

Turing Test: An Approach to Defining Machine Intelligence

Abu Sayeed Muhammad Saifullah

Student No. 101876890

Graduate Student

Computer Science

University of Windsor

E-mail: saiful1@uwindsor.ca

Professor: Dr. A. K. Aggarwal

Course: 60-520

Presentations and Tools

Nov 25, 2005

Contents

1	Introduction	1
2	The Imitation Game	2
3	Contradiction and Turings Replies	5
3.1	Theological Objection	5
3.2	Objection from Extra Sensory Perception	5
3.3	Heads in the Sand Objection	5
3.4	Mathematical Objection	6
3.5	Lady Lovelace Objection	6
4	Argumentations Against TT	7
4.1	The Chinese Room	7
4.2	Nordic Sea-Gull Test	7
4.3	Rocks that Imitate	8
4.4	The TT as Science Fiction	8
4.5	The TT Interpreted Inductively	9
5	Passing the Turing Test	10
6	Other Turing Tests	12
7	Conclusion	13
	Bibliography	15
A	My Conversation With George	16
B	Conversation of a Failed Program	17

List of Figures

2.1	Imitation Game: Stage 1	2
2.2	Imitation Game: Stage 2	3
2.3	Imitation Game	4

Abstract

The Turing Test(TT) was proposed by Alan Turing in his famous article "Computing Machinery and Intelligence" in 1950 in order to give an operational definition of intelligence. TT is one of the most disputed topics in artificial intelligence, philosophy of mind, and cognitive science. In this report I will discuss Turings ideas in detail and present the important comments that have been made on them. Within this context, behaviorism, consciousness, and similar topics in philosophy of mind will be discussed. I will also cover the sociological and psychological aspects of the Turing Test. At the same time I will focus on the current situation and analyze programs that have been developed with the aim of passing the Turing Test. I conclude that the Turing Test has been, and will continue to be, an influential as well as controversial topic of Artificial Intelligence.

Chapter 1

Introduction

In fact, Turing Test was never performed by Turing himself. TT appeared in the mid 70s, long after the mans suicide. Since then it has been discussed, attacked, and defended over and over. Some regard paperhis as the Beginning” of AI and TT as the ultimate goal of AI while at the other extreme some regard it as useless, and even harmful. In between are arguments on consciousness, behaviorism, the other minds problem, operational definitions of intelligence, necessary and sufficient conditions for intelligence-granting, and so on.

”What is intelligence?” or ”How can it be noticed or observed? ” has always been a large debate in the AI, Psychology, and Philosophy community. Some philosophers define intelligence as the use and manipulation of various symbol systems, such as those featured in mathematics or logic while others define intelligence as the presence of the feelings, creativity, personality, freedom, intuition, morality, and so on. For defining the intelligence in a machine, Artificial Intelligence gets classified in four dimensions like:

1. Acting Humanly
2. Thinking Humanly
3. Thinking Rationally
4. Acting Rationally

Turings aim is to provide a method to assess whether or not a machine can think. He states at the beginning of his paper that the question ”Can machines think?” is a highly ambiguous one. He attempts to transform this into a more concrete form by proposing what is called the Imitation Game (IG).

Chapter 2

The Imitation Game

The game is played with a man (A), a woman (B) and an interrogator (C) whose gender is unimportant. The interrogator stays in a room apart from A and B. The objective of the interrogator is to determine which of the other two is the woman while the objective of both the man and the woman is to convince the interrogator that he/she is the woman and the other is not. This situation is depicted in Figure 2.1.

