Comparison of Methods for Computing Closed-Form Expressions of Convex Combinations

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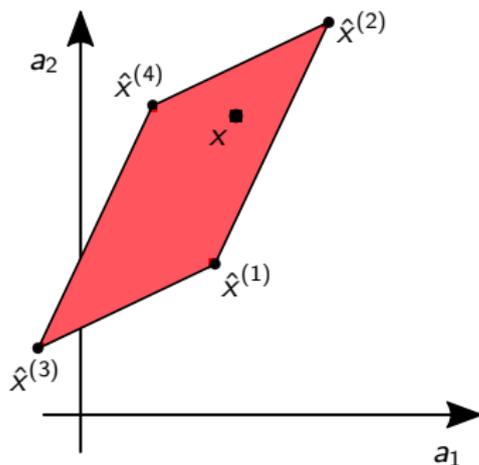
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Convex Combinations

Any point x in a convex set $\mathcal{S}$ can be expressed as a convex combination of the extreme points $\hat{x}^{(i)}$

$\Rightarrow$ One can find λ_i such that

- $\lambda_i \geq 0$
- $\sum_{i=1}^{p} \lambda_i = 1$
- $\sum_{i=1}^{p} \lambda_i \hat{x}^{(i)} = x$

Closed-Form Expressions of Convex Combinations

- Convex combinations are used for many applications, including the control of linear parameter-varying systems, which can be used for e.g., space ships, wind power plants, robotic systems, etc.

- In many cases it is helpful or even required to have closed-form expressions of convex combinations, e.g. for faster computation times or for safety verification

- Different approaches exist for computing such closed-form expressions, many of them specialized or restricted to certain shapes

Topic: Comparison of Methods for Computing Closed-Form Expressions of Convex Combinations

Tasks:

- Review literature about existing methods
- Implement new algorithms and/or improve existing implementations for obtaining closed-form expressions of convex combinations
- Compare the runtime and the complexity of different approaches

Questions?

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