International Research Journal of Computer Science (IRJCS)
Issue 05, Volume 5 (May 2018)
ISSN: 2393-9842
www.irjcs.com

QUANTUM COMPUTING VS COMPUTERS COMPUTING

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Manuscript History
Number: **IRJCS/RS/Vol.05/Issue05/MYCS10090**
Received: 07, May 2018
Final Correction: 12, May 2018
Final Accepted: 14, May 2018
Published: May 2018
Citation: Farzad & Copuroglu (2018). QUANTUM COMPUTING VS COMPUTERS COMPUTING. IRJCS:: International Research Journal of Computer Science, Volume V, 236-240. **doi://10.26562/IRJCS.2018.MYCS10088**
Editor: Dr.A.Arul L.S, Chief Editor, IRJCS, AM Publications, India

Abstract—Nowadays, quantum computing is one of the popular subjects in computer science. The quantum information, which was completed between 1920 and 1930 in general terms, then began to be combined with quantum physics and computer science with the development of computer technology. Theoretical quantum information in physics theoretically shows that it can work both as '' yes '' and '' no '' while working with the knowledge of '' yes '' and '' no '' while performing calculations of classical computers simply through 0 and 1. This calculation technique led scientists to join two sciences, physics and computer science, to create a new science. Quantum computing and quantum computers. Recent studies show that this is very serious.

Keywords—Quantum Computing; Distributed Systems; Parallel Computers; DNA Computing; Qubit;

I. INTRODUCTION

Quantum Computer is a computer system that operates by quantum mechanics laws. What is quantum mechanics? Quantum mechanics examines particles that bring this atom to the centre of a substance or atom, which is also present in very small levels of light [1]. They try to solve the movements of the particles and their communication with each other. However, how can this information be reflected in quantum computing and quantum computers? The smallest unit of information used in today's computers is called bit and QUBIT in quantum computers. From a physical point of view, the bit is a logical value prepared according to the binary numerical system. These values are; Yes / No, True / False, or simply 1/0. Computers have capacitors. We can say that information goes through these capacitors as well. The voltage difference between the surfaces of this Capacitor forms the bit information. Charged capacitor one represents zero if it is unloaded. According to the physical system to be used in quantum systems, qubit, different movements of light, different states of electrons can be called spin. Spin is the name of the movement of an electron that moves perfectly in a very short time at great speeds. At the same time, the qubit can also indicate energy levels of the atom. We can say that all systems that can be counted as two levels conforming to quantum laws carry a bit of information.

However, quantum mechanics states that the cubit, which is supposed to be the superposition principle, can take both zero and one states. In this sense, an unimaginable increase in data storage capacity and processing speed in quantum systems will be inevitable. The important thing about the Quantum Computer is that it promises a new technology out of the ordinary. This quantum computing technology allows scanning many data at the same time. However, at the same time, scanning multiple data lines may not seem like an incredible thing to do. To give a short example; imagine a hotel with 500 rooms. I want to find a key missing in this hotel and find out which of these keys belongs 500 rooms key. The job that the hotel employee should do is try this key by inserting the door one by one. We can also guess how difficult this process is, how long it takes, as well as being difficult. This is a method used in the classic calculation method described above. However, quantum computing does not work like that. It creates 500 copies from the hotel staff and sends each copy to the gate at the same time, revealing at a great speed that door the lost altar belongs to it.

II. SYSTEM DESCRIPTION

A. Kubit in Quantum Computers Instead of Bit in Classical Computers

Quantum computers do not work by stopping electrons and producing bits like conventional computers that we normally know. Instead, they use photons called cubits and produce data according to the polarizations of the photons. Photons are assumed zero in vertical polarity and one in horizontal polarity. Here, the photon can actually be perceived as light. From here, it is understood that quantum computers have processing capacity at the speed of light.