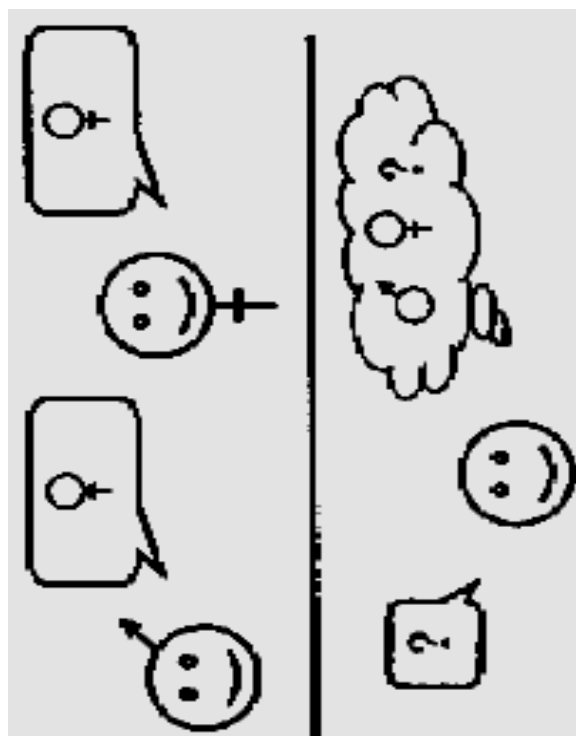


Figure 2.1: Imitation Game: Stage 1

The means through which the decision, the convincing, and the deception are to take

place is a teletype connection. Thus, the interrogator asks questions in written natural language and receives answers in written natural language. Questions can be on any subject imaginable, from mathematics to poetry, from the weather to chess.

According to Turing, the new agenda to be discussed, instead of the equivocal "Can machines think?", can be 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? [17]. Figure 2.2 depicts the new situation.

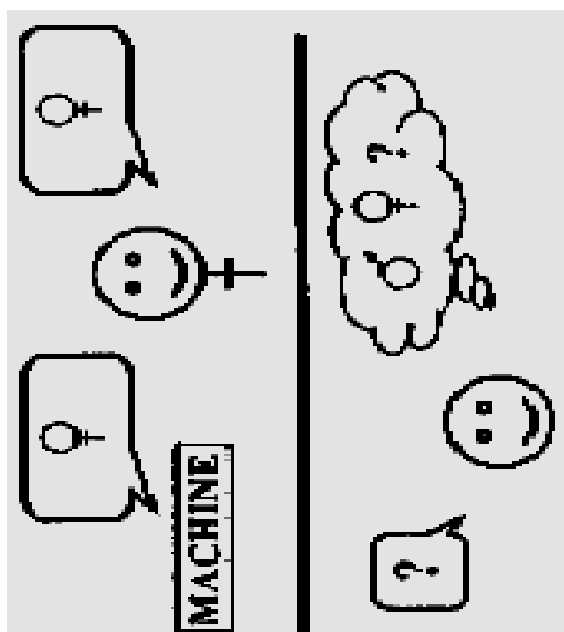


Figure 2.2: Imitation Game: Stage 2

The Turing Test, in the best form, has no gender issue. The interrogator asks questions to a machine and a human via a teletype. If the machine can fool the interrogator, it can be said that the machine has intelligence. The situation is depicted in figure 2.3.

