Offline Bewegungsplanung: SWR und Touring

Elmar Langetepe
University of Bonn

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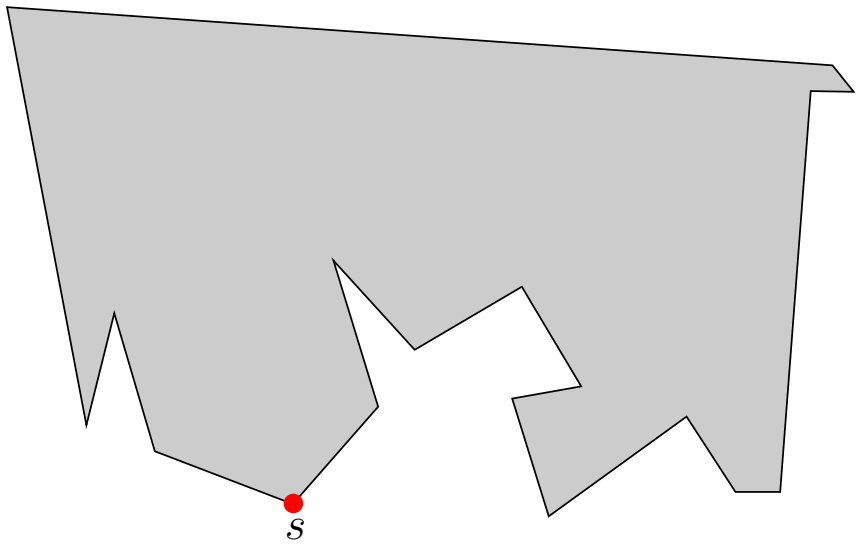

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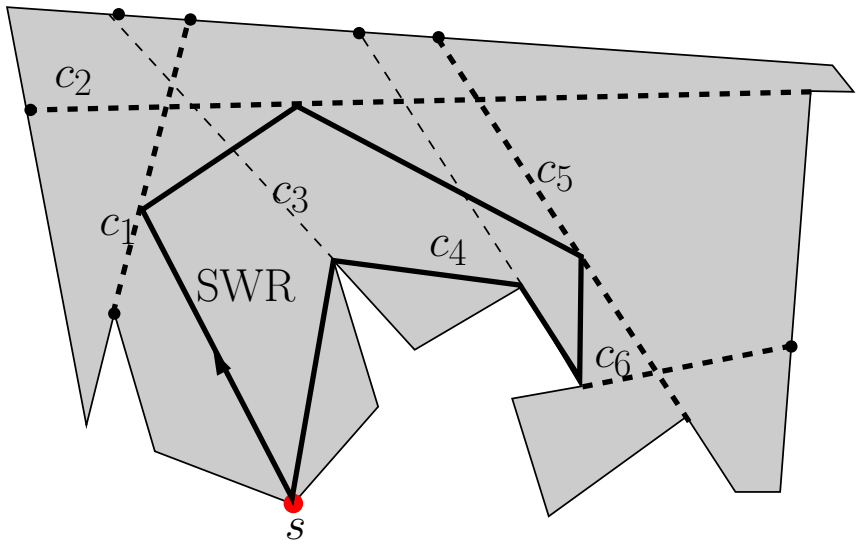

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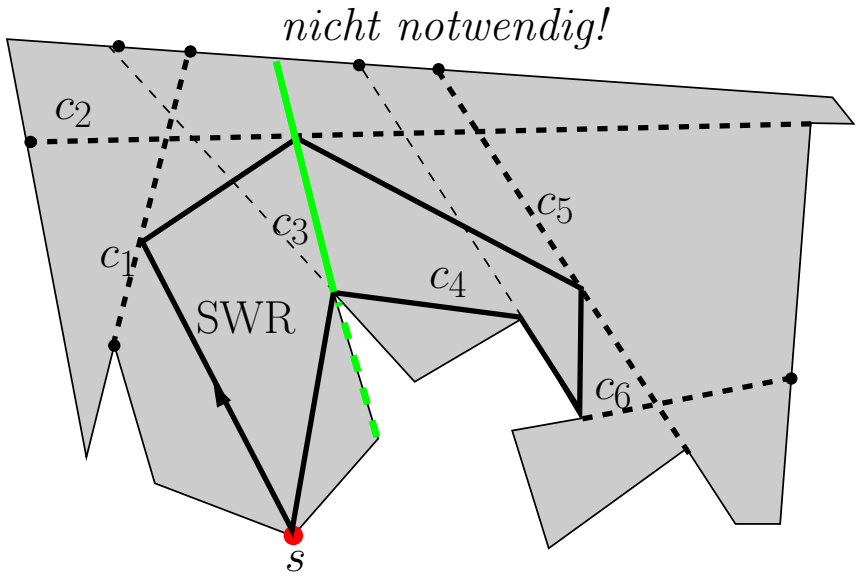

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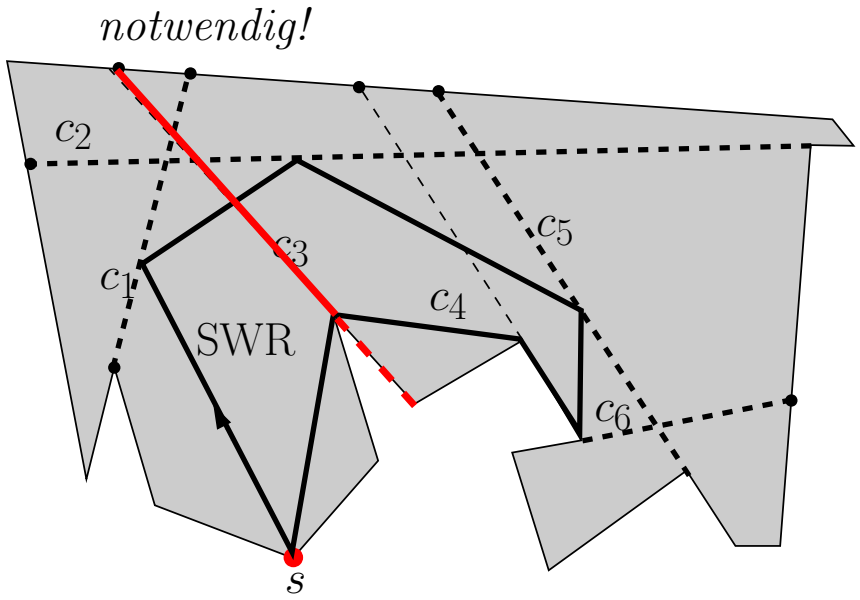