B. owns all data's at the same time

When a combination of operations is performed on a conventional computer, the computer executes the bits in different combinations. This can be done in a certain order, not at the same time. For example, when you want to search on a computer, the computer runs two transistors and calls them combinations. In total, try four combinations that you have in order to reach the desired rate. Since it means that the probability of increase of the number increases as it is in the hotel example we give above, it takes some time since it is obligatory to perform a certain order in the classical computer. In quantum computers, photons have both zero and one at the same time. The reason is hidden in the quantum space. As long as you do not measure photons, you do not know the polarizations of the photons and they have both in certain possibilities, this is called Superposition. For this reason, it has all four combinations in the same way as two cubits in your hand. Even nicer when you search, you can get the result you want directly.

III. THE DIFFERENCE BETWEEN COMPUTERS COMPUTING METHODS AND QUANTUM WE USE TODAY

Under the heading of operating systems, we need to open up a bit more of the QBIT and transactional mathematics we are referring to. The working system of classical computers is the concept of information we call BIT. Zero and one symbolizes this concept called BIT. We call this machine language. The ability to decide between " 0 " and " 1 " is used. The crucial point here is that the decision made by the classical computers in the calculations is only and only it can be found in one of the cases. It is either yes or no. It can be interpreted as either happens or not. In quantum computing, the first difference comes out here. In classical calculations, these ICTs are replaced by QBITs. The concept of cubic can be explained better by explaining the concept of bit. For example, on a conventional computer you can display any number with 1000 digits, using about 3300 bits. When we go through a quantum computer, the strange laws of quantum physics tell us that this 1000-digit number information can represent all combinations of 1000 numbers. This means that 3300 cubits represent all numbers between the smallest number and the largest number that can be written with 1000 numbers. Let us try to explain this phenomenon, which may seem incredible, with an example [2].

Let us consider the spin of electrons as a quantum system that expresses information. We can also call it the spinning motion of the spin electron. When an electron turn is examined, it may be showing up, down, right, left, front, rear, and a random direction outside them. For this reason, theoretically, the spin of electrons, the return motion, can be found in infinitely different situations. However, the quantum physics law tells us that we must interpret the spin direction as two levels. One reason for this is that every measurement made to determine the direction of spinning gives only two possible values. Before we measure, we need to select a direction in space. Because, physically, if we do not choose this direction, we will catch an infinite movement in an infinite space, and this movement becomes impossible to observe. After selecting a direction in space, the result of the measurement is that the electron movement is in the direction of the selected direction and the direction of the electron movement is opposite to this direction. According to the quantum physics, all the other possible spin directions occur with superposition of these two special cases that can be found in the experiment. Let us think we're measuring in an up-down direction. Let us say a spine "1" oriented upwards and a "0" spine downwards.

Spin, we said that these cases could be found in different situations outside of the two. That is, a spin can be in both 0 and 1 states. If we make such a spindle, each measurement will give a value of "1" at "0". If the spin is to the right, we find a value of "1" with a 50% probability and a value of "0" with a 50% probability. If there is an electron spin (cubit) in the memory 3300 to the right, this means that all numbers with the same probability up to the same number are in memory at the same moment. However, as we said above, the same amount of bits (3300 bits) can hold only one of these numbers. The embedding of such a large number in such a small physical source is an indication of how powerful a quantum computer can be from a classical computer [2]. A conventional computer can extract it in 2L steps, while the Quantum Computer is composed of L cubes and subtracts from the input mathematical operation, which can be encoded in 2L different ways (because it can be in both one and zero states). A conventional LB cubic bit. The processor requires 2L parallel processors. In this case, the speed ratio between quantum and conventional computers is 2L / L. If you look further down, give it to the classical computers to communicate between the processors, wait during processing, energy consumption etc. added to this as a temporal multiplier, the new ratio goes to eL / L. When this ratio is examined for 64 bits / cubic data, quantum computers are about ~ 1026 times faster than classical computers. It can be clearly seen that this speed will never be able to be memorized and it will start a new technological revolution, so that the computer will change our lives largely in the present day [3].

