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Turing Test for Organizational Intelligence

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Abstract

This article considers the popular perception of man's superiority to machine and the arguments for and against the possibility of thinking-machines.

The Turing Test is used as a basis for these discussions and the philosophical debates that surround the test and some of the implications that artificial intelligence may have for mankind are reviewed.

The paper also considers Turing's Test for artificial intelligence as a method for exploring the concept of organizational intelligence.

Introduction

The question "can machines think" has manifested and been popularised in many forms, from cybernetic creations such as Terminator, to Dr Who's Daleks and Hal in Arthur C Clarke's unforgettable '2001: A Space Odyssey'. All of these have presented man's inner fear of anything that is not of himself and each incarnation of the mechanical menace has been intent upon the destruction of man.

There are few apparent exceptions to this trend. Douglas Adams' paranoid android, Marvin, with a "brain the size of a planet" at first seems comical in his ability to at once make fiendishly complex calculations yet be unable to deal with his own apparently trivial problems and disorders. Further analysis however alludes to a deeper human problem, that our quest to know the answer to "life the universe and everything" may only result in misery, that knowing everything removes the basic desire to acquire further knowledge and therefore removes a base human motivation. Dr Who's mechanical canine companion K-9 also appears to be a super-intelligent and helpful aide. However, the social relationship of man to dog, with man as master, often becomes reversed as K-9's scripted witty retorts and logical observations show man's insecurity in the face of intelligent machines and reveal his fear of becoming dominated by them.
Even Star Trek's Commander Data manages to show man's inferiority complex. Despite being hugely intelligent and an accepted member of the crew, during his quest to become more human-like he becomes helpless when the Borg attempt to assimilate him into the collective by fitting his arm with a sheet of human skin. In this position Data is no longer the hyper-intelligent, logical machine but instead becomes man and, as man, also possesses his fragility and his weaknesses in the face of his cybernetic domineers.

There is a serious side to this discussion that Alan Turing first opened for debate when he asked the same question "can machines think" in his article in Mind, A Quarterly Review of Psychology and Philosophy in 1950 (Turing, 1950). Turing goes to great length to define what is meant by 'machines' and arrives at the term

'digital computers'. This was an important distinction at the time but is a phrase that will be comfortable for any modern user of desktop or laptop computers or the myriad array of other devices which contain a computer including washing machines, fridge freezers and alarm clocks.

The Turing Test For Intelligence

Turing proposes to determine whether a machine is intelligent by playing what he terms the "imitation game" (Turing, 1950, p433). This game involves three participants that are separated from one another, perhaps in different rooms, so that none can see or hear any other. One of these people is the 'interrogator' who may communicate with the other two by asking questions by means of a keyboard and may receive their typed responses on some form of visual display. The interrogator's task is to determine which of the other two participants is human or a computer.

Despite the simplicity of the game it has provoked much discussion, from concerns over the applicability of the discussion interface, to deep philosophical questions of the very meaning of intelligence. Indeed Turing was quick to challenge his own proposition and provides a number of refutations and counter-arguments for the possibility of having machines that think.

Firstly there is' *the theological argument'* which centres around whether a non-human could possess a soul – the soul being suggested as a necessity for thought and intelligence. Turing suggests that, by definition, any Creator is omnipotent and therefore capable of bestowing a soul upon any entity if he/she wished thus at least giving the concept of a thinking-machine the possibility of existence. Some would argue that this is a weak reasoning against the theological argument and somewhat akin to posing the question "*can a Creator create a stone that he/she could not lift?"* Any response to this question concludes that a Creator cannot exist. If he/she could not make a stone that could not be lifted then the Creator could not be said to be omnipotent; there would be a feasible object that the Creator could not create. Alternatively if he/she could create a stone that could not be lifted then also, he/she could not be said to be omnipotent; there would be an object that he/she would be unable to move by lifting. The central issue remains, that just because an omnipotent Creator *could* provide a thinking-machine with a soul does not necessarily mean that he/she *would,* especially if man had been created in the first instance in the Creator's own image.

