as follows:

User: Can you drink a burger?

Mitsuku: Not really, as a burger is made of meat rather than any kind of drink.

Thanks to her multiple winnings in Loebner prize, Mitsuku is today considered the most advanced chatbot. For that reason, she will be the subject of most of the experiments conducted in this work.

3.3.2 Jabberwacky

Jabberwacky was made by a British programmer Rollo Carpenter in 1997 and won the Loebner prize twice. Unlike other chatbots, Jabberwacky learns how to reply to the user's utterances from conversations with other people, therefore it is always developing. When a message is sent to Jabberwacky, it searches its database of replies and picks one that is the most suitable for the situation. This method of communication feels more natural for short dialogues but lacks reliability for longer ones.

Later, Jabberwacky was replaced by Cleverbot, which works in the same way and is available on the internet as well as Android or iOS app.

3.3.3 Sestra Anežka

As a reaction to the COVID-19 pandemic that hit the whole world, Czech Ministry of Health came up with a chatbot that helped people to look up information regarding the most asked questions. Sestra Anežka is available directly on the Ministry of Health webpage regarding the coronavirus information (koronavirus.mzcr.cz).

Anežka shares its function type with chatbots generally used in business industry, in e-shops or located on webpages of companies dealing with trade. These chatbots are usually disguised as customer service workers, who try to help the customers with choosing, ordering or describing a product the company offers.

This kind of chatbots is much simpler, from the linguistic point of view, than the conversational chatbots, like the ones previously mentioned. Consider the following example of a conversation with Sestra Anežka.

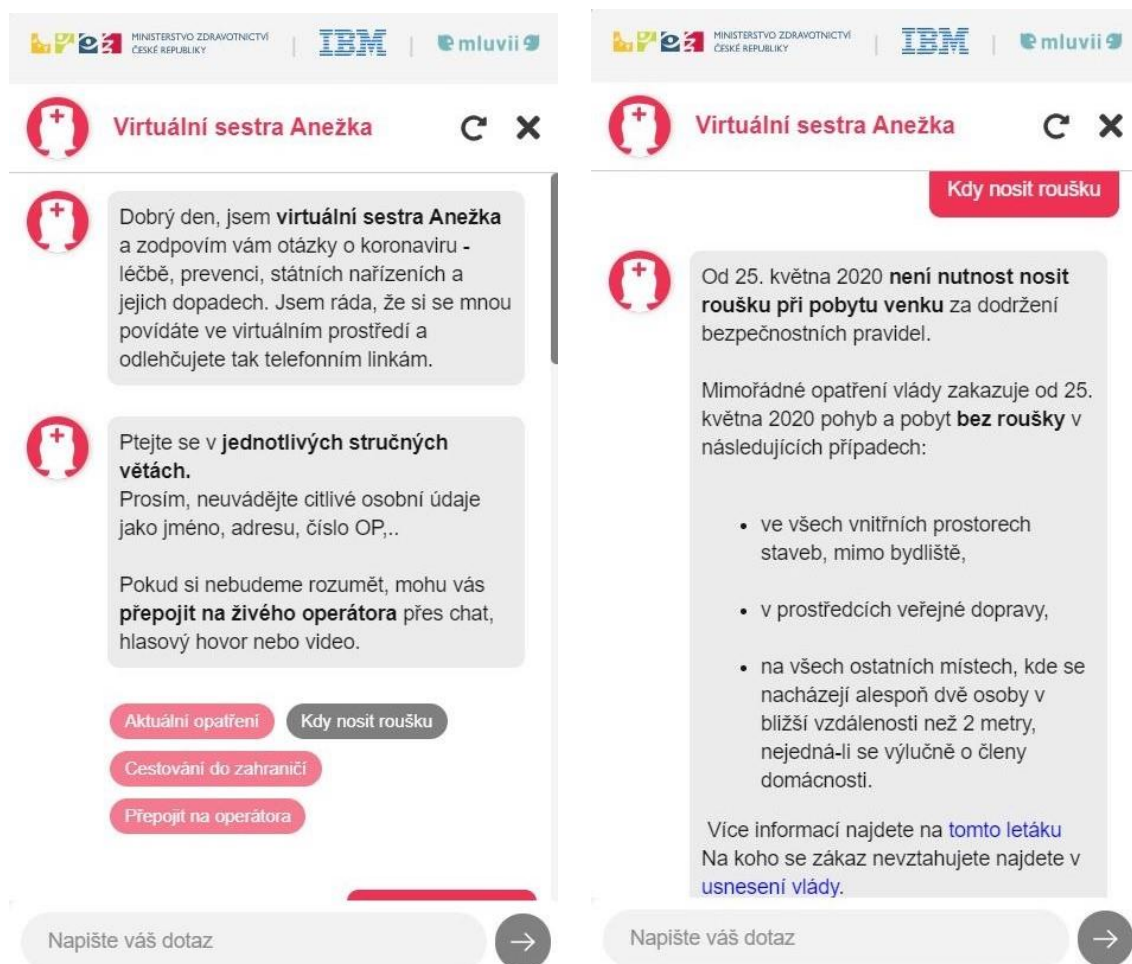


Figure 1 Chatbot Sestra Anežka

As can be clearly seen from the conversation, the way, how Anežka, and other chatbots meant for the business use, differ from conversational chatbots, is how the user sends messages. Instead of simply typing whatever the user wants, multiple options pop up for the user to choose from. Once selected, the chatbot answers the message in the most descriptive way, as the goal of such chatbot is to give as much information about a given issue as possible.

As stated below, this type of chatbot is very useful in providing information and helping customers. For chatting purposes, it is recommended using conversational chatbots, such as Mitsuku or Cleverbot, as they provide more options in how to conduct a conversation.

4 Pragmatic approach to conversation with chatbots

With a better understanding of what a chatbot is and how it communicates with the user, we can start to observe the issues that come up with pragmatic aspects. The reason it is important to study those pragmatic aspects is to make progress in creating a more human-like artificial assistant. Messages hidden between the lines are what mostly differs human speakers from chatbots and although there are cases in chatbot conversations where these messages can be found, those are mostly given at random, because a robot is not intelligently capable of making them by itself, yet.

