To Relativity, the maximum speed of information transmission is c, which is false

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Abstract

According to a bits generation technique, that is, bits can only take a binary value of 0 in the absence of wave function collapse and 1 when wave function collapse occurs, that is, regardless of the value random in which the collapse of the wave function occurs that in the past caused the development of an alternative technique of classic bits to be renounced and remains currently an impossibility in normal science, through series of quantum entanglements, using BCD, EBCDIC or ASCII coding standard in computing, data are teleported surpassing c, from a sender to a receiver, theoretically placed at any distance. This technique is a new discovery with theoretical foundation in the work "Superluminal Data Transmission supported by Quantum Entanglement" (1) by this author, stored, since April 2023, as a preprint, in the ResearchGate, and Philpapers repositories, and pending implementation by communications engineering in a long-term future. In this work it is unequivocally established that the maximum speed c for this type of transmission is false, causing critical break with Relativity. This new technique, unlike the one presented in my previous paper, it is a version much simpler that can be implemented according to the current state of technology, so at present the instantaneous transmission of information can be tested experimentally.

PACS: Physical sciences, physics, engineering, relativity

1. Introduction

The quantum entanglement that implies the instantaneous action between particles, in addition to its probabilistic nature, violates the principle of locality, introduced by Special Relativity, which defines that any interaction between events can only occur with a speed less than or equal to the speed of the wave electromagnetic in a vacuum, c, and that the particles exist in a single state.

The physicists, Nobel Prize winners in 2022, Anton Zeilinger, Austrian, John Clauser, American, and Alan Aspect, French, experimenting with entangled photons, unequivocally established that quantum mechanics is non-local.

In quantum mechanics, particles are described by a wave function $\psi(x)$. And particles exist in a superposition of states. For example, a photon has a superposition of two states that are incompatible with each other. The photon is assumed to be in both states simultaneously:

Iψ> = IA> + IB> Iψ> is the "state" of the system.

In entanglement, two distant systems are in a state of correlated superposition. Thus, we can create an entangled state where:

Iψ> = IA1> IA2> + IB1> IB2>

If we use a photon detector to measure which path photon 1 is at location 1 and find that it is on path A1, then photon 2 must be on path A2 and the state instantly "collapses" to Iψ>=IA1> IA2>. This has instant physical effects at location 2 (2).

The Gisin group in Switzerland performed a nonlocal interferometry experiment over a distance of 10 km. They later showed that wave function collapse occurs at least 10,000 times faster than the speed of the electromagnetic wave in a vacuum (2).

Quantum entanglement as an instantaneous action at a distance lead to the idea of instantaneous communication between two parties that share an entangled pair particle, and according to the theory of Special Relativity, it is impossible to take advantage of it by any technique attempted since c is the maximum limit of speed. In this work, we demonstrate conclusively that data transmission above c is possible and, therefore, that such a limit is false.

2. Fundamental of bit teleportation

While it is true that the state that results from the collapse of the wave function in an entangled system between two particles is probabilistic, it is also true that it is deterministic that said state changes when an update occurs. This change is manifested by the change in energy of the state that can be detected. That is, between the quantum entanglement of two particles, the resulting state in the second as a consequence of the potential state in which the superposition would collapse will change when a new entanglement is caused between the first particle of the pair and a third and in its absence, there will be no collapse, and, therefore, its energy will be maintained.

3. Technological design

A bit teleportation technique is designed by author. In classical bit technology, discrete discontinuous signals of two electrical states (on/off, high voltage/low voltage, current/no current, etc.) are used. In the author's technique, bits are generated from the second particle detecting the change in its energy or not, depending on yes/no, since it will be yes, making it possible to assign 1 to a bit, when the first particle is entangled with a third and it will be no, making it possible to assign 0 to that bit, when there is no such entanglement.

4. Infrastructure requirement for remote communication based on quantum entanglement

For data teleportation, a certain number of quantum entanglements of two remote particles are required.

4.1 Data coding

The data to be sent according to the numerical, alphabetical and/or special characters that compose them, will be represented in one of the binary pattern systems used in computing, for example:

- ASCII (American Standard Code for Information Interchange) which provides 128 different binary patterns, using 7 binary digits for each character.