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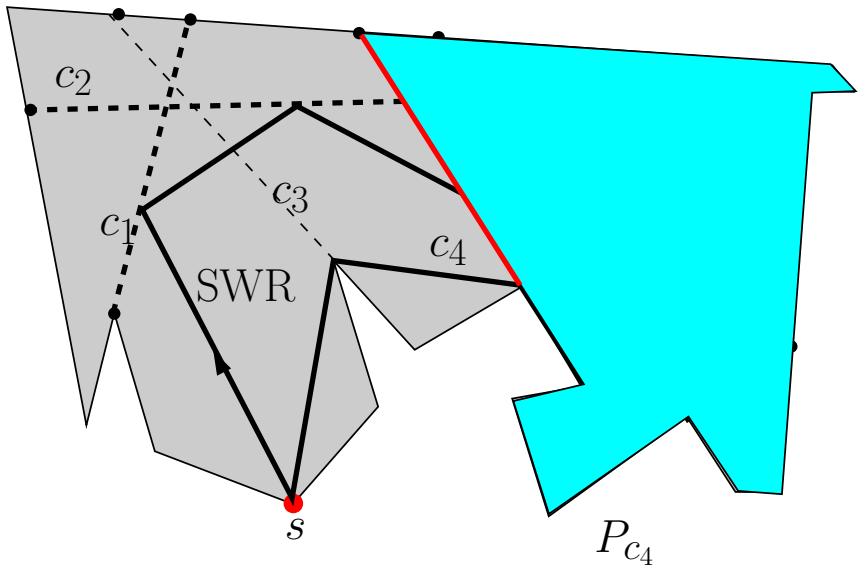

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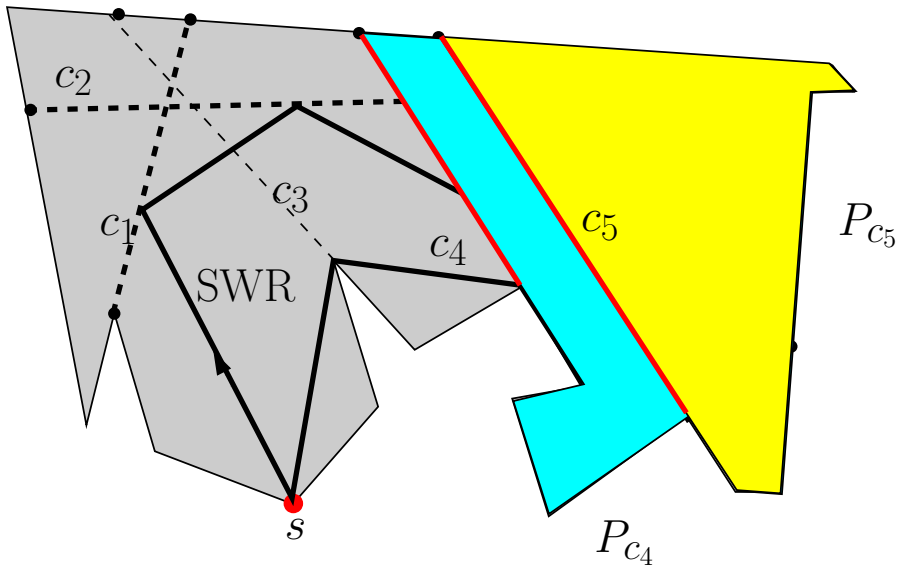

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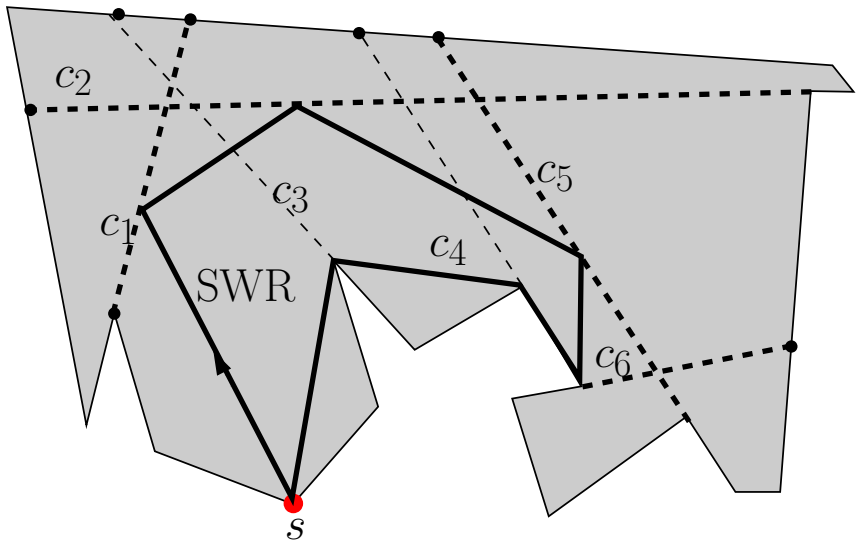