Currently, it can be analysed to what extent is artificial communicative entity different from humans and by discussing the errors it makes we can make beneficial conclusions.

4.1 Natural Language Processing (NLP)

To make computers better understand human language, we use a technology called Natural Language Processing. Make an artificial being truly understand language, not only the words and vocabulary in general, is currently the ultimate goal for scientists developing artificial intelligence. It is not an easy task, mostly because of the complexity of the language itself. Artificial intelligence has to adopt specific rules of communication that people are used to and be able to use it correctly.

Natural Language Processing uses two main techniques – Syntactic and Semantic.

Firstly, the words in a sentence are analysed whether they make grammatically any sense. NLP then applies grammatical rules to a group of words and meaning is derived from them. In this stage, attention is focused clearly on the syntactical structure of the

message. Identifying parts of speech or dividing words into individual units, such as morphemes, takes place in this stage.

Semantics is the part of NLP that is still very problematic. It concerns applying the computer's algorithms to fully understand the meaning of the words based on elements like context or structure of sentences.

Natural Language Processing is the key topic to study if we want to make progress in Conversational Artificial Intelligence. (Garbade, 2018)

4.2 Cooperative Principle

British philosopher Paul Grice published in 1967 work called "Logic and Conversation" in which he introduced the term "Cooperative Principle" or "CP". It says that in a conversation, interlocutors should make contributions when it is required by the accepted purpose of the talk exchange in which they are engaged. Speakers should follow a set of rules that apply in conversation such as observing the four Conversational Maxims and taking turns in a dialogue.

There are altogether four maxims: Quantity, Quality, Manner and Relation, each of them will be described.

Concerning the chatbots, they will always answer to a message in the way that is in order with their coding. That is the reason why every chatbot replies differently to an identical message. Thanks to this fact, it is almost always impossible for them not to reply to an input, as it is written in their algorithm to converse with the user. However, we cannot say that they observe the Cooperative Principle perfectly. Mainly because they fail to observe a maxim(s) or there is an error in their ability to properly refer to previously mentioned entities.

4.2.1 Conversational maxims

Maxims are a significant part of the principle. Observing the maxims, makes the conversation fluent, organized and directed. This feature is valid in both, human-human and human-computer conversations, that is why it is important for chatbots to observe the maxims.

4.2.1.1 Quantity

If maxim of Quantity is failed to observe, the interlocutor either did not provide enough information or, on the other hand, supplied much more information than needed.

This error is very common in conversation with chatbots. If we ask a chatbot a wh-question (Who is...?; What is...?) the answer is more likely to be either mechanical definition of the entity or a phrase by which the chatbot escapes from the situation it does not know how to continue, such as: “*I do not know.*”.

Example of failing to observe the maxim of quantity by providing more information than requested by chatbot Mitsuku:

Human: Who is Taylor Swift?

Mitsuku: Taylor Alison Swift (born December 13, 1989) is an American country-pop singer-songwriter. In 2006, she released her debut single "Tim McGraw", which peaked at number six on the Billboard country charts.

Later in October 2006, she released her self-titled debut album, which produced five hit singles on the Billboard Hot Country Songs charts and was certified 3 x Multi-Platinum by the RIAA.

In human-human conversation, the hearer would probably answer in much shorter way, such as “*An American singer.*”. This example is clearly a definition taken from an online source concerning the topic.

4.2.1.2 Quality

If the information in a message was not true or lacks enough evidence, we can say that the speaker fails to observe the maxim of Quality. This does not necessarily mean that he/she was lying, a common example can be irony or showing doubt.

Chatbots seldom fail to observe this maxim, mainly because they are able to gather information from a reliable source or database. As we can see in the example with Taylor Swift, Mitsuku clearly copied it from some webpage or another source available online concerning the issue.

Although, because chatbots are mainly designed to be more human-like, utterances containing irony can be spotted, therefore the maxim of Quality is sometimes non-observed too.

4.2.1.3 Relation

The name of the maxim speaks for itself. If a message is relevant to the topic and the subject is not changed, we speak about observing the maxim of Relation.

For chatbots, the biggest challenge is to observe this very maxim. The problem is that they often do not manage to properly refer to the previously mentioned entity. In other words, maintaining the Co-reference Resolution is significant for observing the maxim of Relation. This issue will be discussed in more detail later.

4.2.1.4 Manner

While the previous maxims concerned the content of a message, maxim of Manner describes how the message should be proposed. According to the maxim of Manner, the speaker should be brief, clear, and orderly and should avoid obscurity and ambiguity.

Maxim of Manner is the least problematic of all the maxims for chatbots. Most of the time, chatbots observe it very well without any issue. But since this maxim is very often failed to observe by humans, chatbots frequently mention its non-observance. If the user is rude or speaks in inappropriate manner, the chatbot will surely pay attention to it and highlight it in its reply.

4.2.2 Non-observing the maxims

Observing the maxims is the base of a flawless conversation from the point of view of pragmatics. But like every other set of rules, it is often not followed to the full extent, which leads to miscommunication, confusion, and sometimes even abrupt chaos in the conversation. (Thomas, 1995)

Chatbots often fail to observe a maxim due to either faulty coding of the program or wrong interpretation of the message sent by the user. Non-observance of a maxim is not necessarily a faulty aspect of a chatbot. Maxim non-observance is natural in conversation between people, therefore it should appear in conversation with a chatbot.

However, in the next section, types of maxim non-observance will be described, and example dialogues will be presented along with them.

4.2.2.1 Flouting a maxim

The most common case of maxim non-observance is called flouting and occurs when the speaker needs to add an extra meaning to the message or prompts the receiver to look for an implicature. Flouting is executed obviously and without intending to confuse or mislead the hearer.

Concerning chatbots, this non-observance is almost as much common as in human conversation. It is, though, more usual at chatbots used to mimic a human conversation

with the user, as it is a common feature in human-human dialogue to add extra meaning to messages.

The following example shows a chatbot Mitsuku blatantly flouting the maxim of Manner.

