XIAMEN UNIVERSITY MALAYSIA
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Research Talk XMUM

Quantum stabilizer codes from a group algebra perspective

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Research interests: Algebraic coding theory, quantum error correction, quantum key distribution and other areas of quantum computing

Speaker Introduction

Dr. Kai Lin, Ong is an Assistant Professor at School of Mathematical and Computer Sciences, Heriot-Watt University Malaysia. He was graduated from Universiti Sains Malaysia in 2019, and he have been consistently exploring the intersection of mathematics and computing.

Abstract

Quantum Error Correction (QEC) aims to combat quantum decoherence by encoding quantum information into a subspace of a higher-dimensional Hilbert space. A notable QEC framework, called the stabilizer formalism, was introduced by Gottesman, where a set of error operators is chosen as the stabilizer. The resultant quantum stabilizer code contains all quantum states which remain invariant under every error operator in the stabilizer. This work adopts linear isomorphisms established between selected group algebras and the stabilizers. Through a group algebra perspective, the choice of the underlying group and code generator element enables diverse types of stabilizers to be developed. We study how the dual structure of group algebras, as both vector spaces and rings, allows them to adequately model the additive space structure of stabilizers, with good characterizations on various properties of the underlying quantum stabilizer codes.