

Reading Assignment 1

Computing Machinery and Intelligence

A. M. Turing, 1950

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I. DESCRIPTION OF THE STUDY

In this paper Alan Turing talks about the importance of a digital computer vs a human computer, asking a simple question "Can machines think?" He introduces several different takes on this question and how to best answer them. Turing also discusses and refutes some common objections on this subject, from mathematical ideologies to ESP. This question that Turing mentions is very significant for various reasons. It can help us learn the nature of these 'machines' or digital computers and develop an idea of how to properly get these machines to think on their own. Turing's main points of view are listed as follows:

- The imitation game should be played at the end of the century and then we will have satisfactory evidence.
- A thinking machine would need to have 10^9 binary digits to store and retrieve data
- To imitate an human mind we must consider three things
 - The state of mind at birth
 - The education that it has been subjected
 - The experiences that it has been subjected

II. CONTRARY VIEWS

Turing talks about the contrary views in this article where he tries to discuss and refute others opinions and arguments. He talked about 9 different ideologies in which he tries to respond to the argument that was presented.

1. Theological Objection:

In this argument the ability to think and an immortal soul is something that god gave only to man and women. Thus since only humans were granted this gift that no animal or machine could think. Turing trying to refute gave an example of how humans procreate to make children so humans creating a thinking machine much like a child is acceptable and does not take away from Gods power of creating souls.

2. 'Heads in the sand' Objection:

This objection is that a thinking machine would be too dangerous for humans and that the "consequences would be too dreadful." (Turing, 444) Turing does not even bother to refute this objection because he feels that the argument is not substantial to require it.

3. Mathematical Objection:

The mathematical objection states that there are always limitations for a discrete-state machine and according to Gödel's Theorem the results cannot be proved nor

disproved in the system itself. Turing acknowledges that there are limits but states that there is no proof yet but people who believe this objection will be willing to discuss the Imitation Game experiment.

4. Argument from Consciousness:

This argument states that emotions and thought are needed to form a machine that is as good as the human mind. According to this argument "Person A believes that A thinks B does not think and B believes that A does not think." (Turing, 446) However usually the argument can be resolved by having a conversation on how everyone thinks. Turing also states that these people would also be open to the Imitation game experiment.

5. Arguments from Various Disabilities:

The main argument for this objection is that machines may not be able to do a specific task. This is responded by Turing as he states that these are founded on the principle of scientific induction, which is we draw a general conclusion from what we have seen or experienced. He also expressed that limitations in machines occur because of the small storage capacity. When multiple machines are constructed for a single different purpose they are essentially useless.

6. Lady Lovelace's Objection:

Lady Lovelace wrote a memoir about Babbage's Analytical Engine, in which she states that it could only perform things that they knew how to implement. It could not originate or learn anything for itself it needed to be taught everything it could do. Turing then decides to quote Hartree who stated that it does not imply that it impossible for a machine to think for itself but also that machines that were created in that time had the property. Turing fully agrees with Hartree on this point. He implies that there is a possibility that we can construct electronic equipment that can think for itself.

7. Argument from Continuity in the Nervous System

This argument states that the nervous system cant be emulated by using a discrete-state system. Because the information that is being passed though a neuron could vary in size, and that outgoing impulse may make a large difference leading to a different action. Thus Turing stated that if the conditions of the imitation game were to be followed the machine would not be able to use the advantages of using a continuous machine. Therefore the discrete state system and the continuous machine would be equal.

8. Argument from Informality of Behavior

This argument says that there is no way of forming a rule set to describe exactly what a person should do in a situation. Turing states "If each man had a definite set of rules of conduct by which he regulated his life he would be no better than a machine." (Turing, 452) He goes on to say that there are two main ways a man lives, by laws of behavior and nature. If we find such laws using scientific observations then we would be able to properly construct a discrete-state machine which follows these laws.

9. Argument from Extrasensory Perception

The final argument that Turing discusses is that of Extrasensory perception or ESP. Machines can not do these kinds of ESP that which few humans are capable of. For Turing this argument is pretty strong but there are some scientific theories that are workable in practice. He suggests that during the Imitation Game Experiment that the test should be done in a telepathy-proof room.

III. LIMITATIONS

The main limitation of this article is that it is mostly theoretical. Turing stated that at the end of the century the technology would be there for us to actually test the hypothesis but no physical proof came from this study. The foundation for the thoughts behind this article were very solid having defined a digital computer and comparing it to a human computer, but advancements in technology can not be predicted extremely accurately, there could be some fluctuation. The store, execute and control method could become obsolete if a completely new architecture is created thus changing the whole basis for this article.

IV. SIGNIFICANCE

The main significance of this article is that it gives us a guideline of how to implement a thinking machine. By refuting common objections a layout or plan for a thinking machine to win the imitation game. The game serves as an experiment to find out how well a thinking machine can figure out which person is A or B given all the options. This is still all for research for now but the benefits of a thinking and learning machine are tremendous.

V. CONCLUSION

For most of this paper I agree with what Turing had to say. The ideology that a learning machine would have to be nurtured and taught like a child really peaked my interest. If one were to spend time growing and nurturing a machine why not spend time with a human child? What major benefits could a machine with the mind of a human possess. I feel the need to strongly disagree with the 'Head in the sand objection'. I believe that a machine raised by humans to think like a human would not cause harm, if they are properly trained. Overall I feel that the paper expressed the task of building a learning machine can not be underestimated. Building a mind that replicates the human brain is an extraordinary task but I believe it is possible and we will find out at the end of the century, when we play the Imitation game.

REFERENCES

- [1] Turing, Alan M. Computing Machinery and Intelligence. *Mind*, vol. 59, no. 236, Oct. 1950, pp. 433-460.