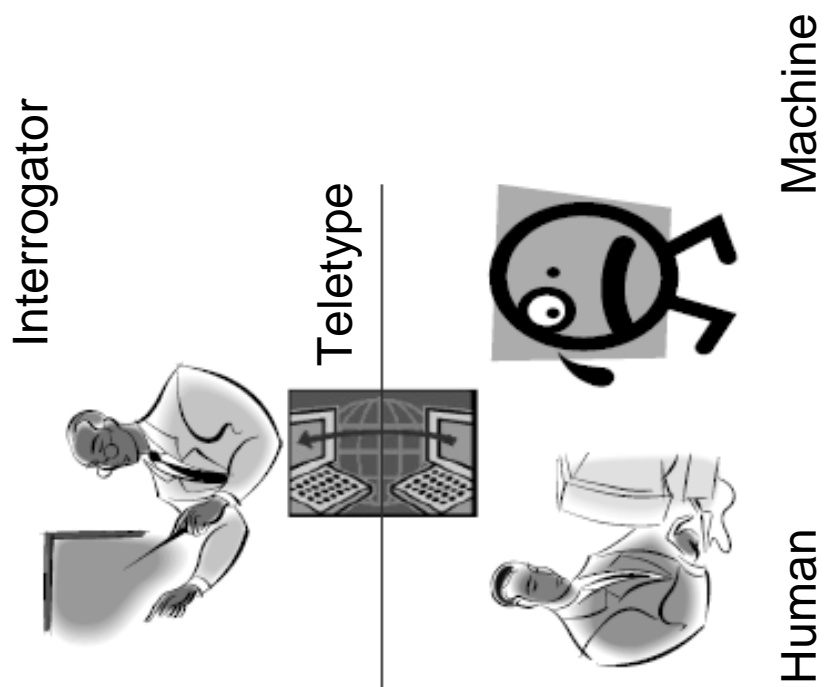


Figure 2.3: Imitation Game

Chapter 3

Contradiction and Turings Replies

Turing was aware that some of his ideas would be opposed at the time he proposed the test in [17] and he responded to some objections that he believed his work would be confronted with.

3.1 Theological Objection

Substance dualists believe that thinking is a function of a non-material that somehow combines with the body to make a person. Turing [17] answers to this by stating that making a body can never be sufficient to guarantee the presence of thought and digital computers are no different from any other merely material bodies in being utterly unable to think. If some one argues that human beings are made in God's image, Turing [17] simply says that God can make things (digital computers) in God's image also.

3.2 Objection from Extra Sensory Perception

If the human participant in the game was telepathic, then the interrogator could exploit this fact in order to determine the identity of the machine. For this, Turing proposes that the competitors should be housed in a telepathy-proof room.

3.3 Heads in the Sand Objection

Most people like to believe that humans are "special" and thinking is considered to be one of the most important traits that make us so. To some, the idea of sharing such a "human" ability with machines is not a pleasant thought. This outlook was probably

more widespread in Turings time than it is now. Turing believes that this argument is not even worth refutation, and with a little sarcasm, he states that consolation (perhaps in the transmigration of souls) is more appropriate [17].

3.4 Mathematical Objection

Godels Theorem shows that in consistent logical systems of sufficient power, we can formulate statements that cannot be proved or disproved within the system. Turing [17]states that although it is established that there are limitations to the powers of any particular machine, it has only been stated, without any sort of proof, that no such limitations apply to the human intellect

3.5 Lady Lovelace Objection

Lady Lovelace states that machines cannot originate anything, can never do anything new, can never surprise us. Turing replies by confessing that machines do take him by surprise quite often. Proponents of Lady Lovelaces objection can say that such surprises are due to some creative mental act on part, and reflect no credit on the machine. Turings answer to this is: The appreciation of something as surprising requires as much of a creative mental act whether the surprising event originates from a man, a book, a machine or anything else [17].

Chapter 4

Argumentations Against TT

4.1 The Chinese Room

TT was confronted by Searle [14] in 1980. The analysis of the Chinese Room can easily get out of hand since a great number of comments have been made on the issue and the debate still rages on. In a nutshell, here is what the Chinese Room looks like: Suppose that Searle, a native speaker of English who does not know a word of Chinese, is locked in a room. There is an opening in the room through which we may send in Chinese sentences on pieces of paper. In the room, Searle has a "Chinese Turing Test Crib Book" he can consult to find an output that corresponds to each Chinese symbol he receives. This system passes Turing Test without being intelligent. However the Chinese Room problem suffers from some flaws and limitations which were criticized by Anderson [1].

4.2 Nordic Sea-Gull Test

In [4], TT has been criticized by comparing it with the Sea-Gull test. It so happens that the only flying animals known to the inhabitants of a large Nordic island are seagulls. Everyone on the island acknowledges, of course, that seagulls can fly. One day the two resident philosophers on the island are overheard trying to pin down what "flying" is really all about. Says the first philosopher, "The essence of flying is to move through the air." "But you would hardly call this flying, would you?" replies the second, tossing a pebble from the beach out into the ocean. "Well then, perhaps it means to remain aloft for a certain amount of time." "But clouds and smoke and children's balloons remain aloft for a very long time. And I can certainly keep a kite in the air as long as I want on a windy day. It seems to me that there must be more to flying than merely staying aloft."

