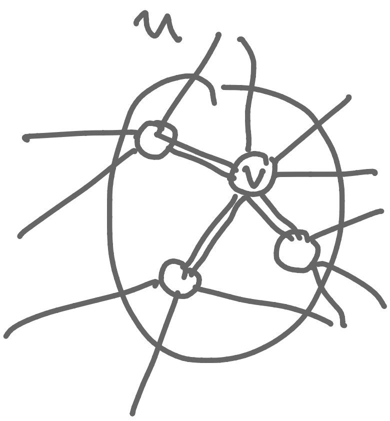
$\boxed{\text{KO} \quad 6.12.16}$

$$P^{perf}_{match}(G) = \mathrm{conv}\{\chi(M) : M \subseteq E \text{ perfektes Matching}\}$$

$$x_e \geq 0 \qquad \forall e \in E$$
$$x(\delta(v)) = 1 \qquad \forall v \in V$$
$$x(\delta(U)) \geq 1 \qquad \forall U \subseteq V,\ |U| \in 2\mathbb{Z}+1$$

- Sei $U \subseteq V$, $|U| \in 2\mathbb{Z}+1$

- Summiere $x(\delta(v)) = 1$ für alle $v \in U$:



$$2x(E(U)) + x(\delta(U)) = |U|$$

- Subtrahiere diese (für die affine Hülle von $P^{perf}_{match}(G)$ gültige Gleichung) von $x(\delta(U)) \geq 1$:

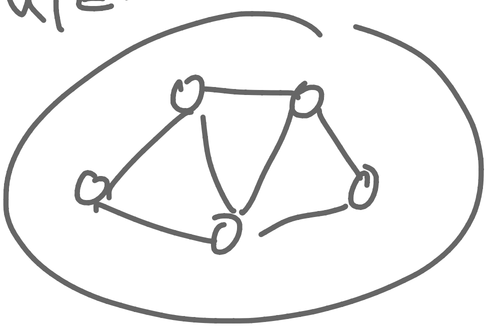
$$-2x(E(U)) \geq 1 - |U| \qquad \Big|\cdot\left(-\tfrac{1}{2}\right)$$

$$x(E(U)) \leq \frac{|U|-1}{2} = \left\lfloor \frac{|U|}{2} \right\rfloor$$

Kor. 3.32: Für $G=(V,E)$ ist $P^{perf}_{match}(G)$ beschrieben durch:

$$
\begin{aligned}
x_e &\geq 0 && \forall e \in E \\
x(\delta(v)) &= 1 && \forall v \in V \\
x(E(U)) &\leq \left\lfloor \frac{|U|}{2} \right\rfloor && \forall U \subseteq V,\ |U| \in 2\mathbb{Z}+1
\end{aligned}
$$

$|U| \in 2\mathbb{Z}+1$

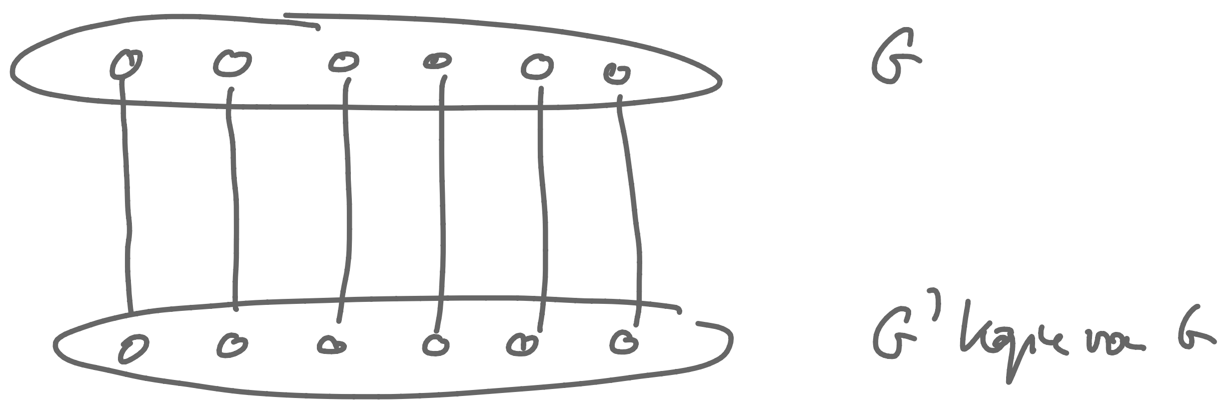


Satz 3.33: Für $G=(V,E)$ ist $P_{match}(G)$ beschrieben durch:

$$
\begin{aligned}
x_e &\geq 0 && \forall e \in E \\
x(\delta(v)) &\leq 1 && \forall v \in V \\
x(E(U)) &\leq \left\lfloor \frac{|U|}{2} \right\rfloor && \forall U \subseteq V,\ |U| \in 2\mathbb{Z}+1
\end{aligned}
$$