- EBCDIC (Extended Binary Coded Decimal Interchange Code), in which 8 binary digits are used for each character. Likewise, as in ASCII 7, they are for the character and the eighth is for the parity that stores the result of the function that assigns the binary digit 0 when the sum of the 7 that represent the character gives even and 1 when it is odd and is used to verify its inalterability.

- BCD (Binary Coded Decimal) which represents 1 decimal digit times 4 binary digits.

4.2 Initial conditions

- Through a classical channel using an analog signal inform the receiver of the start of bit teleportation.

- At least a number of particles entangled between the sending system and the receiving system equal to the number of bits to be teleported corresponding to the total number of characters. That is, for each character an interleaving system of 4 for BCD, 7 for ASCII and 8 for EBCDIC.

- For each entanglement in the emitter, a short-distance entanglement generator of the first particle with a third.

- In the receiver, for each quantum entanglement, a detector on the second particle that when the first particle is entangled with a third will register the change in the energy in the second and in the absence of this entanglement the energy of the second will be detected without change. That is, for each character to teleport 4 detectors for BCD, 7 for ASCII and 8 for EBCDIC.

5. Processes

5.1 In general, the following mathematical model is used, which is taken from (3) and formulated in vectors in Hilbert space.

- Photon to teleport: photon 3 in the emitter.

$|\phi>_3 = \alpha|0>_3 + \beta|1>_3$

Where α and β are complex numbers that satisfy $|\alpha|^2 + |\beta|^2 = 1$, 0 is horizontal polarization and 1 is vertical polarization.

Photon 3 in the emitter will be teleported to the receiver changing the state of photon 2 which, upon breaking the entanglement between photons 1 and 2, will be detected by the change in the energy of photon 2.

- Remote entanglement: photon 1 on the emitter and photon 2 on the receiver

$|\psi>_{12} = 1/\sqrt{2}\,(|0>_1 |1>_2 + |1>_1 |0>_2)$

The objective is to verify that photon 2 is in the same polarization state as photon 3. First, a joint measurement of photons 3 and 1 will be carried out. It will be a Bell-type state measurement, which consists of the projection of the state of the two photons into four possible entangled states $|\Phi^{\pm}>_{31}$ and $|\Psi^{\pm}>_{31}$ (called Bell states), so there will be one of four possible outcomes. Due to the entanglement between photons 1 and 2, the state of photon 2 will depend on the result of this measurement.

When performing the Bell measurement, the $|\phi>_3$ state will be destroyed and photon 3 will be in an entangled state with photon 1 of the four possible Bell basis states.

The four Bell states for two particles are:

$|\Phi^{\pm}>_{31} = 1/\sqrt{2}\,(|0>_3|0>_1 \pm |1>_3|1>_1)$, $|\Psi^{\pm}>_{31} = 1/\sqrt{2}\,(|0>_3|1>_1 \pm |1>_3|0>_1)$

- The state of the 3-photon system in terms of the Bell base states are:

$$|\Psi>_{123} = \tfrac{1}{2}\,[|\Phi^{+}>_{31} (\alpha|1>_1 - \beta|0>_1) + |\Phi^{-}>_{31} (\alpha|1>_1 + \beta|0>_1)$$

$$+ |\Psi^{+}>_{31} (-\alpha|0>_1 + \beta|1>_1) - |\Psi^{-}>_{31} (\alpha|0>_1 + \beta|1>_1)]$$

By making a joint measurement of photons 3 and 1, not only will they become entangled, but photon 3 will teleport.

5.2 In particular, the procedure would be done as follows: Suppose that it is about teleporting a total of 12 decimal digits encoded in BCD, that is, 48 bits

