# Topological Rigidity of Davis Orbicomplexes

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Young Geometric Group Theory X

# Topological Rigidity

$\chi$, a class of topological spaces, is topologically rigid if for all X, X' $\in \chi$, $\pi_1(X) \cong \pi_1(X')$ implies X and X' are homeomorphic.

Examples:

- Thick, hyperbolic 2-dimensional P-manifolds (Lafont)
- Certain quotients of Fuchsian buildings (Xie)
- Simply-connected, closed 3-manifolds (Perelman)

# Right-Angled Coxeter Groups

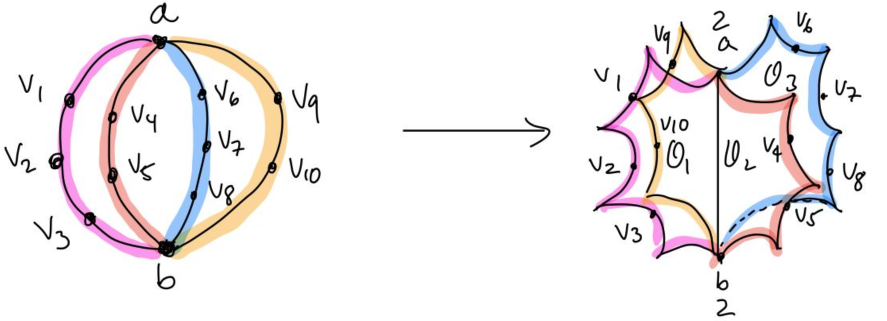
Let $\Gamma$ be a finite simplicial graph. The right-angled Coxeter group (RACG) with defining graph $\Gamma$ is:

$$W(\Gamma) = \langle v \in V(\Gamma) : v^2 = 1, [v, w] = 1 \text{ for } \{v, w\} \in E(\Gamma) \rangle$$

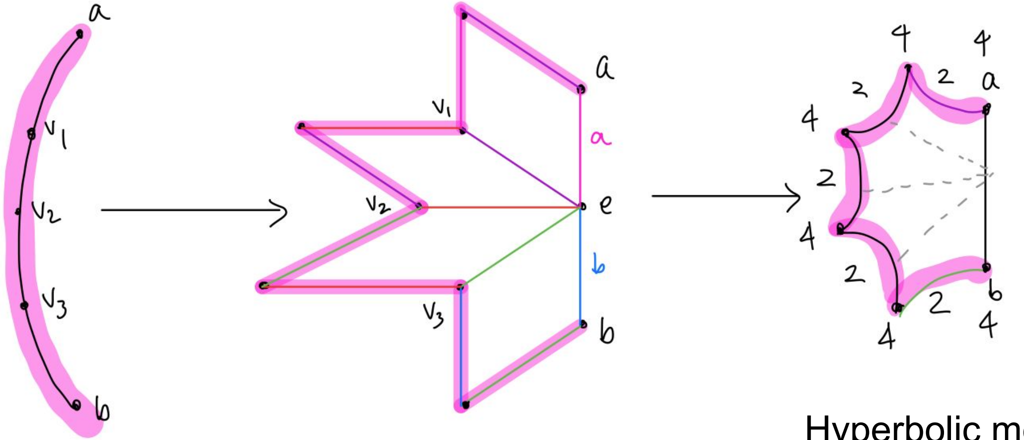
# Davis Orbicomplex of W(Γ)

O(Γ) = (Presentation complex of W(Γ)) / W(Γ)

Γ



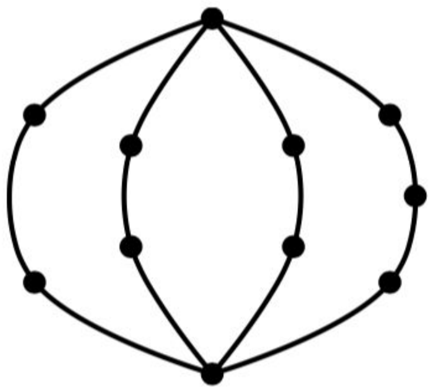

O(Γ)