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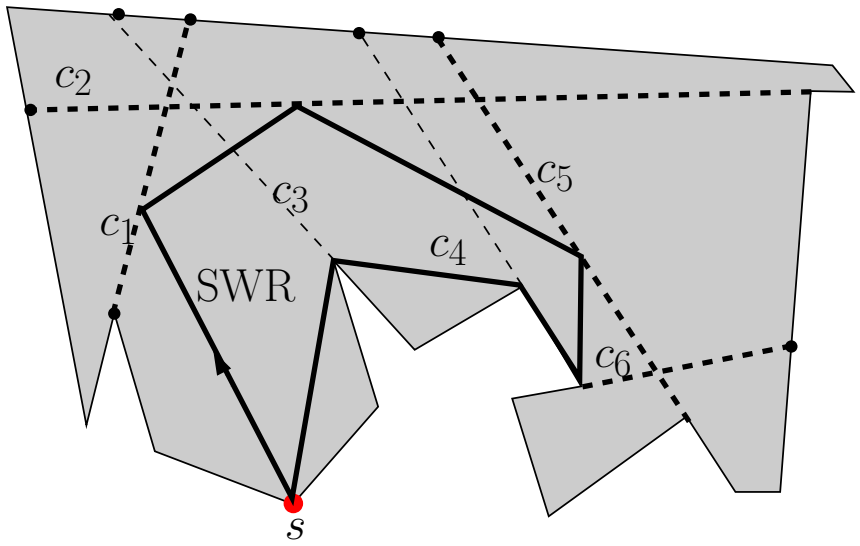

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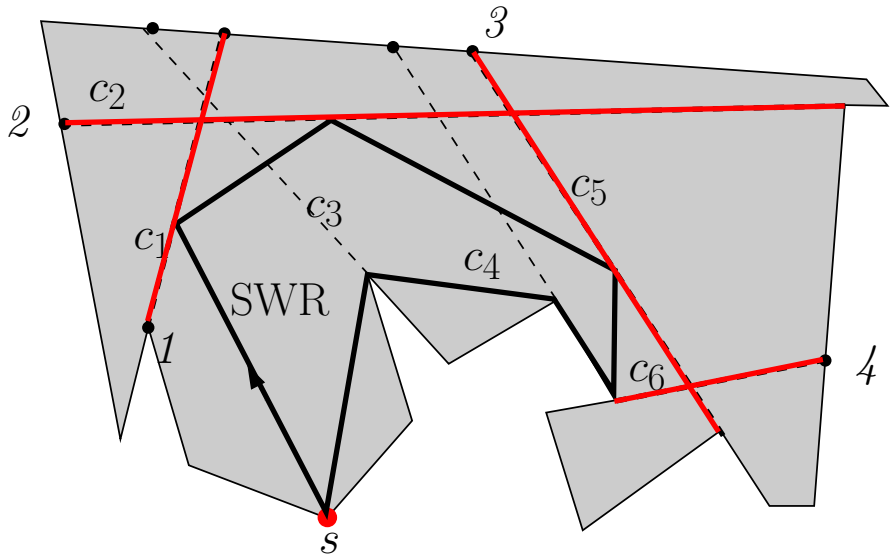

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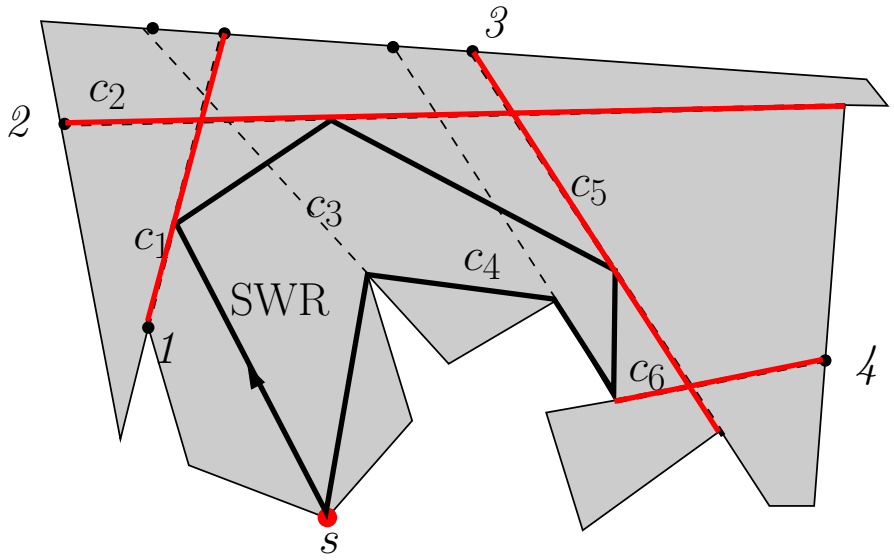

Lemma 1.26 Ordnung entlang des Randes

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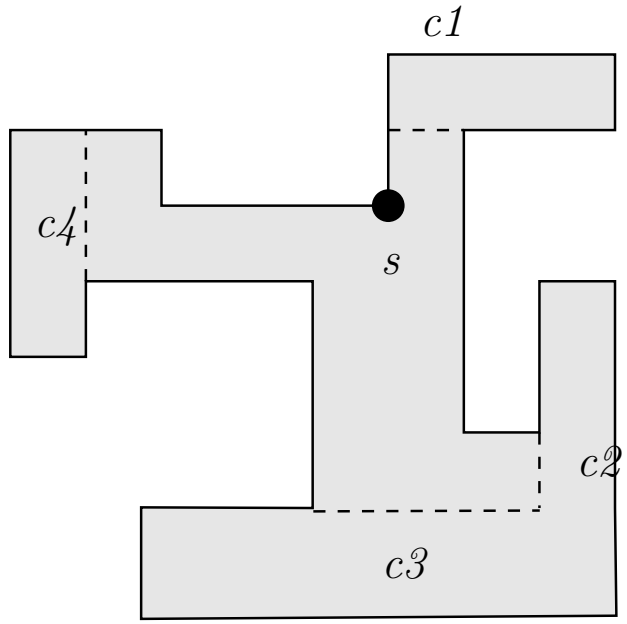

