Quantum physicist explains $100K offer for proof scaled-up quantum computing is impossible

February 8 2012, by Bob Yirka

Scott Aaronson

(PhysOrg.com) -- MIT researcher Scott Aaronson has certainly riled the physics community with his offer this past Friday, of $100,000 to anyone who can prove that scaled-up quantum computing is impossible. His original reason for doing so was, as he describes in his blog, due to adding his two cents to an argument between skeptic Gil Kalai and researcher Aram Harrow about assumptions regarding the Quantum Fault-Tolerance Theorem, on another blog, where he argued that refuting the idea of scalable quantum computing would amount to more than just taking apart the QFT Theorem; it would he suggested, mean coming up with a new version of physical reality. Then, because of the

response he got from the blog owner, he felt compelled to defend his assertions in a rather bold and some might say, foolhardy way. Thus was born the $100,000 bet, or prize.

Now, after some time has passed and many hundreds of comments posted, Aaronson has posted to *IEEE Spectrum*, about the deeper reasoning behind the prize offer.

First he answers a query from IEEE's Rachel Courtland, who wants to know why the possibility of a scaled up quantum computer has come up, and why does there need to be a prize about it?

From his answer it appears it's because, as a quantum physicist whose goal is to find a way to create a scaled up quantum computer, he gets an awful lot of comments on his blog questioning his career choice in light of the fact that there is no certainty that his goal is even achievable. Many of the posts have clearly irked him and he now in response, appears to be hoping that his daring those who throw stones from afar, will either pipe down, or simply go away. Or, perhaps, miraculously free him from his dream by proving that it's an impossible one that will lead him and the rest of his colleagues to eventual embarrassment.

It's clear that Aaronson believes a means of building a true scaled up quantum computer will be found one day, and that the problem at this juncture, as Courtland points out, is more one of pouring additional resources into figuring out how to make it happen, rather than sitting around wondering if it's possible. He points out that as everyone in the small community of quantum physicists knows, tiny quantum computers have already been built that can perform small, rather insignificant operations; hence the need for the "scalable" part of the prize. To win the money, someone would need to prove that what has been done so far, will never be done on a larger scale, i.e. building a quantum computer that can actually do useful stuff.

It's all a matter of decoherence he says, where the quantum parts of the computer must of necessity interact with those that are not. Thus, the issue is whether that one little problem can ever be overcome. He clearly thinks it can, while others think not. Aaronson just wants them to back up their reasoning with actual science.

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