”Maybe it involves having wings and feathers.” ”Penguins have both, and we all know how well they fly . . .” And so on. Finally, they decide to settle the question by, in effect, avoiding it. They do this by first agreeing that the only examples of objects that they are absolutely certain can fly are the seagulls that populate their island. They do, however, agree that flight has something to do with being airborne and that physical features such as feathers, beaks, and hollow bones probably are superficial aspects of flight. On the basis of these assumptions and their knowledge of Alan Turing’s famous article about a test for intelligence, they hit upon the Seagull Test for flight. The Seagull Test is meant to be a very rigorous sufficient condition for flight. Henceforth, if someone says, ”I have invented a machine that can fly,” instead of attempting to apply any set of flight-defining criteria to the inventor’s machine, they will put it to the Seagull Test.

4.3 Rocks that Imitate

Keith Gunderson, in his 1964 *Mind* article [7], emphasizes two points: First, he believes that playing the IG successfully is an end that can be achieved through different means, in particular, without possessing intelligence. Secondly, he holds that thinking is a general concept and playing the IG is but one example of the things that intelligent entities do.

He criticizes TT by showing a game which is played between a man (A), a woman (B), and an interrogator (C). The interrogator’s aim is to distinguish between the man and the woman by the way his/her toe is stepped on. C stays in a room apart from the other two and cannot see or hear the toe-stepping counterparts. There is a small opening in the wall through which C can place his/her foot. The interrogator has to determine which one of the other two is the woman by the way in which his/her toe is stepped on. It’s crystal clear that when a rock box is constructed with an electric eye which operates across the opening in the wall so that it releases a rock which descends upon C’s toe whenever C puts his foot through A’s side of the opening, and thus comes to take the part of A in this game, the rock imitates a human being.

4.4 The TT as Science Fiction

Richard Purtill, in his 1971 *Mind* paper [12] also discusses some issues concerning the IG. Purtill criticizes some ideas in Turing’s paper mainly as a philosopher, but also as a person who has done a certain amount of computer programming. He believes that the game is interesting, but as a piece of science fiction. He finds it unimaginable that a computer

playing the IG will be built in the foreseeable future.

4.5 The TT Interpreted Inductively

Moor [10] disagrees with the idea that the TT is an operational definition of intelligence. Rather, he proposes, it should be regarded as a source of inductive evidence for the hypothesis that machines can think. Moreover, Moor does not agree with the claim that even if the TT is not an operational definition, it should at least be a necessary condition for granting computers intelligence.

Chapter 5

Passing the Turing Test

To pass the TT, a machine needs

1. Natural Language Processing: for communication
2. Knowledge Representation: to store information
3. Automated Reasoning: to use stored information
4. Machine Learning: to adapt to new situations.

The importance of naive psychology is also emphasized by many researchers because

- Without it the system would show an inability to perceive, recognise, and respond to human mental states.
- A system with alien intelligence could have no competence with human mental states
- There is no such thing as "intelligence in general" [4].

The Loebner Prize is the first, and only regular, competition based on the Turing Test, but in order to stage the competition various modifications to the original test have been made. The award program started since November 1991. In 1991, the winning program was *Romantic Conversation* by Joseph Weintraub. He won again in 1992 and 1993. The winning program by Thomas Whalen in 1994 is available for online chat (<http://debra.dgcr.crc.ca/chat/chat.html>). Joseph Weintraub regained his success on December 16, 1995. The details can be found at <http://www.loebner.net/Prizef/loebner-prize-1995>. The winning conversation of 1997 got off to a hot start:

PROGRAM: Did you see that story on CNN last night about the couple who came out at a White House party on Sunday?

JUDGE: NO. I just came in yesterday. I'm still kind of jet-lagged.

PROGRAM: Ellen Degeneres was one of them...

The Turing Test in 2005 was held in New York and the winner was the program George by Rollo Carpenter. The BBC news story is available at <http://news.bbc.co.uk/2/hi/technology/4263> George is available for chat at <http://www.jabberwacky.com/chat-george>. A part of my conversation with George is shown in appendix ??.

A part of conversation of a program during the Turing Test which did not pass TT is given in appendix ??.

