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The Multiplicative Domain in Quantum Error Correction

Quantum error correction deals with correcting errors introduced via quantum channels, modelled by trace-preserving completely positive maps. Correctable subsystems are roughly subsystems of the overlying Hilbert space on which the channel has a left inverse. Given a unital completely positive map, the multiplicative domain of that map is the largest subalgebra on which the map acts as a homomorphism. We show that for a unital quantum channel, the correctable subsystems that are correctable via conjugation by a unitary (called *unitarily correctable subsystems*) are exactly what are captured by that map's multiplicative domain. We also show that if we remove the requirement that the map be unital, a weaker relationship between the two notions still holds.

This is joint work with Man-Duen Choi and David Kribs.