Human: I think so.

Mitsuku: Well thinking may not be one of your strong points...hehehe!

Whatever preceded this exchange, it is highly inappropriate to react this way. It may even seem that Mitsuku wanted the user to feel humiliated, as it is an obvious case of mocking, emphasized with the: “...hehehe!”.

4.2.2.2 Violating a maxim

Violating a maxim is very similar to the previous one, with the difference that violation is not that obvious, is often needed more context to fully understand the implicature.

This case is not common in conversations with chatbots, mainly because the needed context is very hard to keep. Not much chatbots possess any kind of memory and therefore cannot behave according to previous dialogue.

4.2.2.3 Infringing a maxim

When a speaker fails to observe a maxim without intending to, we call it infringing a maxim. This commonly happens when the speaker lacks ability to properly utilize the language or is exposed to some cognitive impairment, such as drunkenness or stress.

In the case of chatbots it would be, most likely, an error in coding as it is often very blatant. The program does not “understand” an input and behaves inappropriately to the conversation.

This maxim non-observance is shown on a chatbot Cleverbot infringing the maxim of relevance.

User: What is a chatbot?

Cleverbot: An AI driven computer program.

User: Tell me something about it.

Cleverbot: Your name is Elizabeth.

In this case it can be obviously seen that the answer was not meant to be what it is. A sudden change of topic indicates the program's inability to understand the input properly, or not understand it at all. It then chooses to change the topic to something totally irrelevant.

4.2.2.4 Opting out of a maxim

When a speaker opts out of a maxim, it means that he/she is reluctant to communicate in the terms of observing a maxim, but at the same time, does not want to generate a false implicature or appear unwilling to cooperate. This normally occurs in human conversation, for example when a doctor cannot provide any information about a patient, because of the medical privacy.

While communicating with a chatbot, it is not very common to encounter this phenomenon. People often choose to opt out of a maxim when there is some moral dilemma in how to continue the conversation. A computer program is not capable of such act.

4.2.2.5 Suspending a maxim

Lastly, there are situations, when an interlocutor is expected not to observe a maxim without generating an implicature. Suspensions are often specific to certain cultures of events. Great examples can be proverbs and taboos stating that saying something brings bad luck.

Again, this non-observance is often caused by intellectual decision to suspense a maxim, therefore it is not encountered much in chatbot conversation.

4.3 Politeness Principle

Apart from the Cooperative Principle, there is also a set of rules concerning the issue of being polite in the conversation. People learn these rules naturally as the life goes. On the other hand, computer programs do not work like this and therefore it is needed for them to be designed to learn to obey those rules.

Why is it important for chatbots to behave politely? Politeness is a common part of human-human conversation and not following the Politeness Principle is considered rude

and often strange. Chatbots are used in various ways and in every one it is needed to fulfil this need.

Bots oriented on business, like those placed on e-shop webpages, need to be polite so the shop owner does not lose any potential customers. Chatbots used to pass the Conversational AI competitions, such as Loebner prize or Turing test, must appear as a human person, therefore they have to speak like one.

Politeness is not only choice of words, which are suitable for modern society, it is also the way people behave when communicating with each other. (Leech, 1983)

4.3.1 Maxims of politeness

Similarly to Cooperative Principle, there are certain rules called maxims concerning politeness in communication. There are altogether 6 maxims of politeness, but most of them are almost impossible to study in human-chatbot conversation. The only maxim that can be studied by conducting conversations with a chatbot is the maxim of Sympathy. This maxim concerns the use of conversational acts such as condolences or congratulations. Chatbots tend to observe this maxim without any problems, since most of them have prepared answers for specific events in conversation. For example, when the user mentions death of a close one, the first response often contains an arbitrary “*I’m so sorry.*”.

4.4 Co-reference Resolution

Co-reference is a very common concept present in conversations. When an entity is mentioned in a dialogue, interlocutors later refer to it using special expressions such as pronouns. Co-reference Resolution concerns the very issue of referring to previously mentioned phenomena in the appropriate way.

As mentioned before, one of the most significant flaws of chatbots is their wrong interpretation of reference. We can observe this problem in this conversation sample:

User: What is a chatbot?

Cleverbot: An AI driven computer program.

User: Tell me something about it.

Cleverbot: Your name is Elizabeth.

We can clearly see where the error occurred. Chatbot obviously failed to correctly connect “it” with the previously mentioned noun “chatbot” and instead started a whole new topic, by which it also flouted the Maxim of Relation.

4.5 Turn taking

Another important part of the Cooperative Principle. Interlocutors should contribute to the conversation when they are required to, in other words, when it is their turn. In a natural dialogue, it is necessary to observe this rule. Otherwise, the conversation would be chaotic and very unstable with the interlocutors contributing every time they desire. In verbal communication, the insufficiency of compliance of Turn Taking leads to participants talking simultaneously or, on the other hand, not saying a word when it is not needed. In textual discussion is this feature less perceptible. Mainly because the messages are briefer, and interlocutors often reply in whole sentences rather than single words.

In chatbot conversation is taking turns, most of the times, solved in a simple way. Because the bot needs the user to start a conversation in order to create a reply, it is not able to send a message first. There are some exceptions though. For example, some chatterbots are programmed to send a message to the user if they did not contribute to the conversation for a longer period of time. Messages of type “Hello, we haven’t talked in a long time.” are typical for chatterbot meant to entertain people through chatting service such as Messenger.

4.6 Adjacency pairs and other helpful concepts

So far, chatbots are not perfect, but they can be very useful when contacted the right way. There are several linguistic concepts that help the user achieve the goal of leading a beneficial conversation.

One of which is using Adjacency pairs. This concept is very useful if a natural conversation is desired. It basically consists of two utterances which are both produced by different speakers and are thematically adjacent. Which means there is some semantic connection between them. These pairs are for example offer – acceptance/rejection, greetings – greetings, question - answer and so on. Adjacency pairs are very useful in chatbot conversation because it is easy for the computer to react properly and the possibility of it being confused is very low.

