Instituto Tecnológico y de Estudios Superiores de Monterrey

Quantum Computing

Reading 5

Mechines, Logic and Quantun Physics

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Abstract

In this text, that is based on the paper: "Machines, Logic and Quantum Physics" by David Deutsch, Artur Ekert and Rosella Lupacchini two ideas are extracted arbitrarily and discussed, according to the interest of the author.

1 Idea 1

What are our fundamental constraints?

The authors of this paper were opposing the ideas that Wigner exposes in his paper left as the first reading assigned in the class, because they think we can understand why mathematics are so good by analysing the case of how the maths that quantum mechanics work so good. Maybe to settle down this discussion we should do this same exercise with previously established physical models that were novel in their times, and also do this exercise with following ones. Personally I sit in the middle, I believe that physical observation played a role as important as our ability of extrapolating information (formalised by maths).

Evolution of our understanding of the universe really work as I think, what would be the barrier that stops us from developing new physical theories? Our observational abilities, that may be limited by our senses? Or the barrier may be our creativity, so that we may not be clever enough to explain some observed phenomenon?

2 Idea 2

An exiting question

Could there be other models that bring our current paradigms and therefore, potentially bring new tools to our computing arsenal? Classical computing can completely be modelled with natural numbers, while quantum computing is modelled with complex numbers, this makes quantum computing more complex at least mathematically. A good bunch of the knowledge we have created comes from our outstanding ability to extrapolate information, so a good question to ask in this inflection point is if there will eventually be computers built under physical phenomenon that are described by quaternions (4 tuples) and octonions (8 tuples). I think there are three possible outcomes for this question:

The first possibility is that we find such physical systems and we build computers so powerful we would not even dream of dreaming of today.

The second possibility is that we find the "ultimate" theory of everything that explains and predicts accurately all the phenomenon we are able to measure; we self congratulate ourselves and after a while, computer science, and physics will be dead sciences because there is nothing new to develop.

Another possibility is that we find such systems, but they are so complex that we can not interact with them in a way coherent enough to perform computations.