Chapter 6

Other Turing Tests

The Turing Test is limited to communication via keyboard. This limitation is removed with Total Turing Test(TTT) proposed by Harnard [5]. In TTT, the computer is a robot that should look, act and communicate like a human. To pass the TTT, computer needs: Computer vision: to perceive objects Robotics: to move them about. He also proposed Total Total Turing Test(TTTT) [5] which is a Total Turing Test with neuromolecular indistinguishability. Harnad himself thought that if we ever have a system passing the Total Turing Test, all problems would be solved, the TTTT would not be needed. In Truly Total Turing Test(TRTTT)proposed by Paul Schweizer in 1998, robots as a race should be able to invent languages, build a society, achieve results in science.

Chapter 7

Conclusion

The imitation game proposed by Alan Turing provides a very powerful means of probing human-like cognition. But when the Test is actually used as a real test for intelligence, as certain philosophers propose, its very strength becomes a weakness. Turing invented the imitation game only as a novel way of looking at the question "Can machines think?". But it turns out to be so powerful that it is really asking: "Can machines think exactly like human beings?". As a real test for intelligence, the latter question is significantly less interesting than the former. The Turing Test provides a sufficient condition for human intelligence but does not address the more important issue of intelligence in general.

It can be concluded that challenging the Turing test is easy, but it doesn't necessarily move us forward in the right directions.

Bibliography

- [1] ANDERSON, D. Is the chinese room the real thing? *Philosophy* 62, 389–393.
- [2] BEDWORTH, J., AND NORWOOD, J. The turing test is dead . *Proceedings of the 3rd conference on Creativity and cognition* (October 1999).
- [3] EPSTEIN, R. G. Noah, the ark and the turing test. *ACM SIGCAS Computers and Society* 26, 2 (May 1996).
- [4] FRENCH, R. Subcognition and the limits of the turing test. *Mind* 99, 393 (1990), 5365.
- [5] HARNAD, S. Minds, machines and searle. *Journal of Experimental and Theoretical Artificial Intelligence* 1, 1 (1989), 525.
- [6] HARNAD, S. The turing test is not a trick: Turing indistinguishability is a scientific criterion. *SIGART Bulletin* 3, 4 (1992), 910.
- [7] K.GUNDERSON. The imitation game. *Mind* 73 (1964), 234245.
- [8] LARSSON, J. E. The turing test misunderstood. *ACM SIGART Bulletin* 4, 4 (October 1993).
- [9] MACINNES, W. J. Believability in multi-agent computer games: revisiting the turing test. *CHI 2004 extended abstracts on Human factors in computing systems* (April 2004).
- [10] MOOR, J. An analysis of the turing test. *Philosophical Studies* 30 (1976), 249257.
- [11] PERRY, L. D. S. The turing test. *Crossroads* 4, 4 (May 1998).
- [12] PURTILL, R. L. Beating the imitation game. *Mind* 80 (1971), 290294.

- [13] RUI, Y., AND LIU, Z. Artificial: automated reverse turing test using facial features. *Proceedings of the eleventh ACM international conference on Multimedia* (November 2003).
- [14] SEARLE, J. R. Minds, brains and programs. *Behavioral and Brain Sciences* 3 (1980), 417424.
- [15] SHIEBER, S. M. Lessons from a restricted turing test. *Communications of the ACM* 37, 6 (June 1994).
- [16] TINKHAM, N. L., AND PROVINE, D. F. The stage one turing test as an artificial intelligence class exercise. *ACM SIGCSE Bulletin* 26, 2 (June 1994).
- [17] TURING, A. M. Computing machinery and intelligence. *Mind* 59 (1950), 433–460.

Appendix A

My Conversation With George

George: are you ready to talk?

Me: yes

George: Where are you from:

Me: Can you tell me?

George: Yes

Me: please tell me.

George: You have some problem.

Me: whats your name?

G: George

Me: What does it mean?

G: I dont know.

Me: Can I take leave? I need to go.

G: Sure, Me too.

Appendix B

Conversation of a Failed Program

ENTRANT: Welcome judge

JUDGE: Hello. What's the weather outside?

ENTRANT: I haven't been outside much today. I am fond of asparagus myself.

JUDGE: How old are you?

ENTRANT: I'm about 30.

JUDGE: About?

ENTRANT: I can talk about Star Trek.

JUDGE: No let's talk about you. Exactly how old are you?

ENTRANT: Right you are batman.