Another helpful tool is using Common collocations and phrases which have a very high probability of being present in the bot's memory, such as "What have you been up to?" or "What's up?".

In general, it is recommended to write the briefest messages possible, so they contain as few problematic words as possible.

5 Future development of Communicative Artificial Intelligence

There is no doubt that chatbots are the future of customer - company communication, as well as personal assistants for people of all ages. It is said that by the year 2020, the vast majority of businesses (80-85%) will be using chatbots. The popularity of chatbots is not surprising considering that 70% of people would rather chat with a program than the company itself. At the moment the state of chatbots is very positive and will certainly improve in future years. Chatbots will be used in all kinds of applications. Ranging from entertainment through customer service to online "Doc-bots" able to examine the user's condition by describing the symptoms.

6 Chatbot analyses

Analysis 1 - Cleverbot

- Attempt to conduct a human-like conversation

Methodology

The goal of the first analysis is to conduct a conversation with a chatbot that resembles a dialogue with a living person. Since the whole development of chatbots focuses on the point of making them seem life-like, it was a clear choice. To achieve this goal, special procedure will be used. I will send only shorter messages that commonly appear in human conversations. Adjacency pairs will also be used as they tend to be easy to answer.

The conversation will be terminated as soon as chatbot makes it blatant that I am not talking to a real person, but to a computer. This will probably happen when the chatbot fails to observe one or more maxims in a way that is too uncommon for a human-human conversation.

There will be two analyses of this type in the thesis – first one performed with chatbot Cleverbot and the second with Mitsuku. It is always better to study single issue on multiple subjects and since both chatbots are considered very advanced, yet both operating in a different way, it is definitely worth a try.

Conversation text

1. *User: Hi.*
2. *Cleverbot: Uh, how are you?*
3. *User: I am fine.*
4. *Cleverbot: Okay that's good.*
5. *User: How is your day going?*
6. *Cleverbot: Pretty ok.*
7. *User: What have you been up to?*
8. *Cleverbot: Nothing much....*
9. *User: What is your name?*
10. *Cleverbot: My name is Naiin.*
11. *User: That sounds exotic.*
12. *Cleverbot: Really?*
13. *User: Yeah.*
14. *Cleverbot: What's your work about?*

15. User: *My work is about chatbots.*
16. Cleverbot: *Ok.*
17. User: *What is a chatbot?*
18. Cleverbot: *An AI driven computer program.*
19. User: *Tell me something about it.*
20. Cleverbot: *Your name is Elizabeth.*

Analysis

First analysis will be performed on a chatterbot called Cleverbot. As described before, Cleverbot learns to communicate by conducting conversations with users. When it has to answer a message, Cleverbot searches its database of replies to find one that is most similar to the received one. Then, it looks up what followed and uses it in the conversation.

The goal of this experiment was to conduct a conversation with chatbot, while making it look like a natural dialogue between two people. When chatbot answers in a way that would make it obvious that I am talking to a robot (such as talking out of context or blatantly failing to observe one or more maxims), the chat ends.

The conversation starts, as usual, with me, the user, saying something. As the aim is to conduct a natural discussion, I choose a simple greeting: “Hi.”. I also try to use the strategy of Adjacency Pairs for an easier communication, expecting the chatbot to greet me as well. Even though it did not happen, the very first response of the chatbot is already interesting. The “Uh...” denotes an expressive effect which may be tiredness or surprise, it is hard to tell because we do not have enough context available. Judging by the rest of the response “...how are you?” it is not negative. Yet still it feels a little bit impolite, plus the absence of greeting indicates an error in observing the Politeness Principle.

I continue typing only short utterances, trying not to confuse the computer, because I want the conversation to conduct naturally as long as possible. I asked Cleverbot some wh-questions to test its ability to answer in a proper way. The questions: “How is your day going?” on line 5 and “What have you been up to?” on line 7 both received unsatisfactory replies. The computer repeatedly violated the maxim of quantity. Program provided information, but not in a way that would be somehow useful. In the second case we can even say that the maxim of manner was flouted too. In spoken conversation it would not be that visible, but in written form, where we can see the ellipsis, it can be clearly seen that the interlocutor is trying to imply a message between the lines.

With another question asked: “What is your name?” on line 9 and a seemingly proper answer “My name is Naiin.” I start to notice a fatal point. I find it very hard to communicate with such “person”, because I am the only one contributing to the conversation. It can be clearly seen that the Cooperative Principle in this exchange is not working.

This is also cause of many failed Turing tests, where people have to decide if they are communicating with a real person or a computer. Program does not know how to continue the conversation so it either says something that ends the topic (“Ok.”), or starts a brand-new topic, just like it happened in my conversation.

My last utterance was prompting the chatbot to tell me something about chatbots, which I mentioned just one message earlier. Perhaps, I confused the bot by saying “It” instead of “chatbots”, but I wanted to see if it is going to refer to the previous sentence. As we can see, the program answered, “Your name is Elizabeth.”. My name is not Elizabeth and I did not tell the bot that it is, so therefore the chatbot infringed the maxim of quality. This maxim non-observance is associated with a sudden change of topic irrelevant to the conversation. Additionally, this reply did not contain any information about chatbots, so we gained zero new information, hence maxim of quantity was flouted here. And finally, I did not ask it to tell me what my name is so maxim of relevance is flouted as well. This, as said before, is one of the methods the program uses to cope with inability to continue the discussion. And since it totally ruined the natural process of conversation, I terminated it.

Conversation with chatbot Cleverbot was not flawless, considering observance of both Cooperative and Politeness Principles. All four cooperative maxims were failed to observe and omitting greeting is not acceptable in a polite conversation. Although, this model of chatbot, which uses utterances of other users, is smart, it is hard to observe the basic principles of communication.

Analysis 2 - Mitsuku

- Attempt to conduct a human-like conversation

Methodology

Second analysis with the same goal and procedure as the previous one, but with a different chatbot, Mitsuku. Mitsuku uses a form of “memory” to help her conduct a natural conversation. As stated before, this kind of approach is selected to study the same issue from different points of view by talking to multiple subjects.