Piecewise flat metric

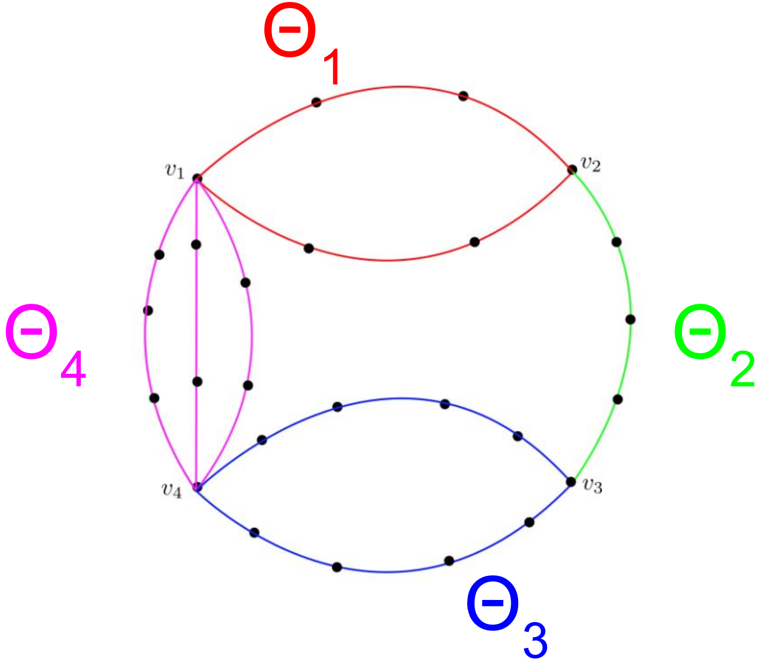
Hyperbolic metric

# Cycles of Generalized Θ Graphs



Generalized Θ graph

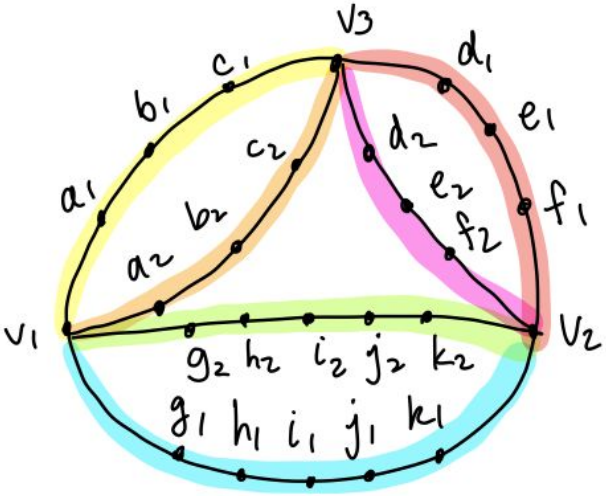
Source: Pallavi Dani

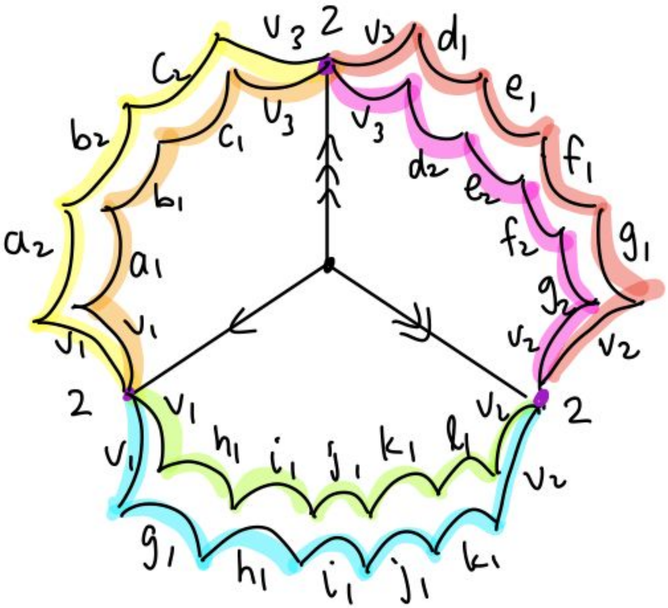



Cycle of generalized Θ graphs