A. Logic Gate Comes Up Instead of Probability Gate

After you have processed the bits in normal computers, they are processed as you like, given through Logic Gates, which are made up of different combinations of transistors. Logic Gates determine how the bits are to be processed, and determine the new electron flow according to the incoming electron flow, which is basically the work of three different logic gates. For example, if the incoming bit and the gate is zero, it gives one in reply, just like a calculator. Quantum computers do not have a Logic Gate, but instead there are Probability Doors. Probability Doors work essentially the same purpose, that is, they do not have a job to process incoming data and create a new one. However, their operation is not the same, contrary to the bits, the cubits measure the cubit from the fact that they have zero and one at the same time and make a new probability calculation according to the polarization inside.

B. Interaction of Photons with each other

A photon measured during the processing of a photon from the Probability Doors is always in interaction with another photon at the same time. This theorem is called quantum circulation, and if you measure one of the objects in the quantum space, you will also measure the object in which it is entangled. This is explained by the example of the famous physicist Einstein's glove; I thought it was a pair of gloves. We leave one of them in a locked cradle and the other in the house. If you open the case in the North Pole and you measure the right glove, you know directly that it is the left glove at home. Probability Doors are the same as those of the cubit, which is measured by using it.

C. Data Processing at Light Speed

Theoretically, transport of light at light speed is not possible at this time. However, can we carry something that is not a substance? For example, thought, information. If someone has something for you that is light fast, then that means you do not update yourself. In normal computers, the data processing speed depends on the speed of the electron flow, the faster the electrons are processed, and sooner the process begins. In quantum computers, the formation of new data after measurement at the Probability Gates of the cubits depends on the interaction time of the quantum entropy. In a study conducted at Delft University in 2015, it was estimated that the interaction of two abounded objects is faster than light. So Einstein made a mistake in 1915 [4].

IV. WHY QUANTUM COMPUTING

We are not satisfied with what we are doing, but we are pursuing computers that can do more. Why are we pursuing tremendous amounts of computation? Actually, their answer may be a topic in itself, but let us try to respond in the shortest and most memorable way. There is, of course, a reason for the adoption of such technology in place of today's computers and computer technology. The technology that ordinary computers have now has reached its limits. That is also, why the working principle of computers lies. Normal computers mainly consist of small electron stops, which we refer to as transistors. If the electrons pass “1”, if they do not, they will generate information called bit “0” based. Nowadays, the number of transistors must be higher for a computer to be better. Because as the days go by, this information is immediately followed by hiding, operations that need to be controlled. In doing so, it increases our need for faster machines. However, transistors are “1” in 1000 of a virus in this state. If they get a little smaller, the vet will come to stop the electron.

Therefore, they cannot generate bits and process data. Because of these, the scientists have come up with different problems such as the emergence of information at incredible levels, the separation of them. Also, they have focus on the storage of the problems, the progress of the technology at the level of dizziness, the atom that cannot be solved at this moment into subatomic particles, the past that we are only interested in what happens in our world, We are going out of the world in the last years and we can say that we are dimensionless and we are dealing with the solutions of this space and we want to get help from the machines in it and if we want to collect all of these things in a pot we need to change the computers.

A. Currently Password Protecting

Because the cubits have all the possibilities at the same time thanks to the superposition, the probability calculations drop to zero [8]. The best place to test this is password cracking. In normal password cracking, the Kali programs, called Brute Force, try to find the real password by trying all the passwords in huge text files that they have. In quantum computers, this process is significantly reduced when it is done according to the number of cubes possessed. With 10 bits, 1024 different passwords are tried one by one, and 10 pieces of cubes and 1024 can be tried at the same time. All of the major universities in the world continue to work on the design of quantum computers. Large companies such as IBM and HP are investing heavily in such research. In addition to the advantages of quantum computers, U.S.A. Management has the most equipped quantum computer lab. Future generations will decide how to use the speed and efficiency that the computer world will live with for the great transformation that will live on. Will quantum computers remove the problem of transportation and communication from the middle and open up the age of consciousness, or will social life become an old habit and deepen the gap between people? We will wait and see. However, it is already clear that these technologically advanced states will open the gap to their competitors on the path of civilization, and it is not only a scientific innovation, but also a sociological, economic and political aspect. We can compare the present state of the quantum computer to the situation in the 1930s, when the bases of classical computers were introduced. Mathematician Alan Turing, then the founder of computer science, invented a machine called the "Universal Turing Machine" that proved mathematical theorem. If a businessperson invested in advanced technology in those days, he say, "What is a machine that proves mathematical theorem?" However, the underlying theme of Turing's basic mathematical questions has made an important step in the development of the computer concept. For this reason, we need to compare the work done on quantum computers today with those of Turing. There are still basic questions waiting to be answered [5, 6]. Of course, the long-term future of quantum computers will penetrate every corner of our lives!