The second argument entitled '*heads in the sand'* is that which the popular science-fiction literature commonly depicts, that man is somehow inherently superior to everything else and in demonstrating or feeling this way manages to maintain his "commanding position". Turing likens this argument to the theological argument and man's belief in his superiority over all other things, perhaps because man is often decreed to have been made in the Creator's image. He also suggests that this argument would be more likely to be upheld by intellectual people "since they value the power of thinking more highly than others" (Turing, 1950, p444). It could also be argued that intellectuals are in fact less likely to uphold this argument since their endless quest for knowledge, unlike Marvin The Paranoid Android's, is never ending

and they are humbled in the face of this insurmountable task: as Tao Le Ching said, "the more you know, the less you understand".

The *'mathematical objection'* cites complex mathematical theorems to place limits on the computational, and therefore on the thinking-powers, of machines. In short, there are logical conditions where it is supposed that machines will be unable to provide an answer. Humans though, are thought to not be subject to the same constraints and this is believed to be one area where 'digital machines' are unable to demonstrate a particular kind of intelligence. However, it has recently been shown that artificial intelligences are quite capable of logical error when provided with some form of memory and appear to mimic the behaviour of human children (Reilly and Robson, 2007). This development suggests that true artificial intelligences can exist even if they have to be less than perfect, just like us, in order for us to pronounce them 'intelligent'.

The *'argument from consciousness'* states that a machine could not feel or possess human emotions. Furthermore, that the only way to discern whether any machine did in fact possess an emotion would be *to be* that machine. The reader may take a moment here to consider whether he or she actually *needs to be* their wife, partner, mother or friend in order to determine that they are extremely annoyed that you have forgotten their birthday for the third year in a row!

'Arguments from various disabilities' suggest that machines could not display human characteristics such as love, taste or be able to think of itself as a conscious entity. Turing argues that this assertion primarily arises from man's experience of computers that have already existed. He suggests that limited storage capacity is one reason for such constraints. If this is true then we can expect machines to begin to display such characteristics or behaviours at some point in the not too distant future. In 1965 Moore's Law predicted that basic computing power will double every two years and this prediction has so far been surprisingly accurate. An extrapolation of this trend reveals that by the year 2020 a single silicone chip may be imprinted with one hundred billion transistors, a quantity that would be equivalent to the number of neurons in a human brain: would such a device then possess the same computational power and capability as a human brain? One also only needs to look at the range of technical model-building kits available for children to find models that are festooned with heat, light and touch sensors. Can we deny that even these simple models are really sensing and autonomously responding to these inputs?
Can we also deny that the range of sensory inputs that a human possesses are incredibly more varied, numerous and subtle compared to such electro-mechanical devices and consequently that a thinking-machine's responses will restricted by such limited variability: fundamentally, can a machine be truly aware of itself and its actions in ethical and moral senses as the argument from consciousness proposes?

'Lady Lovelace's objection' maintains that computers could be programmed or instructed to perform a vast array of tasks or functions but that they could never produce original thought. Turing questions whether any supposedly original human thought or creation is absolutely unique or whether it can be traced back to some prior instruction or suggestion from experience or from a teacher, just as the actions of a digital machine could be traced to its original programming or instruction. One could

argue that such a deterministic view of creativity ultimately results in the necessity for there to be a Creator of some form to provide a first thought or idea in man. Such a line of reasoning could refute any atheistic objections to the theological argument.

'Argument from continuity of the nervous system' portrays a fundamental mechanical difference between man and machines, that machines are configured such that they are either 'on' or 'off' but the human system is continuous and may be at an (almost) infinite number of states. Turing describes the process whereby a small difference in input to a human nerve may result in a disproportionately large output. Does such an argument require us to be very precise in our interrogation during the Turing Test, for, as humans, do we describe our feelings in such continuously variable states? Do we state that we are 33.33% happy and do we differentiate that state from being 45% happy? Or is it sufficient for us to be 'unhappy' or 'quite happy' and make more relativistic statements? For the purpose of Turing's imitation game, could a human interrogator discern the difference between a human and a computer that both described themselves as 'delighted', or, pragmatically speaking, is it even likely that a thinking machine would be constructed or instructed so that it responded to the question "how happy are you" with the reply "I am 62.5% happy" which is such an obviously non-human remark!

