

Efficient Methods for Under-Approximation of Zonotopes

Bastian Schürmann

Technische Universität München

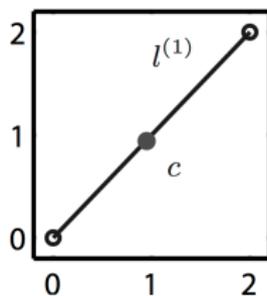
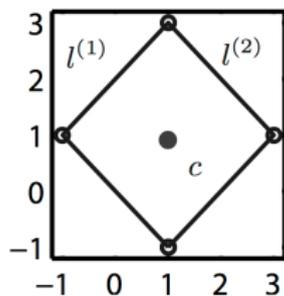
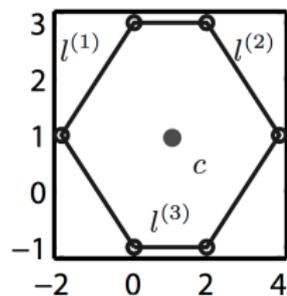
July 7, 2017

Zonotopes

- Zonotopes are set representations defined by

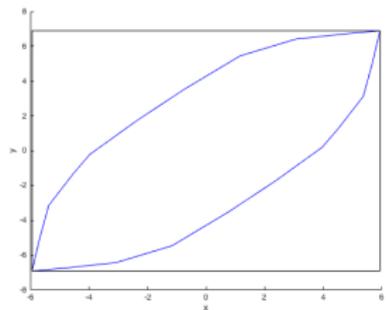
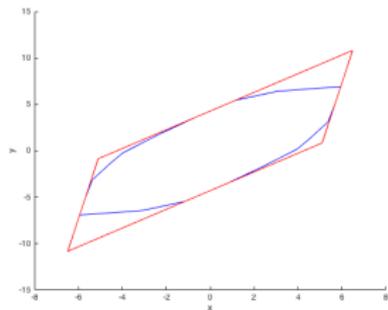
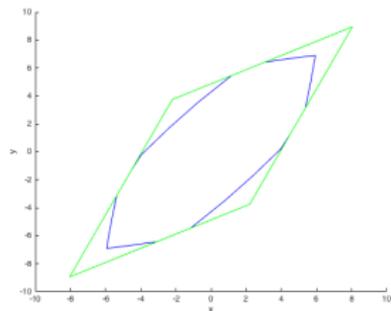
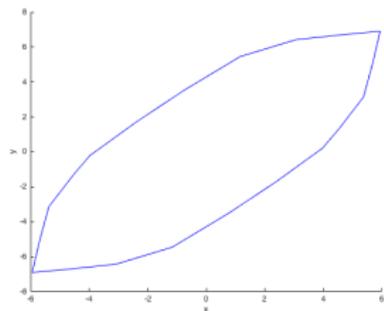
$$\mathcal{Z} = \left\{ c + \sum_{i=1}^p \alpha_i g^{(i)} \mid \alpha_i \in [-1, 1] \right\}, c \in \mathbb{R}^n, g^{(i)} \in \mathbb{R}^n$$

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

(a) $c \oplus l^{(1)}$ (b) $c \oplus l^{(1)} \oplus l^{(2)}$ (c) $c \oplus \dots \oplus l^{(3)}$

[M. Althoff: CORA 2015 Manual]

Over-Approximation of Zonotopes: Different Ways



Topic: Efficient Methods for Under-Approximation of Zonotopes

- Different ways exist to over-approximate zonotopes
- Not many efficient ways exist for under-approximation
- **Goal:** Find a fast and numerical stable approach for under-approximation of high-dimensional zonotopes
- **Tasks:**
 - Develop new approaches for under-approximation of zonotopes
 - Implement new approaches in Matlab
 - Compare the approaches

Questions?

Contact:

Bastian Schürmann

MI 03.07.039

bastian.schuermann@in.tum.de