B. DNA Calculations and the New Island of Man

For many years and even for centuries humanity has been living for a very long time, but this life also has a lot to do with dry calyx. He knows that he must live a lot healthier, much stronger and more knowledgeable than ever. Is this possible? If so, how? We can say that we have in our codes that it is DNA [7]. However, one of the most complex tasks is the resolution of DNA. If humanity can decipher these passwords, perhaps it can freeze itself in the most magnificent view. Diseases can be completely removed. Packet information can be encoded directly into your DNA without wasting time for information. There is no doubt that all of this can be done so that the codes of our DNA need to be solved. However, the technology that can do this, the calculations, must be very complicated, just like human DNA. This seems to be present in quantum calculations for the moment.

V. CONCLUSION

we guess to say that human beings have contributed to the extent of bilateral thinking, which is thought to have developed in parallel in every period, does not lead to a negative conclusion. A few centuries ago, it was not known that the world was round, but turned and turned. With the proof of the return of the Earth, it actually began to progress rapidly in science. This rapid progress has reached such dimensions that we have a lot of complicated information as well as speed. However, it was impossible to keep all of this information in mind at the same time. At the end of this adventure was the emergence of computer science from the mathematics of humanity and fellowship of the machine. However, progress and development also took place very quickly in the period when we were talking about computers. Things are getting more complicated now. It was even so complicated that the computer we produced was often blocked when we did not solve our complexity and started to understand what we mean. This was the case for inventing a more advanced machine. This time, physics and mathematics entered the circuit. At this point, things have come to the levels that even human beings cannot imagine. Because physics and mechanics were right on the paper, that it could be incredible jobs. As common main subject of two sciences, the quantum machines that can do quantum computations and quantum computations that is. Computers, have begun to go out on the stage.

These computers are now chasing abnormal jobs, not normal jobs. There is no doubt that quantum computing today seems to have attracted the attention of everyone involved in this process. Computers that can calculate infinite combinations in the future and computers that know our diseases by these combinations calculate the possibility of traffic accidents on roads, reduce the most accidents, and even finish calculations even machines can solve family problems.

REFERENCES

[1] G. Leisle Squires. Quantum mechanics. https://www.britannica.com/science/quantum-mechanics-physics,2018
[2] Kuantum Hesaplama Teorisi: Bilgisayar Bilimcilerinin Kuantum Mekaniği Keşfi, Bülent Özel, İstanbul Bilgi Üniversitesi Bilgisayar Bilimleri Bölümü, E. T., 2006. http://cs.bilgi.edu.tr/~bulent/kuantum.html
[3] P. Magan Ghatule, V. Ghatule. Quantum Computing: A New Approach for Quantum Computer, International Journal of Innovative Research in Computer and Communication Engineering, 5(2), pp: 2530-2534, 2017.
[4] S. Imre, F. Balazs. Quantum computing and communications: an engineering approach, Book, TU Delft, 2005.
[5] M. Carfora, A. Marzuoli. Quantum triangulations : moduli spaces, strings, and quantum computing , Book, TU Delft, 2012.
[6] E. Fieffel. Quantum Computing, FX Palo Alto Laboratory, pp. 3-12, 2010.
[7] I. Chaudhar, A.P. Singh. DNA Computing, Proceedings of National Conference Computing For Nation Development, pp.1-7, 2007. https://techbeacon.com/quantum-computing-end-security-we-know-it

