SW7

Cutting Plane Method:

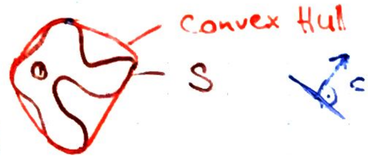
Let P and P' be two formulations for ILP Π: $\max\{c^T x : x \in P \cap \mathbb{Z}^n\}$

P' is called a better formulation for Π if $P' \subseteq P$ // Wenn P' komplett in P abgebildet werden kann.

What is the best formulation? → the convex hull, which is the thightest polyhedrun around the integer Points.

Problem here: It is hard or impossible to find the description of the conved hull.

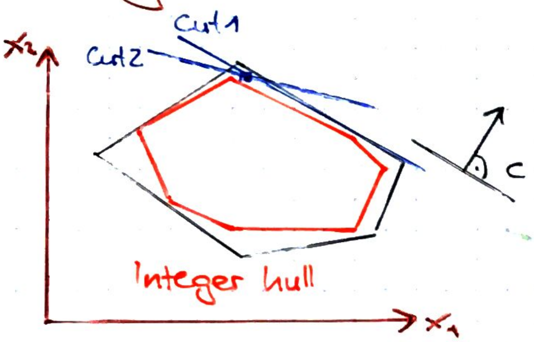
Behavior Convex Hull:



Convex hull = Integer hull

→ The optimum of the convex hull is always a feasible solution in the solution space.

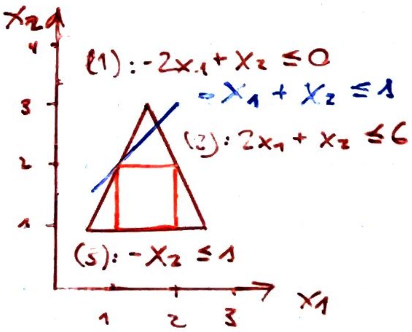
Cutting Plane Method



We are searching cutting planes, which cut the original polyhedrum but not the integer hull.

Cut 1: $\{x \in \mathbb{R}^n : \alpha x = \beta\}$

Gomory-Chvatal-Cut:



Combine inequalities: $3/4 \cdot (1) + 1/4 \cdot (2)$

$\Rightarrow = (-3/4\, 2x_1 + 3/4\, x_2) + (1/4\, 2x_1 + 1/4\, x_2) \leq 3/4\, 0 + 1/4 \cdot 6$

$= -x_1 + x_2 \leq 1\,1/2 = \underbrace{-x_1 + x_2 \leq 1}$

1 1/2 kann gekürzt werden, da wir nur integer suchen.

Matrix notation: $A = \begin{bmatrix} -2 & 1 \\ 2 & 1 \\ 0 & -1 \end{bmatrix}$ $b = \begin{bmatrix} 0 \\ 6 \\ -1 \end{bmatrix}$

- $u = (3/4, 1/4, 0)^T \geq 0$
- $a := u^T A = (-1, 1)^T$
- $\beta := u^T b = 1\,1/2$

G-C-Cut: $a^T x \leq \lfloor \beta \rfloor$

// The coeffitients for the combination can only be found by guessing

The coeffitients don't need to be 1 in total, but they need to result a non-integer on the right hand side of the inequality.