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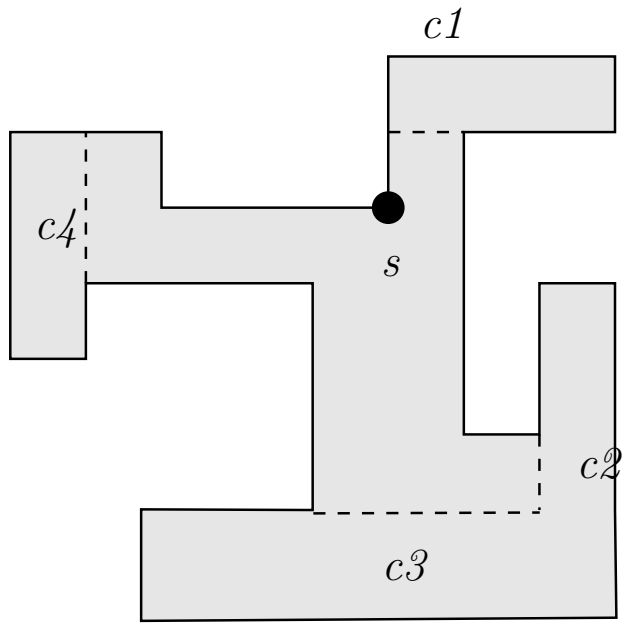

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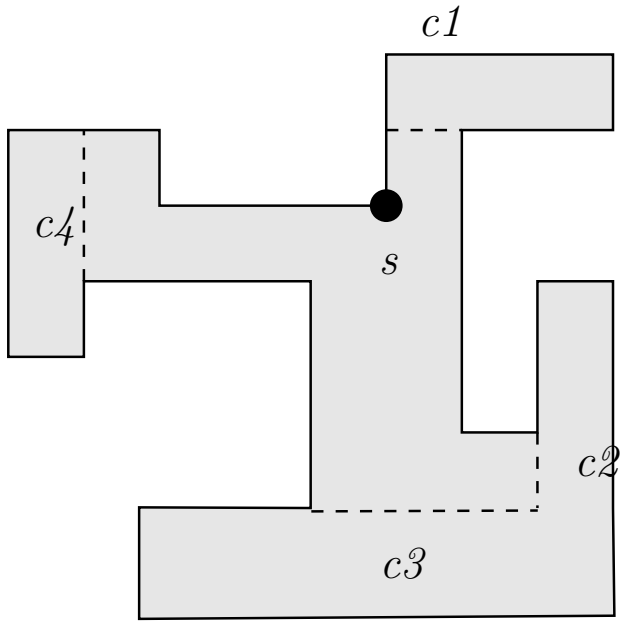

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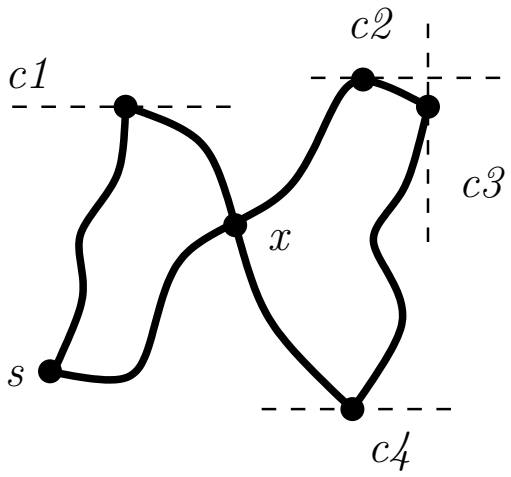

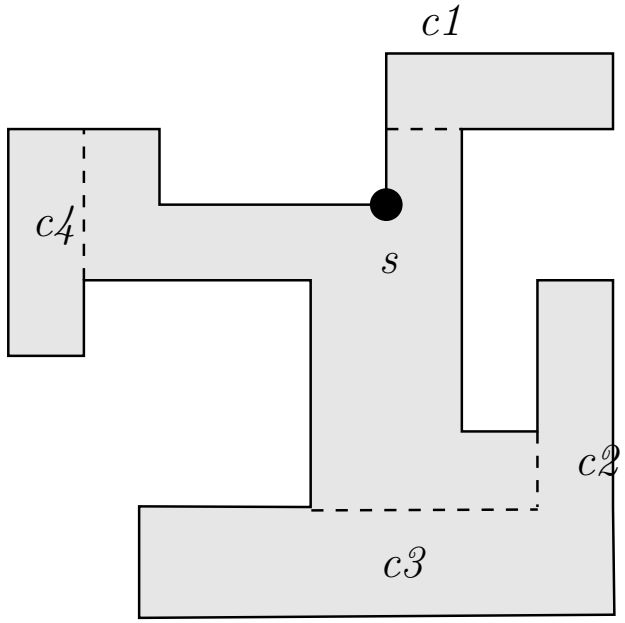

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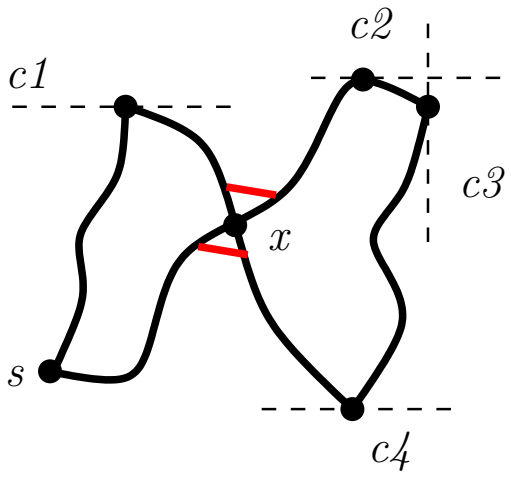

