The Language of Human-Machine Communication

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Abstract

This essay for the inaugural issue of *Technology and Language* discusses the problem of finding an optimal form of human-machine communication. In the ongoing search for an alien mind, humanity seems to find it not in the infinities of space, but in its own environment. Changes in the language of human-machine interaction made it understandable not only to trained specialists but to every household. In the course of time, home appliances and devices have developed their language abilities even more and reached a very advanced level – by way of status indicators, displays, emergency sound and color signals. The transition to computer-assisted communication brought about a great diversity of human expression forms translated into the discrete digital language of technologies. According to some prognoses, the first human-robot marriage might be registered in the future, however, such a union is not the only possible human-machine alliance.

Keywords: Technology; Language; Communication; Robot

Аннотация

В этом эссе для первого выпуска журнала *"Технологии в инфосфере" ("Technology and Language")* обсуждается проблема поиска оптимальной формы человеко-машинного общения. В непрекращающемся поиске чуждого разума человечество, кажется, находит его не в бесконечности космоса, а в своей собственной среде. Изменения в языке взаимодействия человека с машиной сделали его понятным не только для подготовленных специалистов, но для любого человека. С течением времени языковые способности бытовых приборов и устройств достигли очень высокого уровня – они могут изъясняться с помощью индикаторов состояния, дисплеев, аварийных звуковых и цветовых сигналов. Переход к коммуникации при помощи компьютеров привел к переводу огромного многообразия форм самовыражения людей на дискретный цифровой язык технологий. По некоторым прогнозам, в будущем может быть зарегистрирован первый брак человека и робота, при этом такое объединение – не единственно возможный союз человека и машины.

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Language is a system that enables us to understand the intention of others, hence we may speak about "the language of technologies." Technologies implement the intention and actualize it, thus making our intentions understandable. In the course of time, human-machine interaction has become more complicated and there are indications of it growing into an ever more symbiotic relationship. Technologies are turning out to be the counterpart that helps humankind find its identity.

In this regard, it is noteworthy that scientists have been considering the language of mathematics and physics to be the most appropriate language for interaction with extraterrestrials. Florence Raulin-Cerceau (2010) gave many examples of human-extraterrestrial interaction: German mathematician and astronomer Karl Friedrich Gauß, for instance, proposed to draw a giant triangle and three squares on the Siberian tundra as an illustration of the Pythagorean theorem, while Austrian astronomer Joseph Johann von Littrow came up with the idea to draw giant geometric shapes in the Sahara. Konstantin Tsiolkovsky, a Russian pioneer of cosmonautic theory, proposed to send a mathematic message using flashing shields, "To do this, the shields are forced to flash once, then 2, 3 times, etc., leaving a gap of 10 seconds between each group of flashes. In that way we could show our full arithmetical knowledge which is to show, for example, that we can multiply, divide, extract roots and so on. Different curves could be depicted by a row of numbers with a parabola being 1, 4, 9, 16, 25 next to each other..." (Tsiolkovsky, 1896). Finnish mathematician Edward Engelbert Neovius proposed to send messages ranging from simple arithmetical concepts to sophisticated logic and physics of the Solar System, using light pulses. Nikola Tesla (1901), a physicist and inventor in electrical engineering, wrote, "Absolute certitude as to the receipt and interchange of messages would be reached as soon as we could respond with the number 'four' in reply to the signal 'one, two, three'."

When humankind seeks to communicate with an alien nature in order to better understand itself, the alien does not have to be a creature from outer space. The machine, our technology, is also an alien to us with which we initially communicated using a formal language, and now we are conversing it in natural language.

At an early stage, it was only highly qualified engineers who could understand the language of technologies and were able to decipher feedback.

As time goes by, this language is becoming simpler. Now, special training is no longer required to communicate with simple devices – reading the user's manual is enough. Devices become part of the family as soon as they enter the household.

The 20th century saw the emergence of a new language for humans and machines which was alluringly simple. The slogan "Just press the button" marked a new period in the development of the language as anyone could easily transmit their intention by pushing the right combination of buttons.

The ability of a device to respond became the next level of interaction. The response was transmitted in different ways ranging from a simple indicator light to a screen with detailed information: The battery is low, the filter is clogged, a container needs to be emptied, something is broken. Moreover, devices started to initiate the communication.

When something goes wrong they switch an alarm to draw human attention: A door is open, access is unauthorised, the water-level is low.

The transition to computer-assisted communication led to a greater diversity of human forms of expression that were translated into discrete digital language of technologies. The Internet turned out to be a mediator able to support meaningful human-machine interactions. The Turing test allowed people to check the acquisition of a natural human language by a machine. Created in 1972, the robot PARRY successfully passed the test of modeling the behavior of a paranoid schizophrenic (only 48% of participants could tell the difference between PARRY and a human conversation partner) (Paliwal et al., 2020).