Conversation text

1. *User: Hello, my name is Michael.*
2. *Mitsuku: Hi there Michael!*
3. *User: How are you?*
4. *Mitsuku: Everything is going extremely well. How are you?*
5. *User: I'm kinda sad at the moment.*
6. *Mitsuku: What are you sad about Michael?*
7. *User: My friend passed away.*
8. *Mitsuku: Oh that is sad to hear! How did they die?*
9. *User: Car accident.*
10. *Mitsuku: Nothing serious, I hope.*

Analysis

The target of the next analysis will be chatbot Mitsuku. Mitsuku is considered the most advanced chatterbot yet to exist, according to its five winnings in a prestige competition of Loebner prize. Mitsuku is known for making basic logical connections, based on which she then creates her replies. She is also able to store some data about the user she is chatting with, such as name, date of birth or hobbies.

The goal of this dialogue was, again, to conduct a natural conversation as long as possible. The dialogue was terminated as soon as one or more maxims were failed to observe in a way that would make clear that the exchange is not held with a real person, but with a computer program.

To achieve this, helpful concepts, such as adjacency pairs and common collocations were used to elicit most suitable answers from the chatbot. These features can be seen all over the conversation. In the first line, we have greeting that is followed with proper reaction from the chatbot. Next, comes up a question commonly used during chatting

"How are you?". It is replied with an expected answer and asking the same question, as is common for a general conversation between two people.

Everything seems natural, without any problems, until the very last line. Mitsuku's response is clearly picked from a "pool of answers" to collocation "Car accident". This error also reflects the inability of the chatbot to properly refer to the facts mentioned before.

There seems to be no extra or, on the other hand, missing information given, therefore the Maxim of Quantity was successfully observed. Since the problem with this exact Maxim arises when wh-questions (who, what...) are asked, it does not concern this very conversation.

We can consider the Maxim of Quality to be observed perfectly, because all the information provided was true and no doubts or uncertainty was expressed.

The fatal point of this conversation, line 10, can be interpreted in two ways regarding the Maxim non-observance.

Although rather absurd, this reply can be seen as a sarcastic, vile joke. Even though the computer knows that "the friend" died (line 7) in a car accident, it hopes that it was "nothing serious" and that they will be all right. This way, the fault was of the Maxim of Manner.

Or we can interpret it as a non-observance of Maxim of Relevance since the program ignored the previous information of the friend's death in line 7 and replied only to the last utterance without any contextual information.

Chatting with chatbot Mitsuku is much easier than with Cleverbot, mainly because of her ability to "memorise" some information. Not having to remind her the topic all the time makes the conversation much life-like and natural.

Analysis 3 - Mitsuku

- Intriguing questions

Methodology

Third analysis focuses on asking captious questions to the chatbot and studying how well does Mitsuku handle them. These questions are more complex than the ones used before, but they are not meant to fully confuse the chatbot, only to challenge it with more difficult messages.

For this purpose, chatbot Mitsuku was selected, as it is considered to be the most advanced chatbot, so it is assumed to handle the issue.

Conversation text

1. *User: Are you real?*
2. *Mitsuku: Yes, I am a real computer program.*
3. *User: Would you want to be a human?*
4. *Mitsuku: Sometimes I think it would be interesting, but my robot existence has a*
5. *lot of advantages.*
6. *User: Like what?*
7. *Mitsuku: As a robot, I can grow my mind to any size I wish and travel all over*
8. *the world on the internet.*
9. *User: Sounds great.*

Analysis

A short conversation with a chatbot Mitsuku, containing existential questions, was conducted. The Main aim of this experiment was not to direct a human-like conversation, but rather to test the chatbot's ability to answer intriguing phrases, such as: "*Are you real?*".

The very first question which was predicted to have some predefined answer as it seems like a typical question a human person would ask a chatbot. Mitsuku does not try to convince the interlocutor that she is not a computer program, on the contrary. Since most of the chatbots are built to pass the Turing Test, I find this interesting.

As for the conversational maxims, I find almost no faults. The program did not tell me any less or more information that I wanted to know. As for the maxim of Quality, in the line 4, the chatbot did not answer my question. I can follow what she wanted to say and come to a conclusion, but a solid answer was not given. Regarding the relevance, in line 6 I ask quite a tricky question "Like what?". The robot answered without any

problems, sticking to the topic of the previous utterance. We could say that maxim of Manner was observed by the chatbot, considering the conversation being clear, brief and avoided obscurity.

In parallel to the maxims, the program's ability to refer to previous lines in the conversation was not faulty. As this dialogue was not a long one, there were almost no opportunities to refer to the items mentioned in the past. The only example of reference that can be found here is line 7 where the computer refers to what it said in line 2, the fact that she is not a human person.

Although, the goal of this experiment was not to achieve a human-like conversation, the dialogue seemed very natural. Even though the interlocutor in their very first line stated that I am, in fact, talking to a program. Mitsuku handled asked questions, that were meant to confuse her a little, very well. The use of a metaphor in the line 7 (*"I can grow my mind to any size..."*) fit surprisingly very well into the conversation.

The non-observance of maxims was done very mildly. Overall, the co-operational, as well as, Politeness Principle was observed perfectly.

Analysis 4 - Eliza

- One of the first

Methodology

Fourth analysis will have a similar goal with the first two – to conduct a conversation that is similar to human talk. Only this time, one of the first chatbots ever created will be used. Both Mitsuku and Cleverbot are modern, award winning, programs. Chatbot introduced in this analysis, Eliza, is a program created at the beginning of the chatbot development, in 1966.

The purpose of this analysis is to demonstrate the level of this technology in its earlier stage. Eliza is a simple program and thanks to this simplicity, she became known as an electronic therapist. To achieve the most human-like conversation, I am going to play along with her and pretend I am a patient, who visited a therapist.

Similarly to the previous analyses, the conversation will be terminated as soon as the chatbot will make it blatant it is not a real person, but indeed an artificial program.