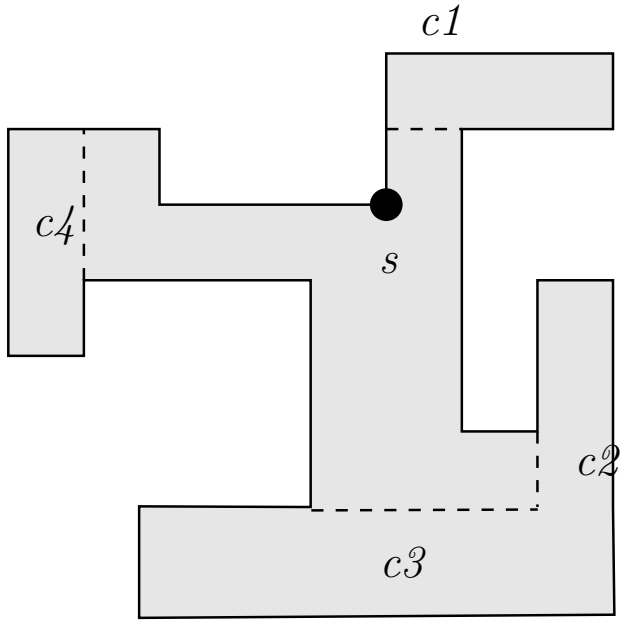

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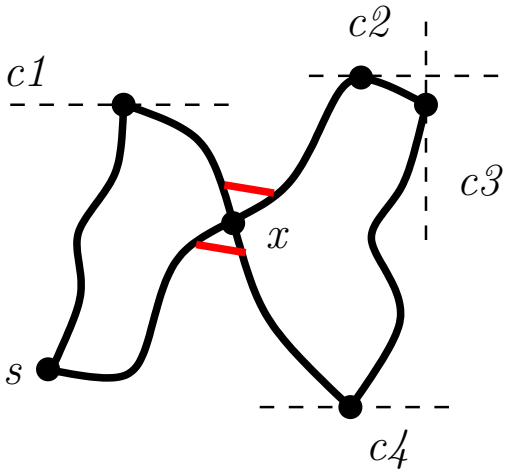

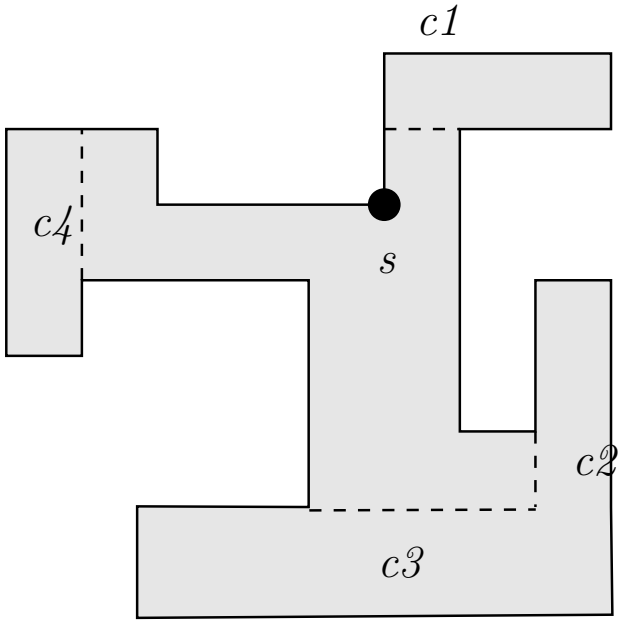

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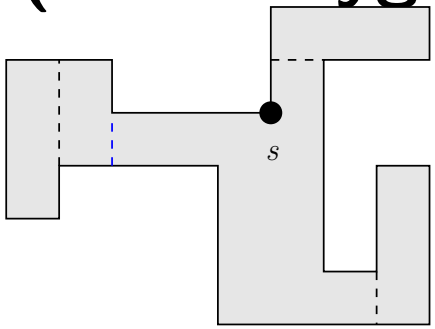

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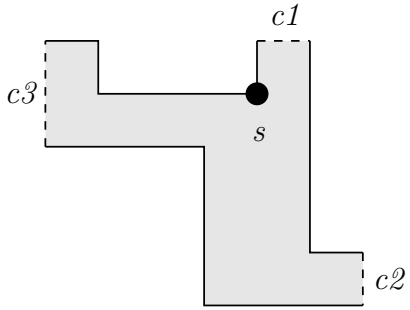

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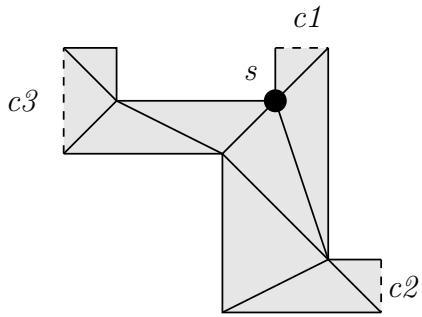

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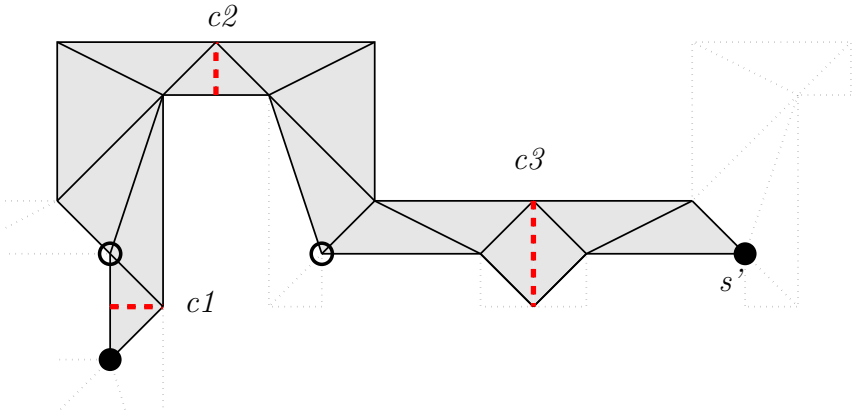