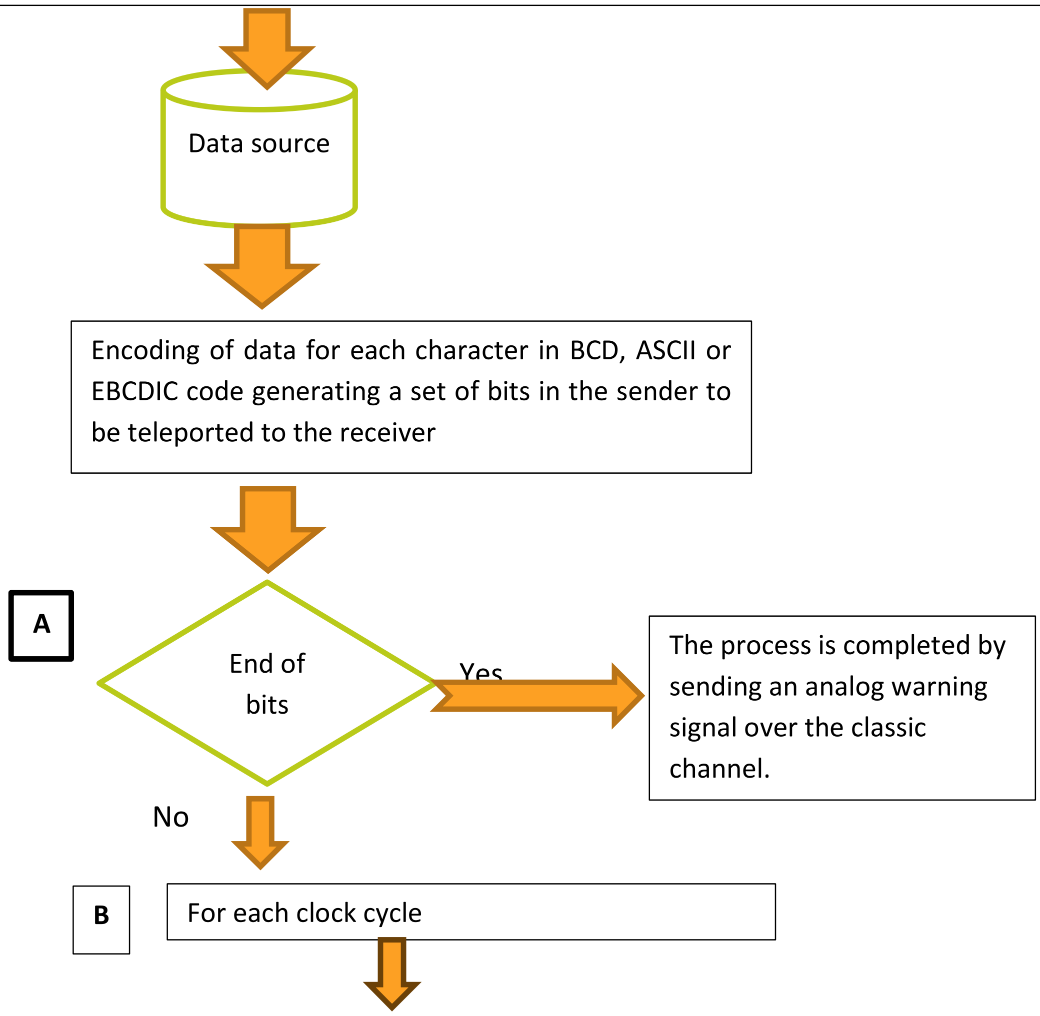
- A group of 48 remote point-to-point interlaces would be generated between the sender and the receiver. According to the example, per character a group of 4 bits would be generated in the receiver, which would take the value of 1 if the detector, in the receiver, for each bit found a change in energy of the second particle when the first particle is entangled, with a third (3) originated by a generator of particles entangled at a very short distance in the emitter, therefore, first and third particles the emitter and only if the value of the binary digit to be teleported is 1. On the contrary, that is, When the value of the binary digit to be teleported is 0, the generator of very short distance entangled particles at the emitter will not do so and, consequently, the corresponding detector at the receiver will not find any change in the energy of the second particle, and thus a bit with value 0 is generated in the receiver.