# Past Work

**Theorem** (Stark 2017): Let Γ = cycle of generalized Θ graphs. Then X is not topologically rigid.



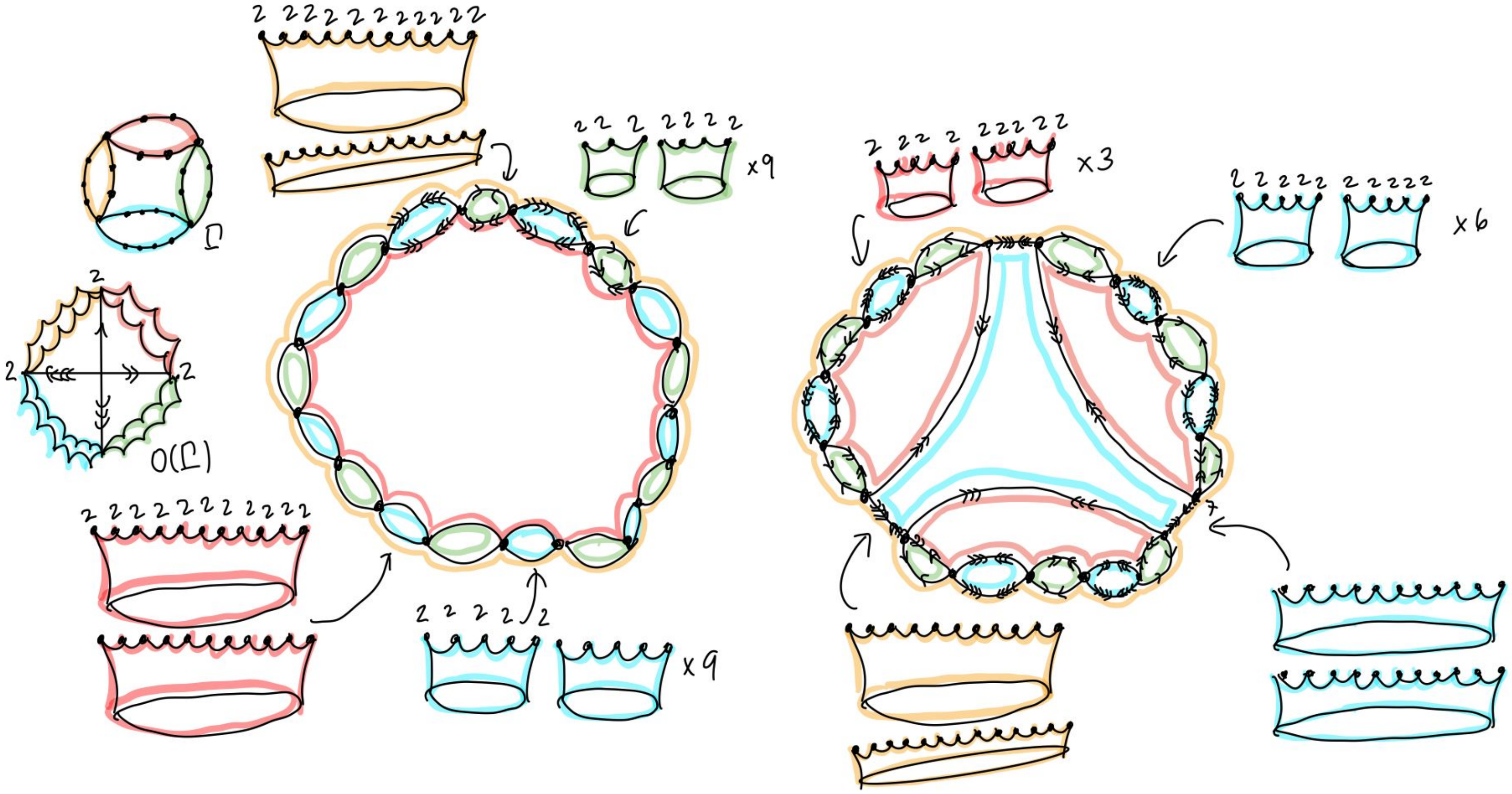
$W$ = any set of RACGs

$X = O(\Gamma)$ and their finite-sheeted covers

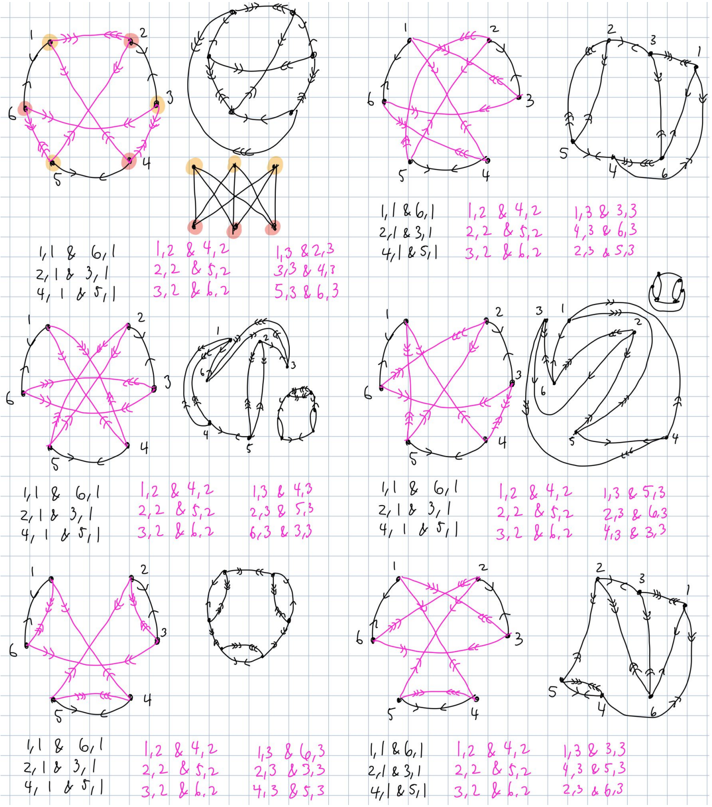
**Open question:** Is $X$ topologically rigid?

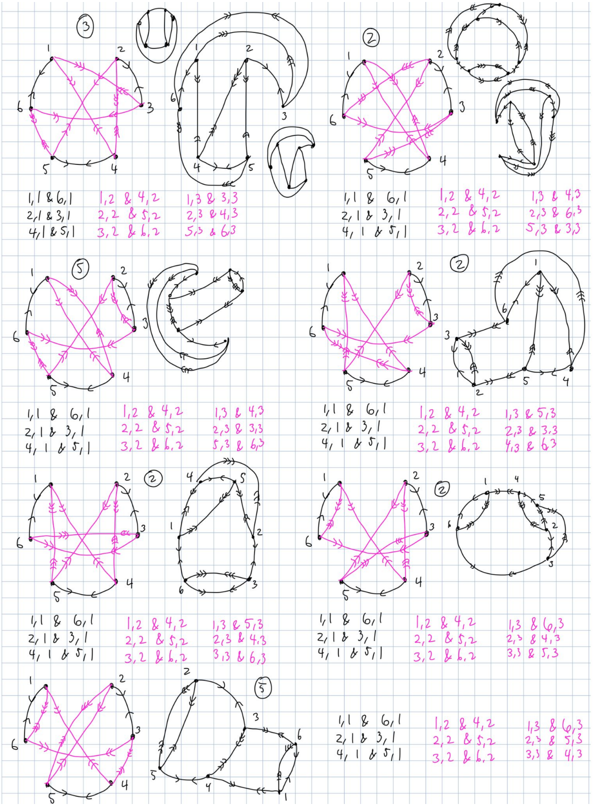
**More specific question:** What conditions on the Euler characteristic vectors are obstructions to topological rigidity?

# Commensurability of Euler Characteristic vectors



# There are a lot of possible covers...





# Graphs (covers of singular subsets) may be nonplanar