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HUMAN-COMPUTER COMMUNICATION IN NATURAL LANGUAGES THROUGH NEW INTERFACES

Annotation. *The article provides an overview of new interfaces for human-computer communication based on natural languages. It explores the significance and advantages of these interfaces, such as SILK, virtual assistants, chatbots, voice user interfaces, language translation services, and natural language interfaces in applications. The article emphasizes the intuitive and user-friendly nature of natural language interfaces, allowing users to interact with computers using everyday language. It concludes by highlighting the importance of new interfaces in enhancing computer communication and expressing anticipation for further advancements in the field.*

Introduction. With the advancement of technology and progress in the field of artificial intelligence and natural language processing, there is a growing need to develop new interfaces for human-computer communication. One of the most promising directions is the use of natural languages for interacting with computer systems. In this article, we will explore new interfaces based on natural languages, their significance and advantages. Interfaces for human-computer communication have undergone significant evolution over the past decades. From early command-line interfaces and graphical user interfaces to new forms of communication based on natural languages, we observe a striving among software developers to make interactions with computers more intuitive and natural. With the advancement of natural language processing technologies, new possibilities have emerged for creating interfaces in natural languages. Machine learning and deep learning algorithms have played a crucial role in this development.

Results. A computer is a machine, not a biological entity. Like any technical device, a computer exchanges information with a human using a set of specific rules that are mandatory for both the machine and the human. These rules are called an interface – “a connection between two pieces of electronic equipment, or between a person and a computer” (*interface*, b. d.). The technology of human-computer communication depends on the interface.

There are several types of interfaces and the simplest one for humans is SILK which stands for *sketching interfaces like crazy*. This type of interface was created by James A. Landay (*SILK: Sketching Interfaces Like Crazy*, b. d.) and is the closest to natural, human-like communication. Within this interface, there is a regular conversation between a human and computer. In this process, the computer finds commands for itself by analyzing human language and identifying key phrases within it. Based on this, SILK is an interface that is most closely built upon natural languages. A prominent example of software with a graphical interface is the Microsoft Windows operating system. In the mid-1990s, with the emergence of inexpensive sound cards and widespread speech recognition technologies, the so-called *speech technology* appeared and was explored by scientists and practitioners (Wilpon & Roe, 1994). Thanks to this, machines were able to recognize any commands and could translate words into other languages (Воройский, 2022).

With the development of technology, many new interfaces for human-computer communication in natural languages have emerged. The most significant among them are the subject of our further discussion and analysis.

Virtual Assistants are software-based interfaces that can understand and respond to voice commands and queries in natural language. Examples include Siri/Google Assistant/Amazon Alexa/Microsoft Cortana (Hoy, 2018). There are some basic skills that most virtual assistants are expected to have: word processing skills, computer skills, strong communication skill, strong writing skills, strong management skills (Hawkins, 2019). Natural Language Virtual Assistants utilize various technologies and algorithms to process user queries and provide relevant information or perform tasks. They typically operate on cloud computing infrastructure and have access to large volumes of data to provide accurate and useful responses to inquiries. Virtual assistants can answer user questions by providing information about weather, news, sports, finance and other topics. They can assist users in performing various tasks such as creating reminders, setting timers, making to-do lists, sending messages and more. Virtual assistants can control home devices such as lighting, thermostats, smart speakers, and others, as well as manage applications on mobile devices. They can play music, tell jokes, conduct quizzes and other entertaining features. Virtual assistants can assist users with travel planning, ticket booking, hotel search, information about landmarks, and such more.

Chatbots. These are computer programs designed to simulate human conversation through text or voice interactions. They utilize natural language processing and artificial intelligence techniques to understand and respond to user inputs. Chatbots can be found in messaging apps, customer service platforms and websites. Chatbot can be categorized into various areas as per needs the area could be business, services, products, social reach, online reach or personal convenience (Mittal, 2019). *Natural language chatbots utilize natural language processing (NLP) and machine learning technologies to understand user questions and commands and provide relevant responses or information. They can operate based on predefined rules set by developers or employ machine learning algorithms to analyze and comprehend the context of user queries. Chatbots can be available on various platforms, including mobile devices and web interfaces, making them convenient for use anytime and anywhere. They can process queries instantly and provide accurate answers based on the available data. Chatbots can serve multiple users simultaneously and scale with increasing demand. They can also perform routine tasks and provide information without human intervention, allowing employees to focus on more complex tasks.*

