Efficient Methods for Order Reduction of Zonotopes

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Zonotopes

- Zonotopes are set representations defined by

\[ Z = \{ c + \sum_{i=1}^{p} \alpha_i g^{(i)} | \alpha_i \in [-1, 1] \}, c \in \mathbb{R}^n, g^{(i)} \in \mathbb{R}^n \]

- \( Z \) is the Minkowski sum of line segments \( l^{(i)} = [-1, 1]g^{(i)} \)

[M. Althoff: CORA 2015 Manual]
Order Reduction of Zonotopes: Different Ways

[Graphs showing zonotopes in different dimensions and orientations]
Different ways possible to reduce zonotope order

Resulting zonotopes and computation times differ significantly

**Goal:** Find a fast and numerical stable approach for order reduction of high-dimensional zonotopes

**Tasks:**
- Develop new approach for order reduction of zonotopes
- Implement new approach and/or existing approaches in Matlab
- Compare the approaches
Questions?

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