# Perception

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Abstract

Perception of an object from two opposite directions gives contradictive results. Acknowledgement of this fact is necessary to understand Bell experiments correctly and that is of great importance concerning the interpretation of the Quantum Theory.

Most people are probably unaware of the fact that from birth till death we always look in one direction. Usually this is no problem but when objects are being perceived by observers from opposite directions, we have to be aware of this fact and take into account the effect. What the observers see is correct and what they report is correct. In respect of the perceived object, however, the reports of the observers are contradictive and often even wrong.

For example: when two observers are looking at you and observer A is in front of you and observer B is behind you, then A will report that your right arm is at the left hand side and B will report that your right arm is at the right hand side. Their reports are correct of course but to you the reports are contradictive and one of them is wrong: your right arm cannot be at the right hand side as well as on the left hand side.

The problem can easily be solved by making adopt the observers the same reference frame as the object. A reference frame is a frame of fixed directions in respect of an object or an observer. A direction is determined by a plane: in a point of a plane there is only one direction perpendicular on that plane. When you look forward, the plane perpendicular to the direction in which you look , is your reference frame. If the observers take this plane as their reference frame, then their reports will correspond and be correct: your right arm is at the right hand side.

Another example: looking forward my nose is at the front. If I leave my body, stepping a few steps aside to the left and then turn around towards me, then my ‘leaving’ will say that my nose is at the left hand side. By turning towards me, my ‘leaving’ rotated 90° in respect of my reference frame. If another ‘leaving’ of mine steps a few steps to the right and turns around towards me, he will say that my nose is at the right hand side. By turning towards me, this ‘leaving’ rotated 90° in opposite direction in respect of my reference frame. The reports of my ‘leavings’ concerning the place of my nose are correct from their points of view but they are contradictive and both wrong in respect of me and my reference frame. Taking into account the rotations of the ‘leavings’, their reports can easily be corrected and made in correspondence.

So far this is not very difficult, I think. The difficulty is in seeing and accepting of what the consequence of this means for Bell experiments. In Bell experiments the two detectors detect entangled pairs of particles in exactly the same way as my ‘leavings’ look at me and my nose: not only they detect in opposite directions, they also detect in directions that are wrong in respect of the reference frames of the entangled particles. This will be explained.

A pair of entangled particles can be considered as one object, consisting of two particles, moving in opposite directions. The particles have opposite spin directions in respect of each other, which can be represented by opposite vectors. The detectors can be considered as photographic plates. Their direction of detection is perpendicular to the photographic plate so the reference frame of a detector is the plane that contains the photographic plate. The direction of detection must coincide with the line of motion of the particles. So the detectors must be placed perpendicular on that line of motion to be able to detect the particles. From where are the detectors being placed perpendicular on the line of motion? This starting point must be determined in respect of the reference frame of the particles. The reference frame of the particles can be established by identifying fixed directions in respect of the particles. One of these directions is the line of motion. Another is the direction of the inhomogeneous magnetic field of the Stern Gerlach device a particle is being exposed to. The field directions of the two devices normally don't coincide but that makes no difference. The reference frame of each individual particle is the plane determined by these two fixed directions. This plane is the reference frame of a particle from which a detector plate has to start to reach its position perpendicular on the line of motion. From their starting points the detector plates have to rotate 90° in opposite directions, exactly as my 'leavings' did when they left my reference frame. In the same way the reports of my 'leavings' concerning the place of my nose are contradictive and wrong in respect of me and my reference frame, the reports of the detectors, concerning the spin directions of the particles, are contradictive and wrong in respect of the entangled particles and their reference frames. The place of my nose is like the spin direction of a particle. The only difference is that my nose is always at the front, whereas the spin direction of a particle can have any direction in respect of the line of motion of the particle.

If the spin directions of all particles, detected during one run of an experiment, are considered to be vectors in a vector space, then the perception (or projection) of these vectors show QM's probability (or density) in respect of the reference frames of the particles and they show Bell's probability (or density) in respect of the reference frame of one of the detectors (which is: in respect of the line of motion). This has been described and explained in an exact way in my latest article [1].

Reference:

[1] https://vixra.org/abs/2204.0148