Turing Test in Digital Age

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Abstract. Turing Test is discussed from modern point of view, taking into account the development of social networks, machine learning, big data, AI, etc. The notions of virtual object, virtual situation and virtual reality in this context are also considered.

Introduction

"Humankind cannot bear too much reality", wrote T.S. Eliot in "Burnt Norton", one of his famous "Four Quartets".

Nowadays most of our environments are mixed; they include some "digital" or "virtual" part – in this sense there is even less "pure" or "immediate" reality that has been meant by Eliot.

A lot of objects and persons in this "digital" world are not real as such. They are artificial constructs, combinations of programs, data, signals sent via various interfaces and interpreted by human user (consciously or unconsciously) as objects or persons.

Turing Test, in its original form [7], was suggested long before the importance of this "unreal reality" in everyday life has became obvious.

Turing could not take into account the experience that became available only in "digital age", with its social networks, virtual environments, robots, and more recently, AI.

Main aim of this note is to reassess critically Turing Test from the point of view of our "digital age".

Related questions concern definitions of "virtual objects" and "virtual reality", etc. This note develops some ideas of [1].

1.

Let us recall the original Turing Test. It has been based on a modification of a party game.

Turing wrote:

"It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex.

The interrogator stays in a room apart front the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman.

In order that tones of voice may not help the interrogator the answers should be written, or better still, typewritten. The ideal arrangement is to have a teleprinter communicating between the two rooms. Alternatively the question and answers can be repeated by an intermediary.

We now ask the question, "What will happen when a machine takes the part of A in this game?" Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original, "Can machines think?""[7]

Some assumptions are discussed by Turing – e.g., the condition that the communication channels are very limited. Some others are not mentioned at all.

One of them concerns the motivation of the players.

It is assumed implicitly that a "truly human" player is willing to play the game. It is not clear what "willing" does mean in case of computer program (a "non-stop" condition?), but more important is that if the participants may quit then the test will not work anymore. A computer may be programmed in such a way that it will quit the game as quickly and convincingly as a human being.

This possibility makes clearer another assumption. It seems that speaking about "machine" Turing does not have in his mind the concept of a database or training dataset, used in machine learning algorithms and, more recently, AI.

Remark 1. *To be precise, the Universal Turing Machine* [8] *is able to model any dataset processed algorithmically. However, it seems that in his rather informal description of his Test, Turing did not analyze the possibility to incorporate enormous quantities of practical information about human behavior into machine program. The construction of Universal Turing Machine is based on enumeration of concrete Turing Machine programs. Any switching from one concrete program to another defined algorithmically (in Turing's sense) corresponds to some program that is also included in enumeration. But change of program due to external signals (human players behavior; also inclusion of their behavior in training datasets), and/or due to some random process is a "gray area" (cf. discussions around so called "Church-Turing thesis" in mathematical and philosophical literature* [2, 3]*).*

Let us come back to the question of communication channels.

Consider the following example (a "strengthening" of the Turing test). An agent (human) plays chess with two opponents. One is a computer program. The communication is limited to the exchange of written moves. Obviously it is even more restrictive than Turing Test.

It is well known that modern chess programs may win even against world champions. They use extensively an archive of games (played by humans). It seems

that on the basis of such "dialogue" it is impossible to distinguish a (strong) human player from a (good) chess program.

2.

In relation to these remarks about Turing Test one may think about a more precise definition of virtual object and virtual reality based on Turing's ideas.

As in Turing Test one has to take into account the restrictions on communication channels. A virtual object can be compared with some real object only "modulo" these restrictions. E.g., it may be seen on the screen, the user may have goggles, gloves, various sensors, etc. For interactive communication a keyboard, joystick, microphone, camera, etc., may be used. The user may not think about existence of this "interface" but at some stage it was taken into account and accepted. In other words, a virtual object has to be compared with a real object considered through the same interface.

One may imagine a human agent who observes a certain object on the screen. It may be not known whether the object exists in physical reality or the image was synthesized by a program.

The agent may have certain means to interact with the object, usually in accord with certain "scenario". For example, according to this scenario the image may be transmitted by a video camera and he can "move" the camera, zoom it, and use remotely some manipulators.

This imaginary situation is very restrictive. However, in common virtual reality games or even in professional training programs one does not expect that all sensory channels are equally represented and have the same quality. One always accepts some convention.

Let us sketch several definitions (open to discussion).

Definition 1. *A virtual object is any source of communication signals which is indistinguishable from the real object with respect to a given (human) agent*[1]*, communication channels and the assumptions explicitly or implicitly accepted by the agent.*

Isolated virtual objects are seldom considered, usually they form complex structures. For example, the image of a human being may be included in the context that consists of some greenery, of his car behind, of a cloud on the sky. Some sound can be synthesized as well.

Definition 2. *A virtual situation is any source of communication signals which is indistinguishable from the real situation with respect to a given agent, communication channels and the assumptions explicitly or implicitly accepted by the agent.*

Definition 3. *Virtual reality is a structured set of virtual situations (including causality relations, etc.) bound by the restrictions and assumptions considered in previous definitions.*

[1] One may think about generalization to non-human "agents".

In these definitions we take into account the distinctions between agents. Thus, for example, the same object may be considered as a virtual object with respect to a "naïve" agent and not with respect to another whose attitude is more critical.

To our opinion these definitions conditioned explicitly by the restrictions on communication channels, assumptions and beliefs, will permit to work successfully with the notion of virtual reality in practically important cases, where one has to take into account all kinds of imperfections.

Conclusion

Turing Test makes sense only in relation to certain environment (real or virtual) and not as test for "thinking machines" in general.

References

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