ISAQC Research Team Screening

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1 Hypothesis-

If a quantum measurement is the collapse of a statefunction to one of the orthogonal eigenstates, how do humans perceive it given they can only perceive classical information? (All the reasoning is done in vision of the copenhagen interpretation)

2 Reasoning-

The state function is a linear combination of multiple orthogonal eigenstates of an "observable" such that they are square integrable.

=> the integral (or summation) of the square values is a finite value.
$|\psi\rangle = \sum C_i|\phi_i\rangle \quad \{\sum C_i^2 = 1\}$

An observable is a measurable quantity of the system. Each observable has an eigenbasis associated with it. The physical perception of the collapse can be observed when the quantum object (represented by the state function) entangles with a macroscopic observer. When this happens, there is a collapse in the state function and assumes the value of one of the possible eigenstates $|\phi_i\rangle$. It collapses to the state $|\phi_i\rangle$ with the probability C_i^2.

Physical realisation of "quantum gates" are physically realised by some specific microwave impulses for a certain duration to manipulate the qubit in a certain way. (it depends on the type of the quantum object)

Every quantum collapse CAN'T be directly observed classically. Those that are observable classically can be observed in classically observable basis.

Eg: suppose there is a quantum bit (a quantum object) in the form of photons. The polarization of the photons can be measured along a given basis by passing them through a slit along the basis directions.
If $|\psi\rangle = \mathrm{a}|x\rangle + \mathrm{b}|y\rangle$ is the current superposition, the collapse can be physically observed by placing a x axis polarizer. If the photon passes through the polariser, the measured wave collapsed along the x-axis, if the photon doesnt pass through the polarizer, it collapsed along the y-axis.

3 Conclusion-

Every quantum collapse CAN'T be directly observed classically. Those that are observable classically can be observed in classically observable basis. If the eigenbasis of the superposition are measurable physically, then the collapse will also be physically measurable.

4 Additional understanding-

If two (or more) particles are entangled and can be measured in physically measurable basis, if measuring one of them in such a basis leads to the collapse of the other qubit in measurement basis as well, the collapse can't be physically perceived unless it is also measured. If it was measurable by itself, this would mean a classical information transfer faster than speed of light (as entanglement ensures a instantaneous effect on other qubit). Eg: Information could be transfered as number of measured qubits if this was possible This would mean instantaneous transfer of information which defies relativistic bounds for rate of information transfer.