**Multiagent Systems Assignment 1**

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**Topic**

Alan M. Turing, “Computing Machinery and Intelligence”, Mind 49: 433-460.

<https://www.csee.umbc.edu/courses/471/papers/turing.pdf>

**Task**

Read the paper and summarize it.

write down your thought about whether intelligence can be realized with (a) digital computer(s).

**Explanation**

**Summary**

In this passage, Turing asked the question “Can machines think?”. He pointed out that machines have the potential to show intelligence like human with certain possible approaches.

To clarify the target task, Turing defined the famous Turing Test, which is the ‘Imitation Game’ between the machine (“digital computers”) and humans, letting the third party human to distinguish the difference in their thinking ability. He also gives the basic definition of the machine (“digital computers”) involved: limitless storage, being universal machines that can replicate any other machine, and most importantly, with discrete, non-continuous states.

In addition, Turing argues that although there is certain mathematical proofs showing that discrete state machines are limited in answering questions, there is no prove showing that human are not limited by these restrictions. This means that there is no evidence of proving discrete state machines can not fully imitate human intelligence.

To achieve intelligence, Turing purposed the approach of designing the machines to simulate the human babies mind, since the machines have shown the possible capability of doing ‘conditioned reflex’ and ‘learn’. Then give these machines ‘education’ like human babies to make them achieve full general intelligence. In short, the intelligence of machines is decided by their capability of learning.

**Personal Opinion**

It was believed that the birth of strong artificial intelligence still needs decades before the coming of new trend of generative models (especially diffusion models) and large language models. However, the new situation truly inspired the world. Personally, I believe that human can realize the general artificial intelligence with the progress in both AI research and the increase in world’s computing power.

Compared to the former generative models which can only generate low quality results, diffusion models now can generate commercial grade artworks and voices and caused huge shock among the related industries. The combined and comprehensive purposed generation tasks are also been researched and taken down in a fast speed, which means they have the potential of generating audio-visual contents in all desired genres.

More Importantly, LLMs show the capability of inferring relations like human logic. As Turing’s prediction, this is the strong sign of possible intelligence [1].Compared to past language models, LLMs shows its difference and advantages in the ability of reasoning and making comprehensive of human knowledge. Even the LLMs are limited in language world and the interface of LLMs is limited to prompt words, they already can be involved in many human jobs because of this capability of comprehensive knowledge reasoning and understanding of natural languages of domain knowledge.

The vital next step is the to let LLMs/VLMs (or, large general models) to be related with physical world. Which means should expand the meta data of large models to physical and mathematic rules, 3d object relations and domain specific knowledge logics. Many recent research are focused on the embodied VLMs. For example, Designing VLM-embedded robot to perform certain physical world tasks [2]. However, as discussed before, maybe to enlarge the Input / output meta data category of large models is much important for the development from LLMs to the general intelligence. Presently, human is at the eve of strong artificial intelligence.

**Reference**

[1] A. M. TURING, I.—COMPUTING MACHINERY AND INTELLIGENCE, Mind, Volume LIX, Issue 236, October 1950, Pages 433–460, https://doi.org/10.1093/mind/LIX.236.433

[2] Brohan, Anthony, et al. "Rt-2: Vision-language-action models transfer web knowledge to robotic control." arXiv preprint arXiv:2307.15818 (2023).