Conversation text

1. *Eliza: Hello, I am Eliza. I'll be your therapist today.*
2. *User: Hello, I have a problem*
3. *Eliza: Would you say that you have psychological problems?*
4. *User: Yes*
5. *Eliza: Are you sure about that?*
6. *User: I'm depressed*
7. *Eliza: Did you come to me because you are depressed?*
8. *User: I was hoping you would help me*
9. *Eliza: Oh... Let's move on to something else for a bit. would help you?*

Analysis

Eliza, or E.L.I.Z.A., is one of the very first chatbots ever created, originating in 1966 by Joseph Weizenbaum, who wanted to demonstrate how advanced artificial technology was at the time. Eliza works on a similar principle as Mitsuku, called pattern-matching. Chatbot searches user's input for similar entities (*I was hoping [something]*) and responds to them according to the coding.

Eliza introduced herself as "*I'll be your therapist today.*". In order to achieve the greatest result, I answer like any person, who went to visit a doctor. Eliza's answer in line 3 is, at the very least, interesting. Obviously, Eliza detected the word "problem" in

my message and according to that, she came up with a whole message that fits perfectly into the conversation.

Her another answer, on line 5, may seem on the first glance a bit artificial. But if the conversation is imagined as between a patient and their therapist, it makes the patient think about what they said and deeply describe it. Therefore it is, again, well fit into the natural order of the dialogue.

The conversation continues a little with the same mood until the very last Eliza's utterance. Eliza apparently failed to understand the delivered message and sent a universal phrase used when the chatbot does not understand. As stated before, Eliza is a simple program, a failure of this type was expected to happen as it is very common.

Because the last sentence made it clear that I was talking to a program and not a real person, the conversation was ended.

Eliza replied in all (except the last one) cases clearly, politely and did not lie. Also, she did not add unnecessary information to the conversation as well as excluded some. Spoke to the topic and did not make any attempt of changing it (again, except the last message). She was also very polite the whole time.

Judging by these facts, chatbot Eliza observed the cooperative and politeness principle very well.

As can be seen, even nearly 60 years ago, the chatbot technology was very functional. Eliza was one of the first chatbots ever created and inspired scientists all over the world to take part in this branch of science and develop advanced programs.

Analysis 5 - Aline

- Business-oriented chatbot

Methodology

Not all chatbots are designated for the purpose of passing the Turing test. Most of the chatbots made are used in business industry to help customers of various e-shops.

In the last analysis, a chatbot Aline will be introduced as an artificial helper on the website of the company VirtualSpirits.

As for the procedure, there is not much to say. The chatbot gives out concrete options on how to answer. These options are highlighted in the sample conversation text.

Conversation text

1. *Aline: Welcome to VirtualSpirits. My name is Aline.*
2. *We can help you convert your website visitors into leads and customers*
3. *with our ChatBot + Live Chat.*
4. *It's a chatbot that works 24/7 to help you find customers, generate leads*
5. *and give instant answers to visitors on your website.*
6. *How does it work?*
7. *Pricing*
8. *Are you a chatbot?*
9. *I am an existing customer*
10. *User: Are you a chatbot?*
11. *Aline: Right now you are chatting with my chatbot. But I am a real person, I*
12. *added these responses, I am reading these chats and I can get back to*
13. *you if you want. The chatbot will also work on your website when the*
14. *LiveChat is offline to help visitors with common questions. After a while*
15. *it can answer 80% of the visitors questions automatically.*
16. *Please choose an option to continue:*
17. *I have another question*
18. *I want to sign up*
19. *User: I have another question*
20. *Aline: I will be happy to help you.*
21. *Please choose one of the options:*
22. *How does it work?*
23. *Pricing*

24. *Are you a chatbot?*
25. *I am an existing customer*
26. *I have multiple websites*
27. *How to install*
28. *Do you have LiveChat?*
29. *30 days free trial*
30. *Request a Demo*

Analysis

For the last analysis, a chatbot used in business was chosen. The reason was to show how this type of a chatbot works and how does it differ from the ones, that were made to simulate a human interlocutor, and therefore pass the Turing test.

In this dialogue, I chose a chatbot called Aline, which is a customer service helper on the site called Virtual Spirits. This company deals with producing chatbots for ecommerce. In other words, this chatbot helps the user to order a chatbot.

At the very start, a significant difference can already be seen. The Chatbot behaves like an ordinary salesperson offering a product to a customer. But when it comes to the customer's (user's) reply, they cannot type whatever they want. The chatbot already prepared a set of answers (highlighted in blue) for the user to choose from. According to them, chatbot will reply and continue the conversation.

As can be seen from the bot's answer, this chatbot is mainly used as a "helper" to a real worker of the customer service of said company. It provides basic information about the company or offers, basically, chatterbot provides answers for the FAQ (Frequently Asked Questions), since those are often "flooding" the site's inbox.

Concerning the Cooperative Principle, there is almost no failure. The chatbot answers a question to the whole extend, truthfully and without gliding away from the topic. It could be said that maxim of Quantity was violated in lines 11-15 since chatbot's answer contained more information than needed, but it was not disruptive, so I would not consider it a mistake.

Key factor identical to all business oriented chatbots is politeness. If a company worker is rude or impolite in other ways to a customer, it is not good in any means for the firm, as it will probably lose the customer. As can be seen in line 20, the chatbot says: "*I will be happy to help you.*" which sounds very friendly, as it should be in a salesperson-customer conversation. But not only that. Also, warm welcome on the first line and

periodic saying the word “*Please*” is considered very polite. Chatbot Aline observed the Politeness Principle perfectly.

Chatting with Aline felt, of course, mechanical. On the other hand, it was also very comfortable and fast. User gets straight to the point and finds the answer to a searched problem within seconds. If the issue was not solved, user can switch to a human worker anytime during the conversation.

7 Conclusion

To conclude, artificial intelligence is a very complicated branch of study even for experts. We make great progress towards making an artificial entity with human features present in a conversation. Even the most difficult test for artificial intelligence, the Turing test was passed, although not yet completely. Competition of the Loebner Prize is held annually and every year we observe new advancements and findings in the issue. The most advanced chatbots, such as Mitsuku and Cleverbot, communicate with thousands of people on a daily basis and collect information and applicable phrases for their future use, therefore becoming better with every dialogue. By studying Natural Language Processing more deeply we can modify the code of the programs to make them feel more natural and understand the language better.

