

Young Mathematicians Conference 2018
The Ohio State University, August 10-12

THE SANDPILE GROUP OF CAYLEY GRAPHS

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[Mentor: Victor Reiner]

Abstract of Report Talk: The **Abelian Sandpile Model** and its recurrent configurations, known as the **Sandpile group**, are abundant in modern mathematics and have combinatoric, algebraic, and geometric descriptions. Past work has focused on the sandpile group of the n -dimensional hypercube. In this project, we perform a more general analysis on the Cayley graph of the group \mathbb{F}_2^r and any of its generating sets. While the p -syllow component of the sandpile group has been classified for $p \neq 2$, significantly less is known about the 2-syllow component. In this paper, we use representation theory and ring theory to prove a sharp upper bound for the largest 2-syllow subgroup in the sandpile group of an arbitrary Cayley graph. We also partially classify the number of 2-syllow subgroups in the sandpile group and make further reductions into determining its structure. Using these reductions, we provide a full classification of the sandpile group for the $r = 2$ case and other enlightening results for small r cases.

[Joint work with Vaughan McDonald, Jiyang Gao, Amal Mattoo]

Received: July 21, 2018