"Blüten-Ungleichungen"

Zum Beweis:



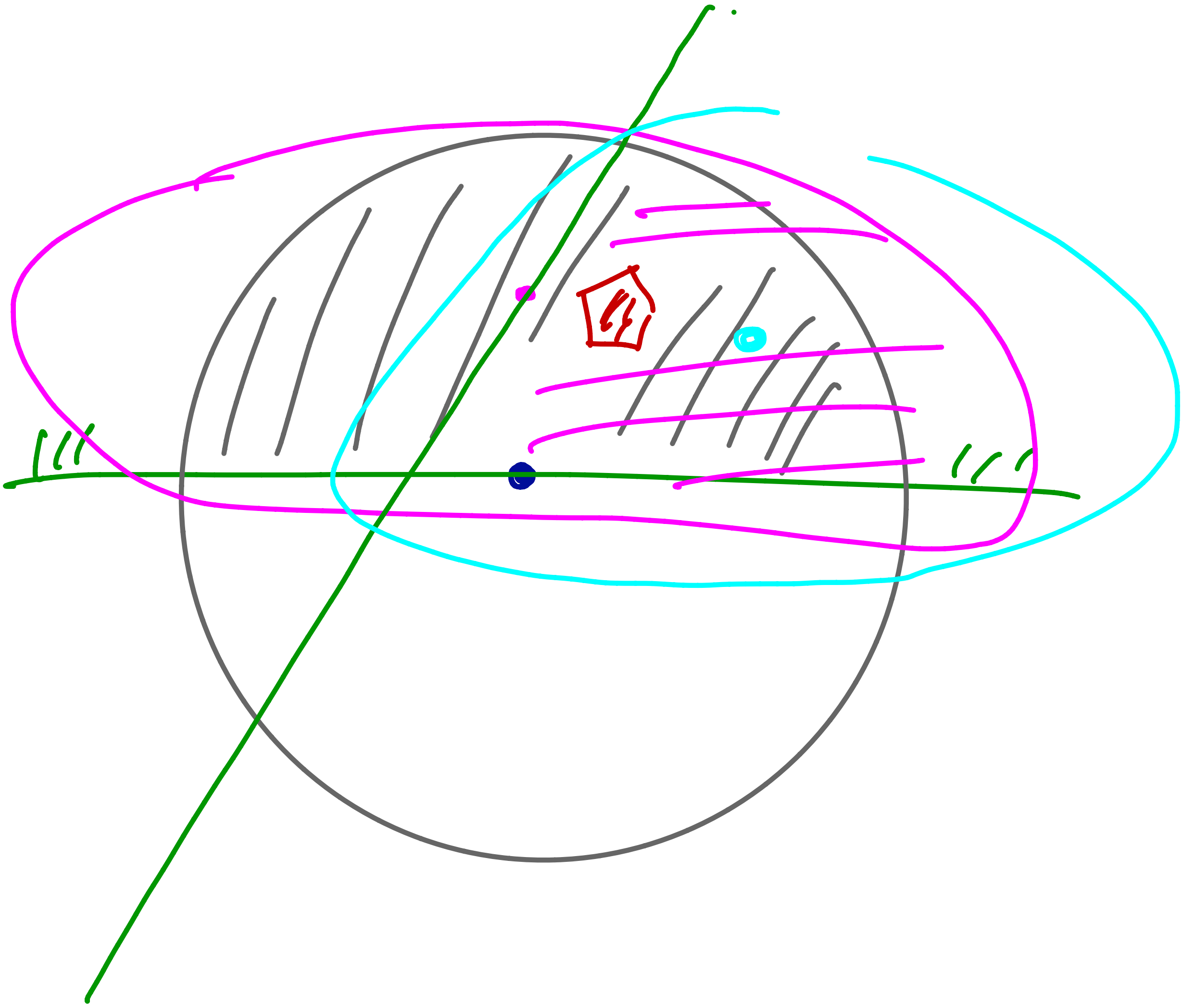
Algorithmen via Linearer Optimierung

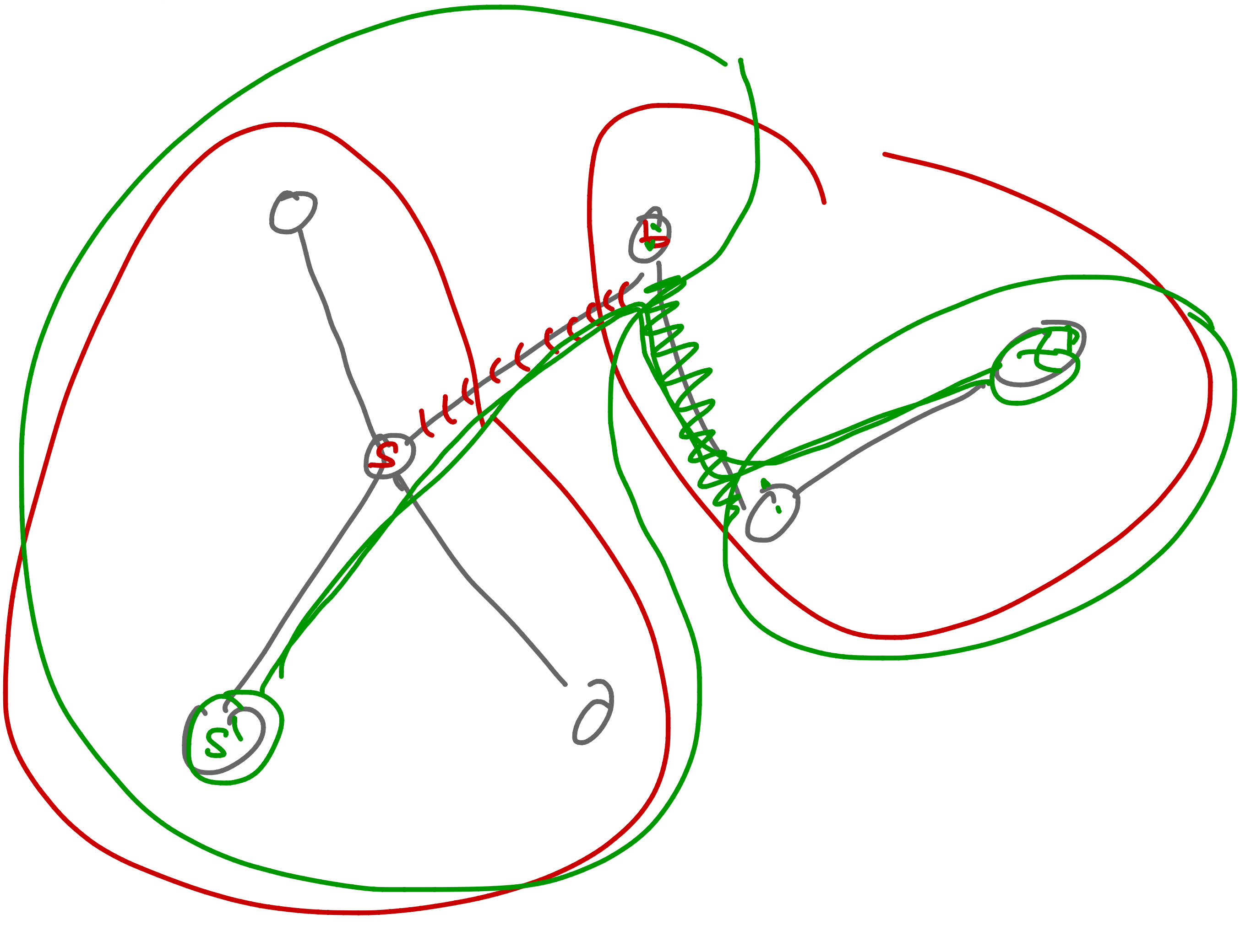
Hier nur für perfekte Matchings:

LP-Formulierung:

$$
\begin{aligned}
\min \quad & \langle c, x \rangle \\
& x(\delta(v)) = 1 && \forall v \in V \\
& x(\delta(U)) \geq 1 && \forall U \subseteq V, \ |U| \in 2\mathbb{Z}+1 \\
& x \geq \mathbb{0}_E
\end{aligned}
\tag{3.6}
$$

Problem: Exponentiell viele Ungleichungen.

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