

Computing Machinery and Intelligence Writeup

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I. DESCRIPTION OF THE STUDY

The purpose of this research was to explore a thought experiment: does replacing a man in a game (in which visual clues are abstracted) with a machine result in an unbiased interrogator mistaking the device for a man a sufficient percentage of the times played?[1] This question is then elaborated upon in an effort to show the reader that while it may appear trivial to discern between man and machine, a sufficiently complex machine may emulate human thought very well.

This problem is significant because it provides an objective for scientists to reach in the quest for true artificial intelligence. Turing states that the game proposed (and the subsequent conclusion drawn from the thought experiment) sheds light on the ambiguous question of "Can machines think?"[1] The answer to this question is important because it allows us to think of machines in a different light and challenges our preconceptions regarding our interactions with machines moving forward in time. If a machine can emulate a human in a manner indistinguishable from humans, then who is to say that a machine cannot think?

The research question is: "Can machines think?"[1] This question is rather broad, so Turing breaks this down into the following sub-questions: "What will happen when a machine takes the part of A in this game?" and "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?"[1] While not explicitly stated, I infer that Turing's hypothesis regarding machine thinking is that machines cannot possess free will. Still, they can "imitate" it in such a way that an average human would not be able to distinguish between a machine and a human.

II. METHODS AND DESIGN

The rationale for the game is described in depth. A few details were skirted around, such as whether machines could carry out something that can be described as thinking but is not in line with the objective of the game, which is to imitate a man, to which Turing says that it does not matter since the machine was constructed to play the game properly.[1] I think that he did justify his design choices very well. He also does an adequate job of placing the human and machine on as equal footing as possible within the game.

The size and key characteristics are described as a Man, Woman, and Interrogator (3 people) are needed per trial.[1] A machine is also required that will do the "thinking," so a case could be made for 4 entities per trial. Turing does not give information about how many trials should be conducted, so a total sample size cannot be inferred. It can be inferred that the human participants should possess some experience/expertise

in tasks that the machine is able to perform in order to even the playing field.

Given that it is a theoretical experiment, specific measures to control representation across demographics are not described, so the samples used in the trials are not very representative of the population of men and women in the World (or the country in which the study is carried out).

The data would be collected as the machine is trained. The paper describes a possible process to prepare the machine before the game, such as using rewards and punishments and testing different training methods to help develop the machine. The specific data being collected would be benchmark statistics such as the time taken to achieve intellectual milestones, but specific methods and recording practices are left up to the scientists implementing this study "at the end of the century." [1] Once training is completed, the actual trials would start with the computer going through various play-throughs of the imitation game. For each trial, recording the results such as whether the interrogator was able to correctly identify which participant was a human and which was a machine. Supplementary data can also be recorded such as the specific questions that helped the interrogator arrive at the conclusions. This data would most likely be aggregated into a database for ease of searching and filtering. This is all to say that the data collection practices are not well defined due to the lack of implementation at the time of writing.

The study explored is not explicitly reliable or valid because it has not been attempted in the paper. The methods appear to be consistent and repeatable if they were implemented at least once. The paper did bring up the problem that ESP can pose, and to my knowledge, there is no "telepathy-proof room" that has been constructed.[1] Besides the roadblocks addressed by Turing, each step presented logically follows from the previous, and the individual trials are relatively simple and easy to conduct. The only part that seems rather tedious to repeat is the method of training the machine to play the game put forth by Turing.[1]

III. ANALYSIS

The primary data used to evaluate the method would be, as mentioned above, the results of each game: whether the machine was correctly identified by the interrogator. The data would be appropriate to evaluate the method because it provides both a valuable statistic and a record of how well the machine performs its intended task of playing the game. Simple arithmetic would be sufficient to judge the efficacy of the method. Whether the machine has a high win rate or not seems to be the best metric to use to analyze the results.

IV. RESULTS

Due to the theoretical nature of the paper, there are no results to report. Given an implementation of the method proposed by Turing, an accurate assessment could be made of the study.

V. LIMITATIONS

There are a great many limitations of this study. The main ones addressed by Turing are reduced to trivial ethics questions, such as the argument from consciousness. Another topic he does not address adequately in my eyes is found in the mathematical objection where Turing acknowledges that there exist some questions which will be answered wrong or that the machine cannot answer.[1] In the context of the game, this issue is said to not matter since Yes/No questions will be asked that do not elicit such a hangup. I believe that if this objection is brushed off as he is doing, then the solution/game that he proposes will not produce generalized results. While such a machine that can answer yes or no is a giant step in terms of machine thinking, it does not adequately solve the problem of "Can machines think" which was asked at the beginning of the paper.

VI. SIGNIFICANCE

This study contributes to the body of knowledge in that it proposes an objective for the community to work towards and provides insight into the methodology that can provide meaningful results toward the goal.

This paper helped guide the direction of further studies in the field of artificial intelligence and provided insights into different approaches to starting the journey that should be explored such as training on an abstract activity such as chess or just pouring money into sensory inputs.

How should the training stage be implemented? How can these "thinking machines" adapt to eventually answer critical questions (or at least halt at some point to say that they cannot answer the question)?

VII. CONCLUSION

This paper was very detailed on what Turing thinks would be the best approach to creating and testing a thinking machine. I think that he talked a lot about theology and ethics, which is important, but he often walked around issues rather than just saying what purpose his arguments have in the paper. The explanation of the game and why certain choices were made in its design were well explained. His ideas were ahead of his time and it shows where the machine learning field should be striving toward. In some respects, the community did (Deep Blue). He attempts to put his ideas into the perspective of outside readers, such as when he explains what storage capacity is and how computer instructions work.[1] I think that this was an influential piece of literature that made its mark on the minds of computer scientists for years. I also think that some of his statements fail to resonate with his audience today (especially the lines about the "Moslem" faith and the friendships between people of various races).[1] He said a lot of words where maybe fewer would have been better, but overall it was an informative read.

REFERENCES

- [1] Alan M Turing. Computing machinery and intelligence. In *Parsing the turing test*, pages 23–65. Springer, 2009.