Voice User Interfaces. These interfaces allow users to interact with computers or devices using spoken commands or queries. They rely on speech recognition technology to convert speech into text and then process the user's intent. Voice User Interfaces are commonly used in voice-controlled smart devices, automotive systems, and home automation systems. The main component of natural language voice user interfaces is automatic Speech Recognition (ASR) systems, which convert spoken speech into a textual form that the computer can understand. Then, NLP technologies are applied to understand the meaning of the message and extract relevant information. Users can communicate with the system in the same way they interact with other people, using their voice and natural language. Voice interfaces are particularly convenient in situations when users are busy or unable to interact with a device manually, such as while driving or using a smartphone. Voice commands can allow users to navigate through a system quickly, perform actions, and obtain information without the need to type text or use a touchscreen interface. Voice interfaces can be beneficial for users with limited abilities who find it difficult or impossible to use traditional interfaces. Examples of voice user interfaces include voice assistants on smartphones (such as Apple's Siri and Google Assistant), smart speakers (such as Amazon Echo with the built-in voice assistant Alexa), and voice control systems in cars. (Flanagan, 2013).

Language Translation Services enable users to input text or speech in one language and receive translation in real-time. They leverage machine translation algorithms and language

models to provide accurate translations. Examples include Google Translate, Microsoft Translator, DeepL and Yandex.Translate. There are several types of natural language translation interfaces. Text translation interfaces allow users to input text in one language and receive its translation in another language. They can be available as online services or embedded within translation applications and programs. Voice translation interfaces enable users to speak phrases or sentences in one language and then receive their translation in speech form in another language. They use speech recognition and synthesis technologies to process the input and output speech. Interactive translators interfaces combine the capabilities of text and voice translation, allowing users to interact with the system through text input, voice input, or both simultaneously. They usually provide real-time translation and can be available on various platforms, including mobile devices and web interfaces. (Contributor, b. d.).

Google Translate is an online translation tool, which translates text from one language to another. The tool can translate over 100 languages, including commonly spoken languages such as English, Spanish, French, and Mandarin. Google Translate provides users with the ability to translate text, web pages, an even spoken words and phrases. The tool uses artificial intelligence and machine learning algorithms to improve the accuracy of translations and simplify the translation process for users (James, 2023).

Even though communicating across the world has never been easier than it is today, having a live human translator to communicate with people speaking other languages is simply not feasible. Similar to the challenge of face to face communication, remote communication can also leverage Microsoft Translator to break down the language barrier (*Live and Remote Communication*, b. d.).

As to DeepL, it is a new machine translation engine launched in 2017, which uses deep learning and NMT to translate automatically from one language to another. The translations created by DeepL are more natural than those similar to it (Dressman & Sadler, 2020).

Natural Language Interfaces in Applications. Many applications now incorporate natural language interfaces to facilitate user interactions. These interfaces allow users to interact with the application using everyday language, making tasks more intuitive and user-friendly. Examples include voice-controlled search engines, language-based virtual keyboards, and intelligent personal assistants. These new interfaces have greatly enhanced the ability for humans to communicate with computers using natural languages, making interactions more seamless and user-friendly. Natural Language Interfaces (NLI) in applications provide the ability to interact with the application using ordinary language, similar to communicating with another person. They utilize NLP technologies to understand user queries and commands, and then provide appropriate responses and functionality. Examples of natural language interfaces in applications include chatbots, voice assistants and command-line interfaces.

Command-line interface. *The natural language command-line interface allows users to interact with an application by entering commands and instructions in natural language, rather than using a graphical user interface. It enables users to perform various operations, manage the application, and retrieve information using text-based commands. In a natural language command-line interface, users can use regular sentences or phrases to describe the desired action. Instead of clicking on a specific button in a graphical interface, users can simply write a command such as “Open file x” or “Create a new record.” The application, based on natural language processing algorithms, understands the command and executes the corresponding action. Natural language command-line interfaces are often used in technical applications and systems such as programming, server administration and data processing. They provide a more flexible and efficient way of interaction, especially for experienced users who are comfortable working with text-based commands (Max, 2010)*

Conclusion. The use of natural languages allows users to interact with computers in the same way they communicate with each other. This eliminates the need to learn complex

commands and specialized programming languages. Users can ask questions and perform commands using their natural language, making the interaction with the computer more intuitive and straightforward. Interfaces in natural language enable people with varying levels of technical literacy to use computer systems without unnecessary complexity. New interfaces play a crucial role in improving how people communicate with computers. As technology continues to advance, we can expect further innovations and improvements in this field.

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