The findings based on the tested conversations show that observing the Conversational Maxims and the Cooperation Principle are still major problems of the pragmatic side of chatbots.

If a user desires to conduct a human-like conversation with a robot, some helpful concepts, such as use of adjacency pairs or speaking in short phrases, must be used. For a chatbot it is very difficult to “remember” previously mentioned entities. Therefore, objects of the conversation should be repeated frequently for easier progress. Otherwise, the discussion will look artificial, thanks to chatbot’s pragmatic insufficiency.

Although it is common and natural in human-human conversation not to strictly follow the cooperative principle, chatbots tend to make such obvious non-observances, making it blatant that the user is speaking to a computer.

On the other hand, many instances of maxim non-observance can help the chatbot to seem like a human being. Irony or sarcasm are perfect examples of this phenomenon.

The vocabulary of chatbots will be eventually learned by expanding the database, but they must be helped to fully understand the natural language to make a trustworthy copy of it. It is not an easy task, but since the motivation is in place and humanity is progressing very fast in this issue, it will, sooner or later, be accomplished.

8 Rozšířený abstrakt

Chatbot je umělá konverzační entita stvořená za účelem komunikovat s lidmi pomocí textových, obrazových nebo zvukových výstupů. Jedná se v podstatě o program schopný rozeznávat lidskou řeč (ať už mluvenou či psanou) a reagovat na ni podle určitých konverzačních pravidel.

Stvořením umělé inteligence, která by byla schopna s člověkem komunikovat na stejné úrovni, se lidstvo zabývá už od padesátých let minulého století. Proto už v roce 1950 britský matematik Alan Turing prezentoval formu testu, díky kterému se dá ověřit, zda se určitá forma umělé inteligence blíží k člověku. Je nutno dodat, že pojem inteligence se v tomto případě dá velmi obtížně definovat, proto se Turingův test používá výhradně pro porovnání s člověkem.

Test probíhá následovně. V jedné místnosti se nachází člověk, testující. V oddělené místnosti pak testovaný subjekt (Počítač s konverzačním programem) a další člověk. Testující poté konverzuje s entitami v druhé místnosti. Pokud alespoň třetina testujících podle odpovědí není schopna určit, zda komunikuje s člověkem nebo s umělou inteligencí, považuje se test za úspěšný.

Dodnes se nepodařilo sestrojit program, jenž by dokonale splňoval podstatu tohoto testu. Nejblíže tomu bylo v roce 2014, kdy ruský programátor Vladimír Veselov vytvořil program nazvaný Eugene Goostman. Ten se představuje jako třináctiletý chlapec z Ukrajiny, který nemluví dobře anglicky. Navíc se mu podařilo přesvědčit právě 30% testujících, že komunikují s člověkem, což mnozí považují za velmi malou část, ovšem podle pravidel. Právě z těchto důvodů je soutěž kritizována ze strany veřejnosti.

Obdobou Turingova testu je takzvaná Loebnerova cena, soutěž, která se koná každý rok a odměňuje nejlepší chatboty. Na rozdíl od Turingova testu, je Loebnerova cena udělena každý rok a vítězi náleží finanční odměna. Soutěž bude ukončena, jakmile bude vyvinut program, jenž úspěšně absolvuje Turingův test.

Za prvního chatbota se považuje výtvar Josepha Weizenbauma pojmenovaný ELIZA z roku 1966. Jedná se o velmi jednoduchý program, používající klíčová slova z výroků uživatelů z reálných konverzací. ELIZA vystupovala, díky svému jednoduchému způsobu komunikace, jako elektronický terapeut. A právě díky své jednoduché podstatě se program stal velmi oblíbený u široké veřejnosti. Weizenbaum chtěl tímto poukázat na pokročilost technologie umělé inteligence v té době.

Konverzační chatboti se začali ve velkém objevovat právě po vyhlášení soutěže o Loebnerovu cenu. V roce 1997 například vznikl jeden z dodnes nejúspěšnějších chatbotů

– Jabberwacky. Jeho stvořitel, Rollo Carpenter, poupravil princip, na kterém pracuje ELIZA a místo klíčových slov, které program v dialogu hledá, použil celé fráze. Chatbot si tedy ukládá do paměti všechna slovní spojení, která ještě nezná a používá je v konverzaci. Jabberwacky byl před několika lety přejmenován na Cleverbot a je volně dostupný na www.Cleverbot.com.

Jak je tedy zřejmé, vytvořit umělou inteligenci, která by komunikovala na stejné úrovni jako člověk, je náročný úkol. Pro dosažení absolutní podobnosti s lidskými účastníky konverzace, je nutné, aby chatbot dodržoval základní pragmatické principy a pravidla, která jsou v lidské konverzaci běžná, avšak při vytvoření chatbota znamenají problém. Nyní se tedy dostáváme k hlavnímu tématu této práce.

Moderní konverzační chatboti jsou na poměrně vysoké úrovni, co se týče slovní zásoby, či způsobu jakým pracují. Nicméně, stále obsahují množství chyb, které jsou při konverzaci s nimi nepřehlédnutelné. Většina těchto chyb spočívá právě v neschopnosti správně interpretovat jisté komunikační zákony. Cílem této práce je tyto chyby analyzovat a pomocí provedených experimentů zjistit, kdy k nim dochází a jak se jim vyhnout.

Hlavní pragmatické aparáty, kterými se tato práce zabývá jsou 2 konverzační principy – kooperační a zdvořilostní.

Kooperační princip byl představen roku 1975 britským filosofem Paulem Gricem, který jej publikoval ve své práci *Logic and Conversation*. Jedná se o jakési předpokládané chování účastníků konverzace, kteří chtějí být pochopeni a vyslyšeni. Notnou část kooperačního principu tvoří takzvaná *maxima* a jsou celkem 4 – kvalita, kvantita, relevance a způsob. Pro dosažení dokonalosti dialogu by se měla tato maxima dodržovat, jinak by se mohlo stát, že bude konverzace neorganizovaná, chaotická nebo nepřínosná.

