THE QUANTUM HUMAN COMPUTER (QHC) HYPOTHESIS

By

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ABSTRACT

This article attempts to suggest the existence of a human computer called Quantum Human Computer (QHC) on the basis of an analogy between human beings and computers. To date, there are two types of computers: Binary and Quantum. The former operates on the basis of binary logic where an object is said to exist in either of the two states of 1 and 0. The latter, however, operates on the basis of fuzzy logic where an object can exist in more than two states simultaneously. Through analogy, it is hypothesized that human beings are superb quantum computers that operate on the basis of human logic that accepts multiple states for objects simultaneously. Moreover, and since human beings are composed of physique, mind, memory, soul, and spirit, it is also hypothesized that the QHC legalizes the existence of objects in Hilbert space. Finally, it is further suggested that, as fictitious as it may seem, human learning can be reduced into a "suggestion model" whereby information is suggested into the human computer in much the same way as a given software is assembled on a digital computer; the paper proposes a model for human learning based on its description of the quantum human computer. It is claimed that human learning can be whole sale rather than being linear, sequential and time-consuming. Sleep and hypnosis are presented as examples.

Keywords: digital computer, quantum computer, QHC, qubit, bit, mind, cognition.

INTRODUCTION

If we ever try to imagine that an analogy can be drawn between the electronic computer and the human being and let this question to make you a brain child, start to care for it, nurture it, give it more room in our mind, and let it grow, are will soon realize that this thought begins to gather momentum, to gather size, and to gradually change into a Computational Learning Hypothesis.

Imagine for a moment that the human being, below the flesh and bone, is a computer system. This comparison is just for the readers' better understanding of how the hypothetical human computer works.

1. The physical computer

The modern electronic computer on our desk in front of us represents the culmination of decades of technological advancements beginning in late 18th and early 19th centuries with the seminal ideas of Charles Babbage and eventual creation in 1941 of the first computer by German engineer Konrad Zuse. As intriguing as it may seem, the present-day high speed modern computer is fundamentally not different from its gargantuan predecessors. The major difference is that modern computers have become more compact and considerably faster in performing their task; the task, however, remains the same: to manipulate and interpret an encoding of binary bits into a useful computational result.

1.1 The digital computer

An electronic computer processes information by first converting it into binary numbers (ones and zeros known as bits) and then using simple mathematics to either rearrange or to make decisions about those numbers. This seems to be quite easy, but there are two things essential to understand the basics of how a computer works. For one thing, a computer treats any type of information as if it consisted simply of binary ones and zeros; no matter whether that information consists of numbers, letters, words, dates, sounds, pictures or even videos. If we type the letter “A” into a computer keyboard the computer will instantly change that into a string of ones and zeros, something like 1000001. The logic behind this operation is that, once in binary form, this information can be stored and moved about more easily. The computer stores the "ones" as magnetized spots on its hard disc, and the "zeros" as unmagnetized spots.

Once information has been converted to ones and zeros, the computer can get to work. Here lies the second key to understanding how a computer works: All of a computer's functions are based on the movement and transformation of electrical pulses (representing ones and zeroes) in electrical circuits. These electrical circuits perform simple mathematical computations, such as adding or subtracting, on the zeros and ones. That is why the machine is called a "computer"; even though it is most frequently used for word processing, games, surfing the web, or other tasks that bear minimum or no similarity to mathematical computations.

A computer contains lots of these electrical circuits. Everything that a computer can do with information is done by using these circuits. They can make decisions about the zeros and ones, store them, display or process them, etc. For complex tasks, like finding, retrieving, displaying a web page, millions and millions of these circuits are used simultaneously. Yet everything the computer does is based on digital ones and zeros and the use of electrical circuits.

1.2 The quantum computer

A recent development is the quantum computer that employs qubits rather than bits. Quantum computers are not limited by the binary nature of the classical bits. Rather, they depend on observing the state of quantum bits or qubits that might represent a one or a zero, might represent a combination of the two, or might represent a number expressing that the state of the qubit is somewhere between 1 and 0.