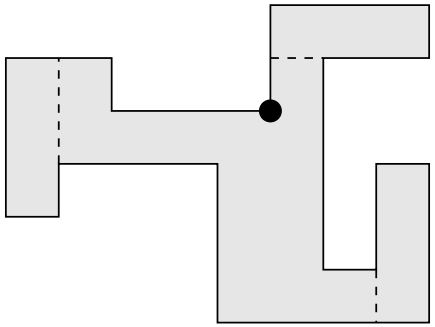

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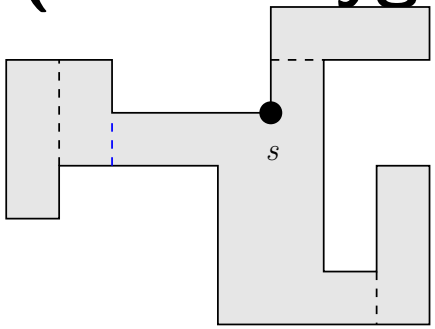

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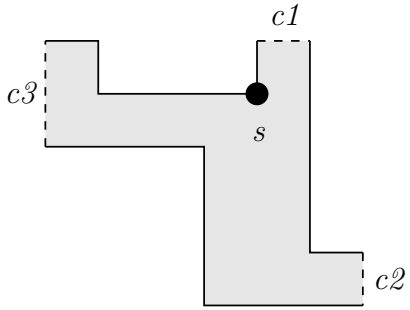

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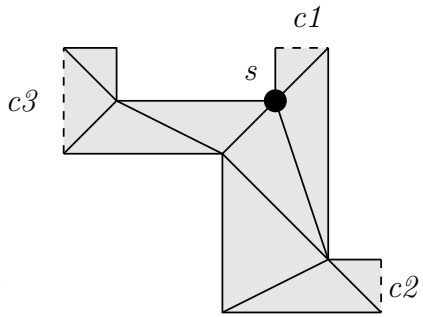

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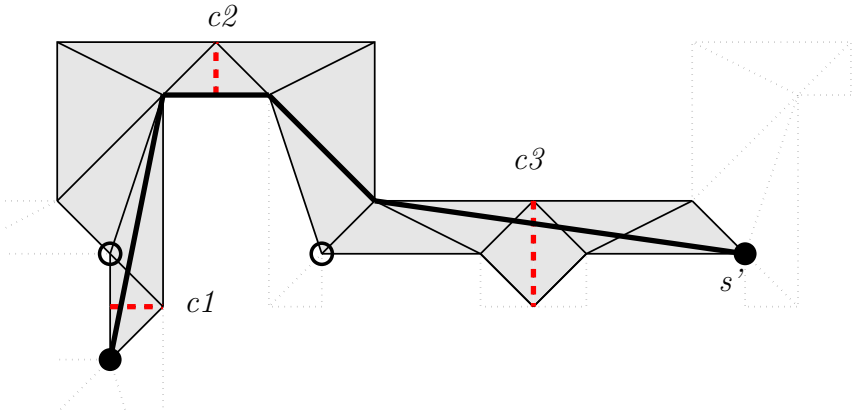

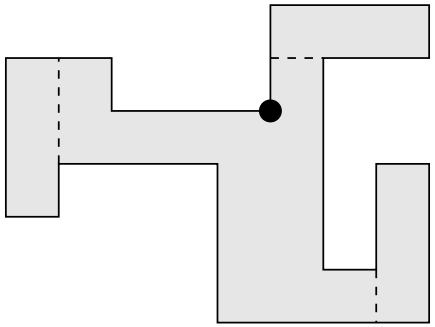

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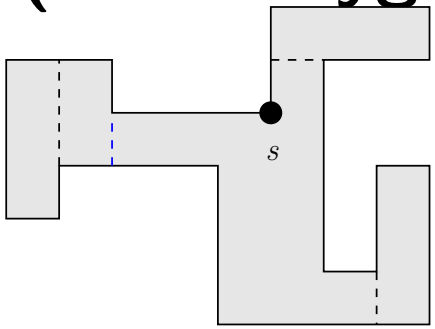

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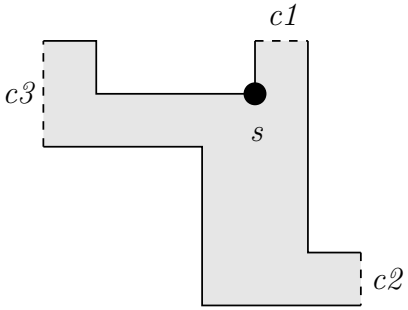

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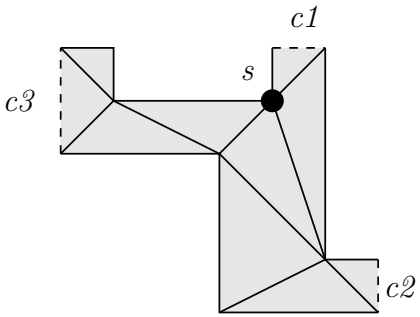