The *'argument of informality of behaviour'* predicts that it is not possible to describe a set of computational rules that can account for every set of circumstances that may arise in the real world. Turing gives the example of a set of traffic signals where a green light indicates 'go' and a red light means 'stop' and wonders how an artificial intelligence would react if both red and green lights were shown simultaneously. It is tempting at first to perhaps suggest that a general rule to 'seek least risk' is somehow also coded in the machine's instructions. This would also result in the decision to stop and this seems to be a rational behaviour which could be attributed to intelligence. However, 'seeking least risk' is not what humans do. Whilst many of us are risk averse there are some groups of people, such as entrepreneurs, that actively seek out risk (Kahneman and Lovallo, 1993; Caird, 1993). Consequently, it is difficult to see how a set of rules, however large in number, could conceivably suggest an appropriate action for every possible variation of situations in which we may find ourselves. Turing argues that just because it is beyond our capabilities at present to determine which laws or rules govern human existence does not necessarily mean that such rules do not exist, a refutation that is analogous to declaring "just because we haven't found fairies at the bottom of the garden does not mean they are not there!" However, adopting such a position means that anything is possible until it is observed whereupon it becomes true; conversely, just because it hasn't been observed does not mean that it is not true. For an atheistic objector to the theological argument this presents problems. It means that the existence of a Creator must be possible until such time that we meet him or her and are able to state categorically that the existence of the Creator is true; even if we never meet him or her the possibility of their existence cannot be disproved.

The entire argument also rests upon the supposition that such rules of conduct or behaviour are somehow embedded within us *a priori*. Undoubtedly many of our actions and responses to real-world situations are acquired socially, by observing the actions of others in similar or comparable situations. The acquisition of such rules *a posteriori* suggests that it would never be possible to encapsulate the entire set of

rules of conduct in a single individual. These rules would be continually adjusting and evolving, even appearing spontaneously in the same way that knowledge does when individuals interact with their environment (Kluge, Stein and Licht, 2001).

Finally the *'argument from extra-sensory perception'* posits that ESP could exists in humans and this may provide an invisible link between the interrogator and the human test subject thus invalidating any attempts to discern intelligent thought in the machine. However, the counter argument is disturbingly fascinating: if the machine was intelligent and ESP does exist in humans then there would be no reason why the machine would not possess ESP too!

Turing's work continues to be central to many discussions of artificial and computational intelligence. Ronald and Sipper (2000) ask whether a 'Turing Chatterbox' would be of any use to mankind. They paint the picture of a female patient being confronted either by a traditional human doctor or by a machine that scans and diagnoses her. Their question of whether despite the machine's expert capabilities "she cannot help feeling not only ill, but indeed ill at ease?" echoes the 'head in the sand' argument, highlighting man's fear of any non-human intelligence. They do however suggest that should such machine intelligence become a reality then it would naturally be accompanied by societal changes and attitudinal changes that result in its acceptance: they say that the human quality of trust would be forged between man and machine. For the present time it remains for us to speculate whether this mutual trust would in fact be arrived at amicably or would only appear after a period of man-machine confrontation.
Numerous websites are available for the casual reader to explore the Turing debates and implications of such proposed thinking machines - http://www.turing.org.uk provides a useful starting point – other more academically-minded souls may prefer to follow the literature reviews of the few articles that are referenced here.

The Test has been analysed and modified in many ways so reflect different perceptions of intelligence, considerations of what an intelligent machine could be capable and incapable of, and even how machines may possess memory functions that are analogous to humans (French, 2000; Dresner, 2003). So far though, the Test has not been able to provide us with a machine that can be considered intelligent despite numerous attempts in an annual competition - The Loebner Prize, www.loebner.net/Prizef/loebner-prize.html . Nor is it universally agreed that the Test is in fact a reliable or satisfactory test of machine intelligence.
Brackenbury and Ravin (2002) provide an interesting exploration of how the Turing Test could be used in furthering the practical value of six discrete artificial intelligence technologies. But perhaps French's own observation that "even in its original form, the Turing Test is already too hard and too anthropocentric for any machine that was not a physical, social and behavioural carbon copy of ourselves to actually pass it" (p331) hints that a novel approach is required.