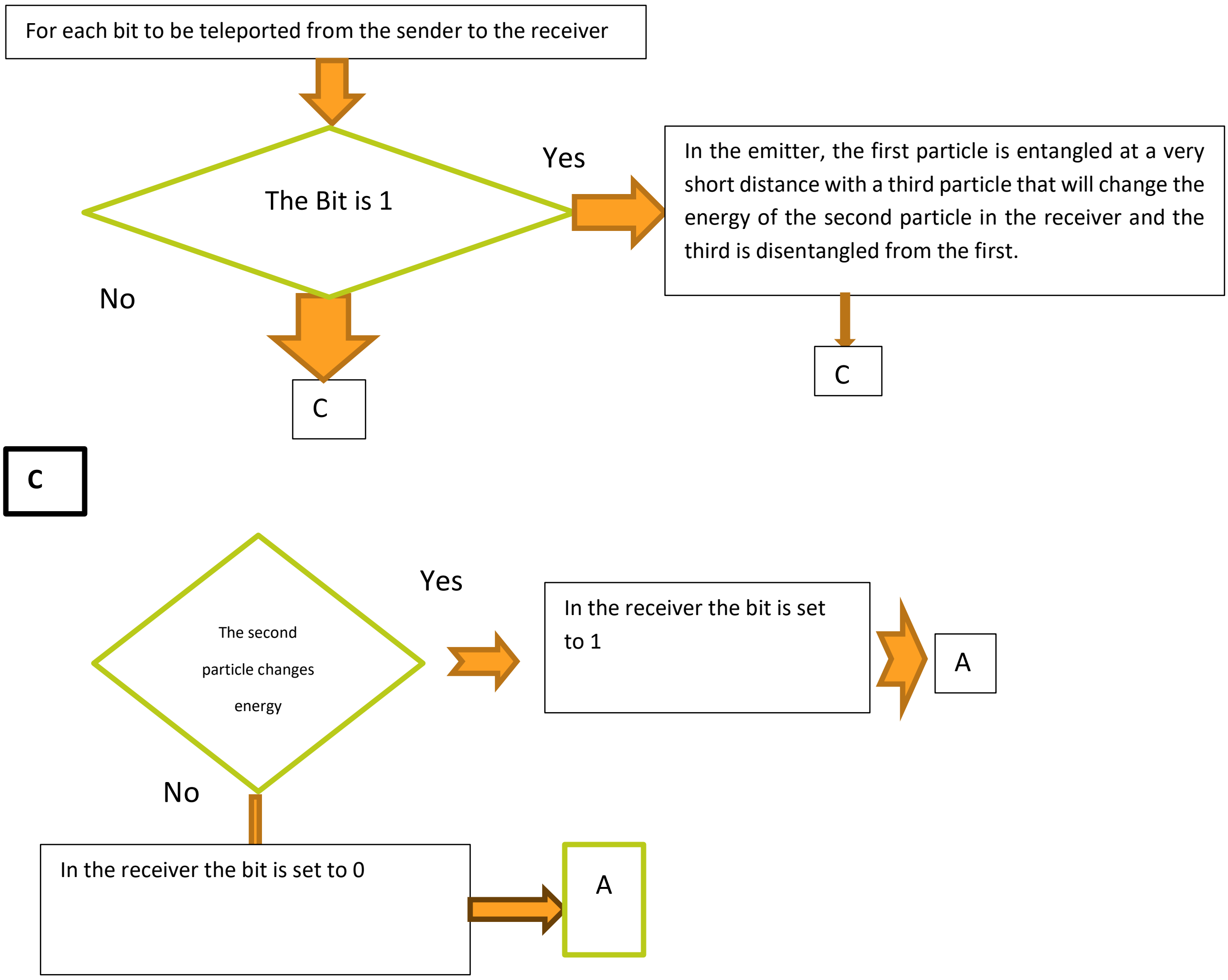
- This process would be iterative until all characters are transferred from the sender to the receiver. In the example, the transmission of the 12 decimal digits would be done 48 times.

The following diagram illustrates the process in terms of a basic algorithm:

INITIAL CONDITIONS

- Analog signal warning of the beginning of a bit teleportation session.
- Pair of synchronized clocks, one in the transmitter and the other in the receiver.
- At least a number of particles intertwined between the sender and the receiver equal to the number of bits to be teleported for the total number of characters given in a given application.
- A generator at a short distance from the entanglement of the first particle with a third in the emitter for each entanglement.
- In the receiver, an energy detector is necessary acting on the second particle for each quantum entanglement.





6. Conclusion

Theoretically it is proven that data can be teleported above c. Its experimental verification is possible with current technology.

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