Brandon Fieger  
CSE300

Stacey Suver

17 November 2016

Understanding the Future use of Quantum Computers

With an era of big data and the growing complexity of computer systems, never before has there been a greater need for faster and more powerful computing devices. We are reaching physical hardware limits with how many transistors we can apply per square inch without running into power consumption and heat dissipation issues. One promising and highly researched topic to overcome these limitations is quantum computing. Previous research suggests we are able to encode and process information on quantum computers. We are able to achieve performances that are millions of times faster than our current fastest supercomputer in Sunway TaihuLight. The limitations, strengths, weaknesses and theoretical uses have all been heavily researched, however, studies showing the practical use of quantum computers in everyday households does not exist. The purpose of this research project is to survey young and middle aged adults with targeted questions to help understand if quantum computers will have a use in everyday households.

Going back to the 1990’s quantum computers has been heavily researched by many organizations, individuals and academic institutions. Research suggests that using the properties of quantum physics allows us to create quantum transistors, most commonly known as qubits, which are able to encode information. Using these qubits we are able to construct parallel computation planes by abusing the superposition of them. In conjunction to their superpositions, qubits are entangled with each other through quantum entanglement which can then be used to encode and process information. Numerous studies show that various applications can be built using these computation planes. A few being enhanced quantum algorithms, quantum cryptography and quantum machine learning. There are, however, downsides and limitations of quantum computers that will restrict them from completely replacing traditional computers. As observed by D-Wave systems, the first business to build a quantum computer, in order for quantum computers to operate a very specific and hard to come by environment must be established. The quantum computer must be cooled to near absolute zero and have zero static electricity when operating. Research has been done in regards to the future of quantum computers, how they are projected to shrink in size and price, however, research on whether there is a practical use for them for every day consumers does not exist.

Using our existing knowledge on quantum computers I will conduct a survey to determine whether there is a practical use for them for everyday consumers, and if not what needs to be changed to accommodate the majority. The survey will primarily focus on young adults to middle aged individuals of all backgrounds. We are avoiding the older generation (50 years or older) as they are not as computer literate as upcoming generations. The individuals’ specific background, ethnicity and level of education will not be considered or recorded. We are aiming to conduct the fairest and most accurate representation of ordinary citizens. One thousand copies of the survey will be distributed evenly across the United States and will be conducted for a three month period. An incentive of five dollars will be rewarded for those individuals who participate in the survey. We will be mailing out information about the survey along with a link to a website that conducts the survey and a means to input a payment method for them to receive their five dollars.

The survey will contain targeted question to help us identify if quantum computers have a place for everyday consumers. Questions such as what the consumer uses their computer for, if they are willing to spend extra money on a computer that can outperform their current system, and how much space will they be willing to allocate to store the device will be asked. We will also ask if they are willing to maintain the computer and to keep it up to date in the environment needed. To help us understand if the extra features and benefits from quantum computers will be utilized, we will ask how important security is to them, and if they will be using, or are currently using their computer for high-end features, such as virtual reality and running real-life simulations. We will also throw in a few questions regarding quantum cloud computing; instead of owning a personal quantum computer would they be willing to rent a virtual quantum CPU to enhance their current setup at a monthly cost. These questions should help us identify if there is a need and a practical use for quantum computer for everyday consumers.

In one way or another quantum computers are the technology of the future and will continue to grow. It has been heavily researched and consistently shows practical uses for large corporations and solving big data crunching problems. Using our existing knowledge and the predicated growth of quantum computers, our survey will better help us understand if quantum computers will have a practical use for everyday consumers. Existing research suggests that because of the limitations and difficult conditions to run quantum computers that it will not reach consumers homes. After conducting the research we will have a clearer answer whether consumers need and can properly house quantum computers and if not feasible what needs to change.

Bibliography

Bennett, C. H., et al. "Strengths and Weaknesses of Quantum Computing." *SIAM Journal on Computing* 26.5 (1997): 1510-23. *SCOPUS.*Web. 25 Oct. 2016.

Hahanov, V., et al. "«Quantum» Processor for Digital Systems Analysis".*Proceedings of 2015 IEEE East-West Design and Test Symposium, EWDTS 2015. SCOPUS.*Web. 25 Oct. 2016.

Padamvathi, V., B. V. Vardhan, and A. V. N. Krishna. "Quantum Cryptography and Quantum Key Distribution Protocols: A Survey".*Proceedings - 6th International Advanced Computing Conference, IACC 2016. SCOPUS.*Web. 25 Oct. 2016.

Svore, K. M., and M. Troyer. "The Quantum Future of Computation." *Computer* 49.9 (2016): 21-30. *SCOPUS.*Web. 25 Oct. 2016.

Wittek, P. "Quantum Machine Learning: What Quantum Computing Means to Data Mining." *Quantum Machine Learning: What Quantum Computing Means to Data Mining.*, 2014. 1-163. *SCOPUS.*Web. 25 Oct. 2016.