A "SPOOKY PHENOMENON AT A DISTANCE" OR A POTENT WIRELESS TOOL DR EINSTEIN?
QUANTUM-SOLUTIONS IN COMMUNICATIONS

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Abstract

Since Marconi demonstrated the feasibility of radio transmissions, researchers have endeavoured to fulfill the dream of flawless wireless multimedia telecommunications, creating the impression of tele-presence - at the touch of a dialling key...

However, making this dream a reality required 'quantum' leaps both in digital signal processing and in its nano-electronics based implementation, facilitated by advances in science both in Edinburgh and farther afield. This process has been fuelled by a huge consumer market. Moore's laws has indeed prevailed since he outlined his empirical rule-of-thumb in 1965, but based on this the scale of integration is set to depart from classical physics obeying the well-understood rules revealed by science and enter into a new world, where the traveller has to obey the sometimes strange new rules of the quantum-world.

The quest for quantum-domain communication solutions was inspired by Feynman's revolutionary idea in 1985: particles such as photons or electrons might be relied upon for encoding, processing and delivering information. During the last three decades researchers and engineers often considered a pair of open problems. Firstly, classic systems relying on the efficient processing capability of quantum-search algorithms were considered in the area of quantum-assisted communications, while the branch of quantum-domain communications relies on quantum channels.

In wireless communications we often encounter large-scale search problems, some of which may be efficiently solved with the aid of bio-inspired random guided algorithms or quantum-search techniques. For example, Grover's algorithm is capable of searching through an N-element data-base with the aid of $\sqrt{N}$ cost-function evaluations. Commencing with a brief historical perspective, a variety of efficient quantum-assisted solutions will be exemplified.

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