# Investigating Bilinear Structures on Adinkras with Few Generators

{ Adam Artymowicz, Sally Dong, Isaac Friend and Kelly Schwiker } PUWS

PIMS

## Objectives

- Investgate what the isomorphisms of adinkras do to the the matrix commutators.
- Extend the definition of the gadget to numbers of generators below 4.

## Node Permutation

Definitions:
$V_{IJ} = L_I R_J - L_J R_I$
$V_{IJ} = R_I \tilde{L}_J - R_J L_I$

Permutation of bosons:
$V_{IJ} \to P V_{IJ} P^{-1}$
$\tilde{V_{IJ}}$ is invariant

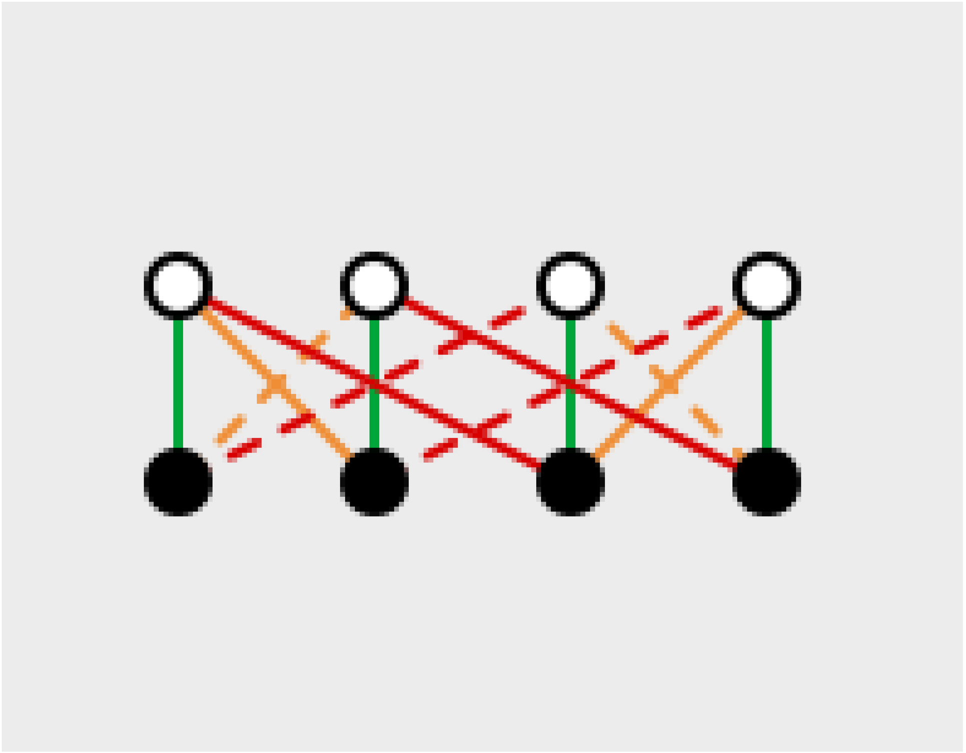
Permutation of fermions:
$V_{IJ}$ is invariant
$\tilde{V_{IJ}} \to P \tilde{V_{IJ}} P^{-1}$ is invariant

## Vertex Switch

Vertex Switch on boson:
$V_{IJ} \to S V_{IJ} S^{-1}$
$\tilde{V_{IJ}}$ is invariant

Vertex Switch on fermion:
$V_{IJ}$ is invariant
$\tilde{V_{IJ}} \to S V_{IJ} S^{-1}$

## Three Generator Adinkra



## Gadget for fewer generators

For 1 generator:
$\mathscr{G}[(R),(R')] = 0$

For 2 generators:
$\mathscr{G}[(R),(R')] = -\frac{1}{4}\sum_{I,J} Tr[(\tilde{V_{IJ}})^{(R)}(\tilde{V_{IJ}})^{(R')}]$

For 3 generators:
$\mathscr{G}[(R),(R')] = -\frac{1}{24}\sum_{I,J} Tr[(\tilde{V_{IJ}})^{(R)}(\tilde{V_{IJ}})^{(R')}]$

As a first step towards generalizing these calculations for arbitrary N, we wrote an algorithm which calculated the subgroup lattice of $\mathbb{F}_2^n$, with the aim of using these subgroups to generate N-regular chromotopologies

## Contact Information

Adam Artymowicz:
a.artymowicz@mail.utoronto.ca
Sally Dong:
sally.dong@uwaterloo.ca
Isaac Friend:
icfriend@uchicago.edu
Kelly Schwiker:
ks1518@messiah.edu

## Reference

M. Calkins, D.E.A. Gates, S. James Gates, Jr., and K. Stiffler. "Adinkras, 0-branes, Holoraumy and the SUSY QFT/QM Correspondence".

Kevin Iga. Personal Interview.