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Final Report

The lectures on Turing machines given this semester best explain how the mind works. Essentially, a Turing machine comprises of a movable tape that has no end as we move it to the right, a state register, a table of state transition rules, a pencil with eraser, and some way to read the symbols on the tape. A Turing machine can compute the answers to most questions. A Turing machine does not actually exist, and is a concept invented by Alan Turing for use in theory of computation. There are two parts of the mind that work through a combination of logical reasoning, inferences given a set of contextual clues, and common sense.

Essentially, the mind is a computer, and the ideal mind could be described as a theoretical Turing machine. This person knows the answer to everything at anytime: either the person knows it from finding and reading information stored on the tape, or the person can compute the answer by deductions from the information stored on the tape. In other words, either this mind already knows everything and can retrieve the answer from its set of existing knowledge, or it can compute the answer based on what it knows.

For example, the person would either know the answer to 15 times 11 by having to memorize a 20x12 table. This person would have this knowledge readily available, and would retrieve the answer from their memorized table stored in their mind. As a , the person may only know the multiplication numbers up to 10, and the state transition rule that (x + 1)\*10 = x\*10 + 10 (more generally, (x+y)\*z = x\*z + y\*z ). Retrieving the value 150 from the table entry in row 15 and column 10, coupled with the rule that (x + 1)\*10 is equal to x\*10 + 10, the person can deduce that the answer to 15 times 11 is (15 times 10) + 15 = 150 + 15 = 165. As a third alternative, the person would not know any multiplication table, and only rules of multiplication and addition learned in elementary school. The person would take the two numbers 15 and 11, typically using a pencil and paper, and perform calculations of 15 times 11 using the rule for multiplication of two multi-digit numbers. Any of these methods of determining the answer to 15 times 11 is indicative of a properly functioning, or well-functioning, mind.

Note that we said nothing about time it takes for this perfect mind to find the answer. This comes with practice, but given the association of the Turing machine to a person’s mind, a person with a well-functioning mind may not need practice, and may figure out answers quickly. We also said nothing about how much tape a person would have available to figure out the answer. The person could bring a very large notebook of all knowledge they have everywhere they go. Doing this would require large amounts of energy. However, a person that is strong can carry this large notebook. Finally, the above assumes that the person would always come up with the right answer, without any flaws or errors, i.e., this person’s mind would be reliable. The person would have a good night’s sleep the night before, and be alert while doing calculations.

The other important part of the mind is that of common sense and context. Let us first consider context. Context can be associated with the precision of each of the states that are existent in the state transition table in the Turing machine. Suppose a person is with a group of 5 co-workers at restaurant where the expected tip is 15%, and that person takes responsibility for deciding the amount of tip the group needs to pay for the $110.0 meal. That person can calculate their tip by doing the calculation of 15 times 11 above, and then dividing the result by 0 to get the tip amount. However, a person may want to ensure others that this answer is in fact true, to avoid uneasiness among the group that they are not overpaying. To validate the answer, the person could ask another person to check their calculation, or the person could use a calculator to do the calculation, and show the answer to everyone.

Common sense can be thought of the breadth of applicability of rules in the state transition table of the Turing Machine. Common sense relies on general knowledge learned formally in school, and is better be described through real-world examples rather than the one contrived above. Suppose person see a lion in front of them. If the person has just paid to enter a zoo, and see a lion contained in a cage 100 feet away from them, that person’s mind will look at awe at it. If the person are sightseeing in the wilderness and see a lion 100 feet away from you, the person’s mind will take action would be to avoid making sudden movements, and slowly go back to your car. The state transition table of a human mind helps differentiate between the action needed to be taken when the person is in a zoo and the action needed to be taken when the person is in the wilderness.

A child reacting to a lion with fear rather than interest when seeing it in a zoo might be understandable. However, for an adult to react fearfully in a zoo would not. The reason is that an adult mind in today’s world is expected to have gained enough experience and contextual clues that a lion in a cage is not anything to be afraid of. The reasons for a child to be afraid is likely due to this state transition already built into the child’s mind through ancestors surviving in the wild, who had to run when an animal to maintain chances of survival. Essentially, the Turing machine state transition table of the mind grows as a human grows. Specifically, this state transition table grows either through past experience or through schooling where someone tells beforehand what a zoo may contain lions, and that animals in the zoo are in cages, which the animal will not (with high likelihood) be able to run out of to attack humans.

As another example, suppose you tell a joke which is not truly funny to the other person. If someone responds to your action by saying “that’s not funny” and laughs, that means that it wasn’t truly funny, but that it was funny because it was such a lame joke (and ultimately, they are having a good time). Your action should be to tell another joke, or share in their laughter. The other person may get confused and possibly if you said “I’m sorry” in a serious voice. If your friend or significant other says “That’s not funny” with a deadpan facial expression, that means a joke was offensive to them. Your action here should be to apologize quickly and sincerely, and respect the other person’s perspective, which you by mistake disregarded. In some cases, knowing how to respond to another person’s reactions can be taught in school. In most cases, this cannot be taught in school, but through experience. Generally, knowing exactly what to say may come through experience. This is an example of common sense, which requires some understanding of the context as well (and that most adults are expected to have).

The person with the perfect mind, the ability to make good contextual inferences, and with common sense, could be the most famous in the world. For example, Einstein was a physicist with a high IQ, and could have a mind close to the ideal Turing machine. He is important in society because of his contributions to theoretical relativity, and its high impact to many fields in science and engineering. However, Einstein didn’t solve problems purely by logic, without contextual inferences and common sense. His contributions were likely in part driven by nuclear weapon technology during this time, which were important for each country of the world to defend themselves, and more generally, important for large groups of people from different parts of the world each trying to protect themselves in the case of conflicts between them.

Ability to not get angry can’t be easily defined in a turing machine?

Computation structures - Turing machine.

Different modules. Ability to reason about social situation.

Common sense

Context -

bag blood in the car

who locks his keys in the car and spends the next hour wondering how to get his family out.

One part that I wish we’d spent even more time on than we did in the class was that of context. I’m still confused as to how common sense works.