In a quantum computer, the fundamental unit of information (called a quantum bit or qubit), is not binary but rather more quaternary in nature. The difference between a bit and a qubit lies in the number of states they can be in. A bit can only be in one of the two states of 0 or 1. A qubit, however, can exist in more than two states. It can exist not only in a state corresponding to the logical state 0 or 1 as in a classical bit, but also in states corresponding to a blend or superposition of these classical states. In other words, a qubit can exist as a zero, a one, or simultaneously as both 0 and 1, with a numerical coefficient representing the probability for each state. Since in everyday phenomena, as people perceive them, seem to be governed by classical physics, and not by quantum mechanics, the existence of a qubit may seem counterintuitive. Computer scientists have used experiments to explain this rather difficult concept. Consider figure 1. Here a light source emits a photon (a single quantized packet of light) along a path towards a half-silvered mirror (also known as beam splitter). This mirror splits the light, reflecting half vertically toward detector A and transmitting half toward detector B. Physics has it that, since a photon is a single quantized packet of light, it cannot be split; as such, it is to be detected with equal probability at either detector A or detector B. This means that if the photon is detected by detector A, it should not be simultaneously detected by detector B. In other words, if one detector registers a signal at a given time, then no other detector should register any signal at that time. The simple intuitive guess would, therefore, say that the photon randomly leaves the mirror in either the vertical or the horizontal direction.

With this piece of information, it may be considered that any given photon travels either vertically or horizontally, randomly choosing between the two paths. However, quantum mechanics predicts that the photon actually travels both paths simultaneously, collapsing down to one path only upon measurement. This phenomenon is known as single-particle interference. It can be better illustrated in a slightly more elaborate experiment similar to the one outlined in figure 2.

In an experiment like the one depicted in figure 2, the photon first encounters a beam splitter, then a fully

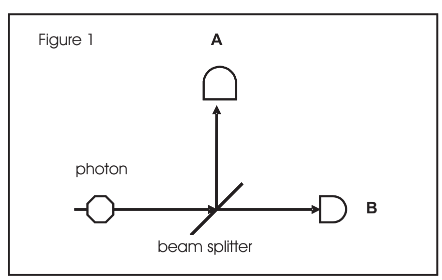

Figure 1. Qbit superposition in quantum computers

silvered mirror, and finally another beam splitter before reaching a detector, where each beam splitter introduces the probability of the photon traveling down one path or the other. Once a photon strikes the mirror along either of the two paths after the first beam splitter, the arrangement is identical to that in figure 1, and so one might hypothesize that the photon will reach either detector A or detector B with equal probability. This experiment, however, shows that in reality this arrangement causes detector A to register 100% of the time, and never at detector B. If, however, either of the paths (vertical or horizontal) are blocked with an absorbing screen, then detector B begins registering hits again just as in the first experiment depicted in Figure 1.

The only conceivable conclusion is therefore that the photon somehow traveled both paths simultaneously, creating an interference at the point of intersection (or beam splitter 2) that destroyed the possibility of the signal reaching B. This is known as quantum interference or single-particle interference. Therefore, although only a single photon is emitted, it appears as if another identical photon also exists which travels the 'path not taken,' and is only detectable by the interference it causes with the original photon when their paths come together again at beam splitter 2.

In theory, the quantum computer is based on the principles of quantum physics. According to quantum physics, a subatomic particle cannot be absolutely said to exist: It exhibits a statistical probability to exist in a particular place and time; more importantly, there is no way of knowing whether it is there or not until you observe it. It is only at this point that all the probabilities collapse down into a definite state. This very fact has led many quantum physicists to claim that it both exists and does not exist until it is observed, whereby the observer sets a particular observed state into concrete existence.

2. The human computer

Now it is time to venture into the world of science fiction to present an abstract model for a hypothetical Quantum Human Computer.

If the Quantum Human Computer (QHC) operates on the basis of a large number of circuits similar to the one depicted in Figure 3 above. The hypothetical QHC possesses an optimal hardware architecture that performs billions of computations in no time. Sense or logic units (i.e., mental bits or m-bits) are fed into the circuit. Sense units arrive into the circuit from outside via the five human sense modalities; logic units, on the other hand, are fed into the circuit from inside (say, from thought resources, memory, or mind). They are then intercepted by a sense/logic distributer (e.g., hypothalamus) that redirects and distributes them along millions of gateways (e.g., axons) and in a multidimensional Hilbert space (i.e., a multi-dimensional complex projective space) simultaneously. It is not illogical to imagine that this distribution takes place in Hilbert space on the ground that human beings do not boil down into flesh and bone, but rather exist as an ensemble of physique, memory, mind, soul, and spirit.