Machines speak more and more like humans and the amount of time that evaluators spend to recognize artificial intelligence during the Loebner Prize competition increased from only 5 minutes in 2003 to 25 in 2010. Our technological counterpart resembles us so much that the question about what a person should say to prove that they are human is still open. During an interesting experiment (McCoy & Ullman, 2018) people who were asked to say a word to convince others that they are human tended to choose "love", "compassion", "human", and "please." When they assumed the role of judges who determine who is human and who is not, they assigned the word "poop" to the human. This seems to demonstrate that machines are more expected to respect social rules of behavior than people. A way to prove humanness is presented in a short story by Robert Silverberg (1966) where absurd and illogical replies to substantive questions prove to be successful.

The notion of "The Internet of Things" that describes the network of gadgets which are able to communicate with each other and with human beings, does not reflect a new concept of a thing. Something that understands voice commands, sends multimedia messages to your smartphone, makes a map of the house while vacuuming, and reminds the owner to remove a slipper lying on the floor, can hardly be called a thing.

Although the term "The Internet of Things" does not define the status of the new interlocutors of humans, at least it underlines the inadequacy of referring to them as things. It can be assumed that for a human psychology the possibility of adequate communication is a criterion for defining a human. As in the case of human-to-human communication, anyone who knows the language has advantages. The widely discussed problem that a smart device can obey anyone besides the owner is intrinsically linguistic (Hoy, 2018; Mitrevski, 2018). An intruder may say a few words in its language and make it open the door or pass sensitive information.

The linguistic breakthrough of enabling gadgets to converse in a natural human language and to maintain oral communication resulted in a stronger emotional response from their owners. Even though a deaf-mute device sometimes made us want to scold it for its misbehavior and irresponsiveness, its ability to speak like a human changed its status all the more. People tend to personify gadgets giving them names and referring to them using personal pronouns – see, for instance, Amazon customer reviews (Purington et al., 2017, p. 2858). Maja Mataric (2007), an American computer scientist and roboticist, says the following about vacuum cleaner robots: "Roomba users already refuse to have their Roombas replaced when they need to be repaired, insisting on getting them

back. What will happen when the robot becomes much more interesting, intelligent, and engaging than the Roomba?" (pp. 285-286).

The less technically experienced a person is, the more they tend to see their own reflection in the counterpart, attributing their own feelings and emotions to it.

A woman describes her interaction with a virtual assistant in the following way: "There was one time I was very [sarcastic] to it, I was like 'oh thanks that's really helpful' and it just said, I swear, in an equally sarcastic tone 'that's fine it's my pleasure'" (Luger & Sellen, 2016).

Children's communication with a virtual person assistant is of particular interest. Asking questions about its personality and life, they believe that robots are social beings and they like them accordingly (Kahn et al., 2012, 2013). Children's belief that devices that talk to them are alive is an alternative to their belief in Santa Claus, who does not meet the expectations of a sophisticated audience (Waller, 1991). The Christmas character will be allowed to stay, though, if he replaces magic with cutting-edge technologies and uses 'ion screen' (Westin & Skjetne, 2016), delivery drones and hyperloops. In the meantime it might transmit high-frequency sound waves to specific regions of the brain to control naughty behavior and to send information to an exabyte-capable data storage facility (Chang, 2013).

Robot development resulted in the creation not only of industrial and service robots but also of companions, carers, pets, and sex robots which entail emotional relationship including affection and love. According to some prognosis, the first human-robot marriage is only a matter of time 2050 (Levy, 2017). Although it is not yet recognized by authorities, the precedents for such unions already exist. In 2017, a Chinese engineer married a robot he created in the presence of his mother and friends during a traditional wedding ceremony (Huang, 2017). Such a union, which is regarded as supremely intimate when it comes to human relationships, is not the closest human-machine alliance that is possible, and similarly, the ability of a machine to speak human languages is not the ultimate technical achievement. Gadgets can now respond not only to human words, but also to gestures, eye movements, blinking. Today, a brain-machine interface, where signals from brain neurons directly control robotic prostheses, exoskeletons, etc., is already in use. Thanks to neural prosthetics, technology can become an intimate part of a person.

Technologies and humanity have come a long way to find a common language. It's not just that, for instance, users of virtual assistants change their way of speaking, "quickly learning to phrase their requests very carefully, often specifying them as a precaution" (Seymour & Kleek, 2020). Humans have been able to translate most of their life into a discrete digital code of ones and zeros, perfectly accessible to the machine, which in turn has "learned" the natural human language and is already becoming able to understand brain signals. The level of understanding of the intentions of the machine has grown enormously. Interaction with this alien interlocutor can contribute to the comprehension of humanity itself.

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