The Permutations Paper for non Algebraic Speakers.

David Ponarovsky

May 5, 2023

Abstract

A guide for reading Becker, Lubotzky and Mosheiff's paper for computer scientists. The goal is help the reader by centralize analogs and examples from the combinatorics rather than algebraic.

1 Motivation (Use Cases List).

We start by presenting several use cases that may be of interest to computer scientists.

1. Testing candidates for LTC/QLDPC codes. One of the resources needed for the available constructions is a square complex in which the encoding associates each bit with a face. We can obtain these structures by taking the Left-Right Cayley graph generated by a pair of generator sets A, B, such that $[A, B] = 0$.

2. Testing if a set of stabilizers forms a stabilizer code. Here the stabilizers are subsets of the Pauli group and they form a code only if they all commute.

3. Classical toy-version of QMA complete problem. It's known that decide if two quantum circuits over n qubits are $1/poly$-equivalent is QMA-complete problem. So, One question that could be interesting is to ask given prem' $P = \prod p_i$ and $Q = \prod q_i$ such that p_i (q_i) act over a constant size of bits (assuming binary encoding), then ask whether $P = Q$.