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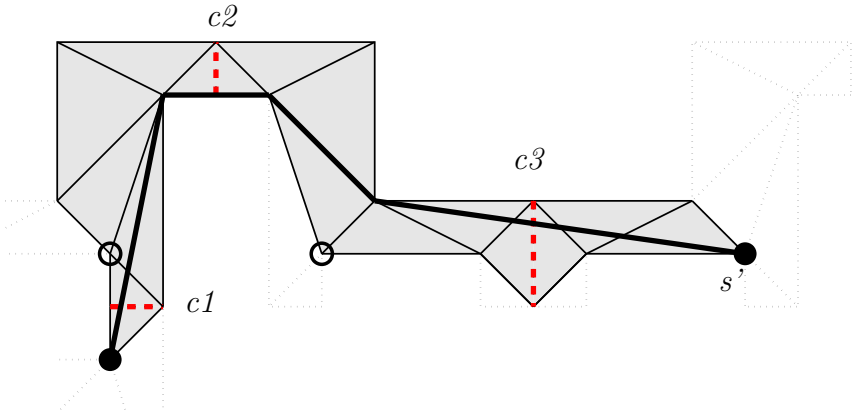

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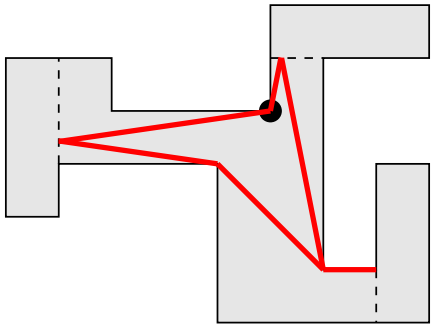

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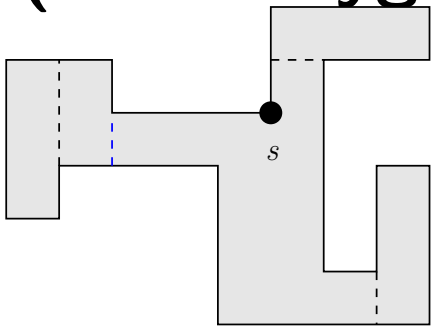

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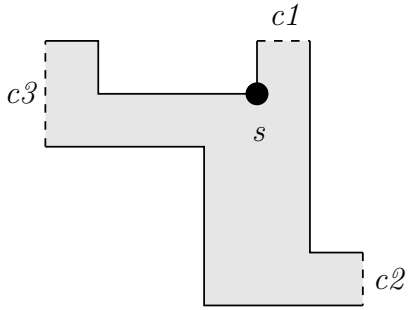

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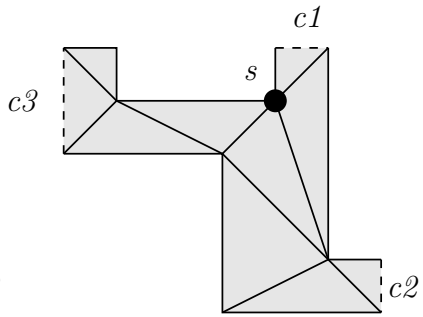

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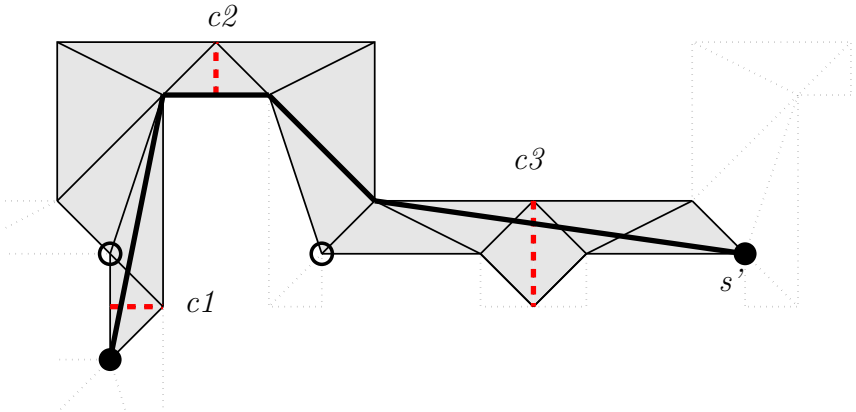

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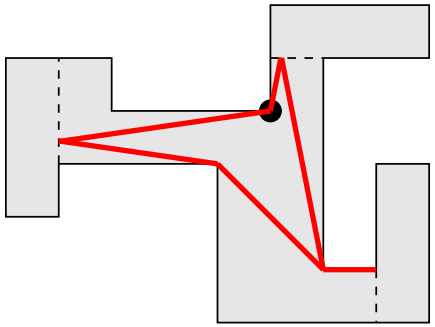

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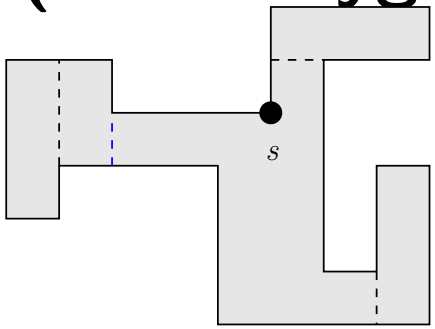

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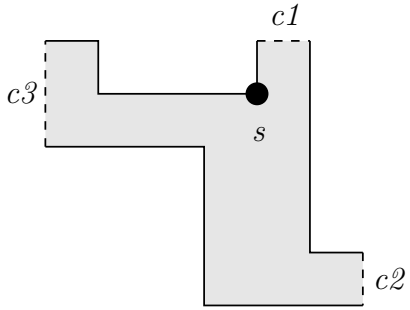

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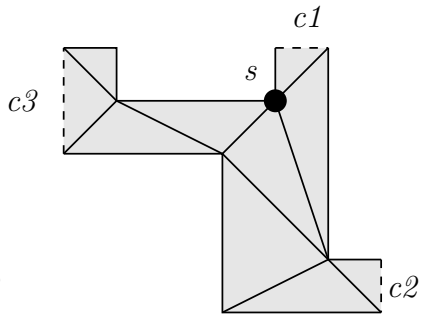