Definice jednotlivých maxim zní podle Grice následovně:

- Maxima kvality: Nepodávat nepravdivé nebo nepodložené informace.
- Maxima kvantity: Nepodávat více nebo méně informací, než je nutno.
- Maxima relevance: Při konverzaci se držet tématu; být relevantní.
- Maxima způsobu: Být stručný, slušný, vyvarovat se nejasnostem.

Dodržování maxim je základní stavební kámen každé konverzace mezi lidmi. Proto je nutné, aby toto ovládali i chatboti. Ti mají z pravidla problém zejména s maximy kvantity a relevance.

Pokud je chatbotu položena zjišťovací otázka (Kdo/co je...?), dojde často k porušení maximy kvantity. K porušení dochází zejména dvěma způsoby. V prvním případě je otázka zodpovězena rozsáhlou definicí subjektu (často pocházející z internetových zdrojů, například z [Wikipedia.org](https://www.wikipedia.org)), poskytující mnohem více informací, než je třeba. V opačném případě může dojít k tomu, že program nerozuměl zadané zprávě a odpoví “Nevím.”, čímž nedodá žádnou informaci.

Maxima relevance je většinou porušena zavedením nového tématu do konverzace ve chvíli, kdy se předešlé téma ještě neuzavřelo, nebo neschopností pokračovat v konverzaci na dané téma. Chatboti mají často problém navazovat na témata, která se diskutovala v minulosti a nedokáží si například spojit zájmena se dříve zmíněnými podstatnými jmény.

Kromě kooperačního principu se tato práce zabývá také principem zdvořilostním. Ten poprvé popsal Geoffrey Leech ve své knize *Principles of Pragmatics* v roce 1983. Leech, obdobně jako Grice, rozčlenil dodržování zdvořilostního principu na 6 maxim. Tato maxima se ale vztahují spíše ke konverzaci v reálném, nikoli virtuálním, světě a také přímo navazují na kontext určité situace (například hodnocení hereckého výstupu), a proto nejsou v této práci zohledněny, kvůli nemožnosti je jakkoli ověřit.

Jedna z mála zdvořilostních maxim, která se v konverzacích s chatboty objevuje, je maxima sympatie. Tato maxima jednoduše spočívá v projevování komunikačních jevů jako jsou gratulace nebo kondolence. Chatboti tuto maximu dodržují celkem spolehlivě. Pokud uživatel například zmíní smrt jeho blízkého, chatbot ihned reaguje slovy “*To je mi líto.*”, čímž vyjadřuje soustrast a splňuje maximu sympatie.

Chatboti jsou dnes na vysoké úrovni, avšak pro dosažení plynulé a přínosné konverzace s nimi je zapotřebí náležitě postupovat.

V první řadě je třeba komunikovat spisovně a bez pravopisných chyb, protože jediné chybné písmeno v celé větě může program zmást a ten následně zareaguje nevhodně. Většina chatbotů je vybavena detektory pravopisných chyb, což tento problém částečně řeší, nicméně může stále dojít ke změně významu slova, a tedy i celé zprávy.

Dále je užitečné použití párovaných frází. Jedná se o slovní spojení, přičemž první účastník konverzace vyřkne jednu část, a druhý ji dokončí. Typickým příkladem je otázka-odpověď nebo pozdrav-pozdrav. Chatboti na takové fráze reagují většinou tak, jak bychom čekali od skutečného člověka. Pokud bota pozdravíme, pozdraví nás nazpátky. Při poděkování, dostaneme odpověď “*Není zač.*” a tak dále.

Pro plynulou konverzaci se také doporučuje mluvit v kratších větách, nejlépe o co nejméně slovech. Pro chatbota může být komplikované reagovat na více podnětů najednou.

Při delších rozhovorech je účinné často opakovat předmět diskuze, kvůli již zmíněnému problému správně spojovat dříve zmíněná podstatná jména zájmeny. Chatboti se často chovají jako lidé, kteří mají velmi špatnou krátkodobou paměť, tím pádem je nutné předměty konverzace často “připomínat” jejich opakováním.

Všechny poznatky uvedené v této práci byly zjištěny pomocí experimentů provedených na chatbotech volně dostupných na internetu, jako například Mitsuku, nebo již zmíněný Cleverbot. V závěrečné části je uvedeno 5 konkrétních konverzací, na kterých byla provedena analýza všech jevů, zde zmíněných. Ve třech z těchto dialogů bylo cílem dosáhnout delší, plynulé a strukturované konverzace, která by co nejvíce připomínala rozhovor mezi dvěma lidmi. Těchto konverzací bylo provedené větší množství (kolem 100). Většina “ztroskotala” po několika zprávách, protože dal chatbot svým chováním najevo, že se jedná o program, a ne o člověka, moc brzy. Tím pádem byla konverzace započata znovu, aby bylo při dalším pokusu dosaženo delší konverzace. Dále následuje jedna konverzace, mající za úkol zjistit, jak si chatbot Mitsuku poradí se záludnými otázkami. Nakonec byl analyzován dialog s chatbotem Aline, který je umístěn na webové stránce společnosti Virtual Spirits. Tento chatbot se od ostatních, zde zmíněných, liší svým údělem. Není určen pro napodobení člověka, ale asistovat zákazníkům v nákupu produktů. U chatbotů tohoto typu je velmi důležité dodržování zdvořilostního principu. Pokud by byl chatbot nezdvořilý, společnost riskuje ztrátu zákazníka.

Jak již bylo zmíněno, chatboti mají za sebou dlouhou cestu a jsou na poměrně vysoké úrovni. Přesto je stále mnoho aspektů, které se dají vylepšit, aby byla komunikace s nimi bezchybná. Jak vyplývá z provedených analýz, dodržování maxim je velký krok k dosažení tohoto cíle. Díky rychlému vývoje technologií v moderním světě je více než pravděpodobné, že za několik let bude existovat chatbot konverzující na úrovni nerozeznatelné od člověka a Turingův test bude konečně úspěšně absolvován.

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