Rather than consider how a test could be created that is non-anthropocentric, or how intelligence could exist in ways that are perhaps not related to human intelligence it may be more interesting to consider alternative environments or situations in which a Turing-type Test may be employed.

Organizational Intelligence

Much academic work is devoted to describing and understanding organizational learning and organizational knowledge (Tsoukas, 2001) and it has been shown that information technologies, or computing systems, are central to the ability of an organization to create and manage knowledge and thus become 'intelligent' (Zhu, Prietule and Hsu, 1997). There is however some debate over whether the organization is intelligent in the sense that a single human being is intelligent, or whether organizations are merely constructs within which intelligent individuals act (Mueller and Dyerson, 1999).
Perhaps this situation of ambiguity and uncertainty is one where the Turing Test could be employed? It is, after all, a test designed to indicate intelligence in computer-based systems or entities. Perhaps the arguments that have been presented by Turing and others that challenge the notion of computer intelligence would not be applicable to the use of the test in investigating organizational intelligence?

Is it likely that anyone would raise the *theological argument* and consider an organization that acts intelligently to have to possess a soul? Is it also likely that an intelligent organization would be expected to demonstrate any aspects of human-like intelligence? The notion of an organization that had a deep desire for ice-cream for example is not one that comes easily to the mind. Anyone that shares Turing's perspective though may posit that there is no reason why a truly intelligent organization, or any other conceivable intelligent entity, should not be capable of possessing a soul if a Creator desired it.

At this juncture it is necessary to end the discourse. However, the journey has hardly yet begun. The casual reader may wish to contemplate how Turing's arguments for and against thinking machines apply to other entities that may also be intelligent, such as, collections of individuals including organizations and larger communities, or they may even contemplate how we could determine if an alien entity was intelligent if it did not possess forms of communication that we possess such as speech, writing, touch or ESP. The academic reader, organizational expert or computer specialist may consider how the information system of an organization could be interrogated or interpreted in order to determine intelligence. To this end I offer the final food for thought.

We must return to the original format of the test to recall that it is a comparative test, that an interrogator is required to tell the difference between an intelligent entity and a non-intelligent entity. Whereas must of the organizational literature has focussed upon how or if organizations are intelligent, a Turing-like Test offers the opportunity to make a comparative analysis of organizational intelligence. By doing this the philosophical debate over what constitutes intelligence is nullified and we become more interested in whether a subject organization appears more intelligent than another subject: it is also allowable for both test subjects to be organizations so that we may assess their comparative intelligence.
Such a test is not dissimilar from many comparisons that organizations already employ to measure or benchmark themselves against competition. Numerous international and industry-specific measures of comparison exist covering

organizational characteristics from quality performance to financial performance to their attitude towards their employees. Where this test differs though is that it is administered independently, by an interrogator, and not self-administered as many existing measures are. Also, the Test would be performed upon the information system and not the employees that the organization comprises so that the response of the organization to environmental factors is measured in terms of changes in its information system intelligence rather than in changes in the attitude and opinion of employees.

In order that organizational intelligence comparisons are meaningful it would be necessary to devise an array of standardised questions or conditions to which organizational response is recorded or measured. At first the number of conditions to which an organization must respond may seem almost infinite, indeed any factor that could be categorised as Political, Environmental, Sociological, Technological, Legal, Environmental (PESTLE) or any factor that was an organizational Strength, Weakness, Opportunity or Threat (SWOT), could and should induce some intelligent reaction in an intelligent organization. This may seem an impossible number of factors with which to interrogate an organization.

Rather than attempting to replicate the myriad conditions and factors that affect an organization it is much easier to replace the question function of the interrogator with the business environment as it already exists. This has the further advantage of removing any argument that the organizational stimuli are in any way artificial. All that remains is to observe, measure and record the response of organizational information systems in response to those changing business conditions.

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