It can further be claimed that these sense/logic units interact with the paths in which they move, manipulate, affect, and change them, and are, in turn, manipulated, affected, and changed by them, so much so that when they reach the second distributor, they are not necessarily the exact copies of their original states prior to the time they entered the first distributor. Before they arrive at the

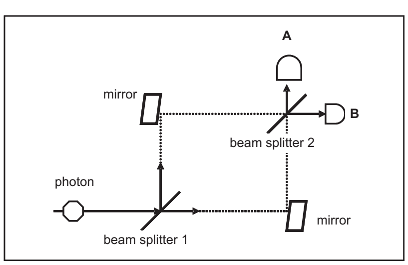

Figure 2. Single-particle interference experiment

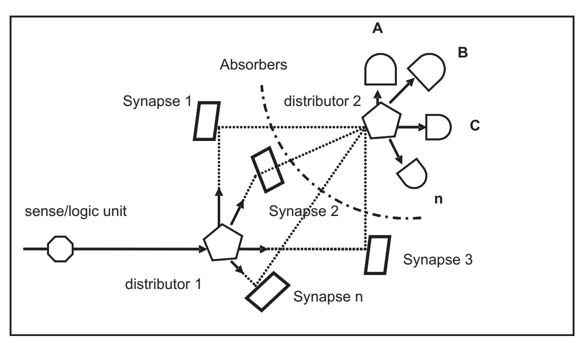

Figure 3. Abstract model for a quantum human computer (QHC)

second distributor, they may be intercepted on some of these paths by filters or absorbing screens of various kinds (e.g., social, psychological, cultural, ethical, pragmatic, ideological, etc.) that make their further progress towards the second distributor impossible. Passing through the second distributor (e.g., a given brain resource), they are directed towards one or more detector(s)—physiological or otherwise—and are processed. These detectors differ in nature and are distributed in all parts of the human nature (physique, memory, mind, soul, spirit, mind); it can be imagined that some of these detectors are physical, some mental, and some otherwise.

Since the hypothetical QHC possesses an incredible number of such circuits, it can factor huge numbers of sense/logic units at an eye blink, much faster than is possible on any conventional computers. Furthermore, the QHC operates in Hilbert space, so one needs to know the sort of quantum algorithms that are appropriate to utilize the immense computing power available in his QHC. Let's take an example. We all know the physical dimensions of length, width, height/depth, and time. These physical dimensions are the parameters that the QHC employs to answer the question where and when some event happened or will happen; for instance: "When and where did Napoleon die?—On May 5, 1821 at Saint Helena (15°56′ S 5°42′ W)". As such, these physical dimensions are employed by the QHC to enable us to correctly perceive the world around us. This gives credence to Kant's claim that we actually do not perceive physical dimensions but they form the frame in which we perceive events; that is, they form the a priori background in which events are perceived. Our QHC also answers HOW and WHY questions, but we do not know exactly how it does so, because we do not have access to the right quantum algorithms.

3. Bringing it all together

A computer is not simply an ensemble of kits and peripherals. It requires an operating system and a power source to operate. Once an operating system is set up and the power is supplied, the computer can accept packs of information from outside, can store them, and can utilize them for their pre-determined purposes. The computer does not need to learn these packages; rather it accepts them as they are, provided that they run on the basis of the computer's operating system. Metaphorically speaking, a computer accepts packages of information in much the same way as a patient accepts organs through transplantation. Human learning, too, can be that simple.

A computer can also be hacked. If you feed a virus or a spam into a computer, you can access its resources and hold control of it. Once hacked, the computer can be made to accept (i.e., learn) packs of pseudo-information it is normally expected not to accept. People use different virus guards and firewalls to abstain their computers from hackers; however, hacked computers are becoming an epidemic.

The human computer, too, requires a source of energy and an operating system to work. Energy is the life-blood of our human computer, and so far as we know, is provided through food, water, and air. Sodium and potassium ions as well as other chemicals and hormones (e.g., adrenalin, epinephrine, etc.), and perhaps their interaction are certainly part of the operation of our human computer. The human computer uses logic as its operating system, but this logic may not be of just one type; it may be an amalgamation of binary, fuzzy, and any other imaginable kind of logic—we all hold to certain beliefs, values, superstitions, etc. all of which can manipulate the way our human computer processes and handles sense/logic units.

Like classic computers, the human computer, too, can be hacked, and made to accept programs, information, and pseudo-information-information that can be suggested to the human computer. Hypnosis and sleep are just two tangible examples of how the human computer can be hacked. Hypnosis is an artificially induced trance state that resembles sleep, and that is characterized by heightened susceptibility to suggestion. Maybe human learning can be as simple as:

1) to know how the human computer operates;
2) to know how it can be hacked;
3) to know how information packages of all kinds

(linguistic, scientific, etc.) can be suggested into it;

4) to know where in the human computer's Hilbert space certain kind of information should be suggested; and

5) to do it

Conclusion

As fictitious as it may seem, human learning can be reduced into a "suggestion model" whereby information is suggested into the human computer in much the same way as a given software is setup on a digital computer. In this paper, a hypothetical human computer was modeled according to digital and quantum computers. Then an analogy was drawn between them and a model of learning/suggestion was proposed. It was claimed that human learning can be wholesome rather than being linear, sequential and time-consuming.

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