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Quantum Euler angles and agency-dependent spacetime

Quantum gravity is expected to introduce quantum aspects into the description of reference frames. Here we set the stage for exploring how quantum gravity induced deformations of classical symmetries could modify the transformation laws among reference frames in an effective regime. We invoke the quantum group SUq(2) as a description of deformed spatial rotations and interpret states of a representation of its algebra as describing the relative orientation between two reference frames. This leads to a quantization of one of the Euler angles and to the new paradigm of agencydependence: space is reconstructed as a collection of fuzzy points, exclusive to each agent, which depends on their choice of reference frame. Each agent can choose only one direction in which points can be sharp, while points in all other directions become fuzzy in a way that depends on this choice. Two agents making different choices will thus observe the same points with different degrees of fuzziness. Arxiv link (https://arxiv.org/pdf/2211.11347.pdf)

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