An anticode approach to quantum error correction

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Error correcting codes are essential for ensuring reliable data transmission and storage in the presence of errors or data corruption. Designing efficient, high-performance codes requires a deep understanding of their structural and combinatorial properties. A key challenge in classical coding theory is establishing bounds on coding parameters and identifying invariants that provide insight into structure and properties of a code. One powerful tool for this is the theory of anticodes.With the ongoing 'quantum revolution,' quantum communication and computation are transforming information processing through the principles of quantum mechanics. However, the complexity of quantum systems introduces intricate error models, making it challenging to directly apply classical coding theory techniques.In this talk, we present a new framework for analyzing stabilizer codes through an anticode approach. We extend the concept of generalized distance to quantum anticodes and derive the McWilliams identities. This framework leads to new insights into the properties of quantum error-correcting codes and a significant generalization of the quantum cleaning lemma.

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