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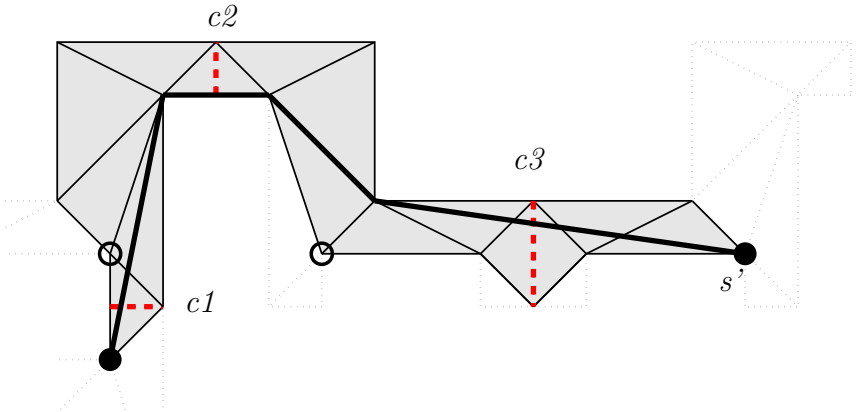

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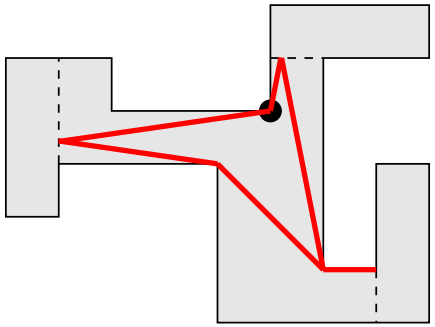

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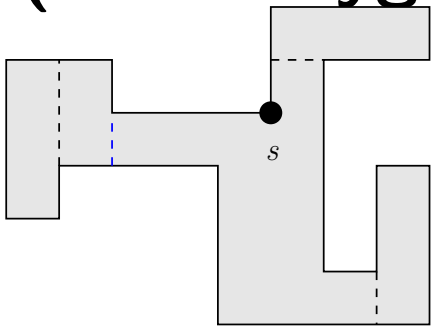

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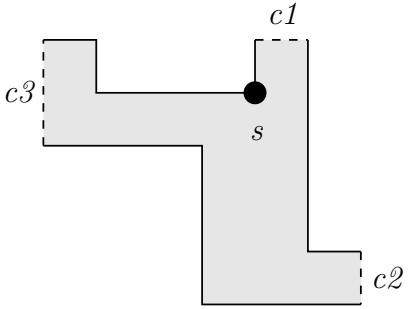

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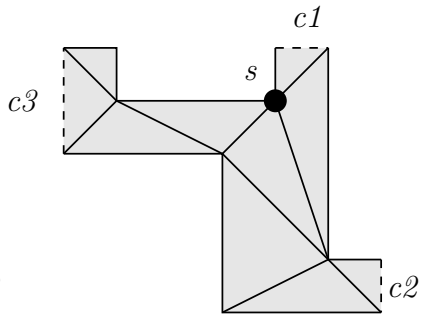
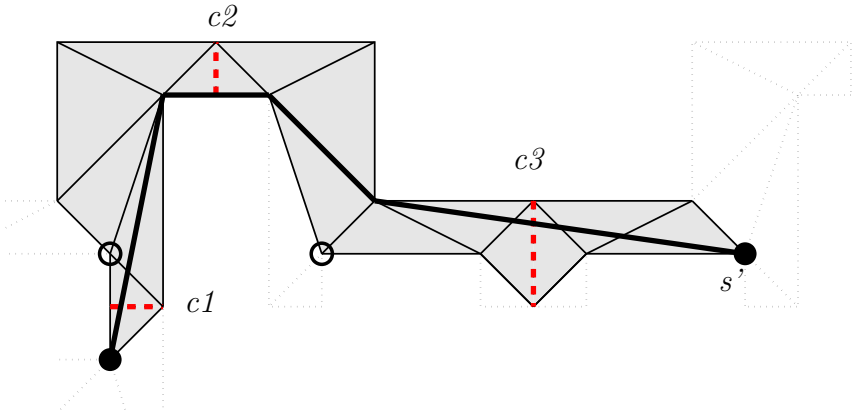
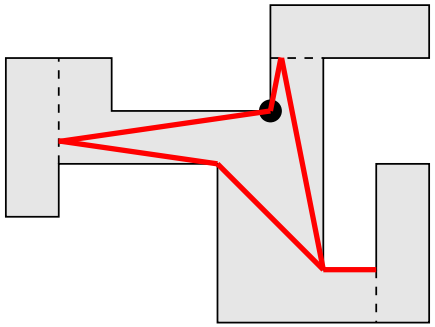
O(n)



(iii) Triangulation
O(n)

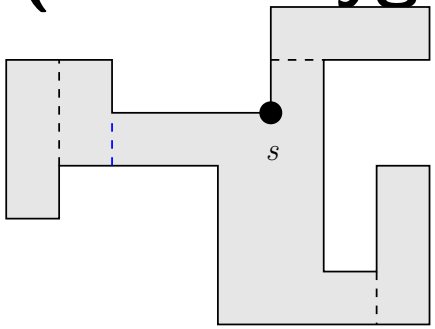


(iv) Spiegeln und Ausrollen!!
(v) Weg berechnen



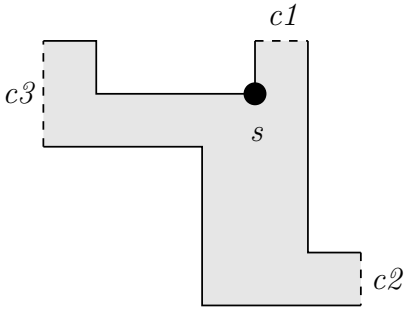
(vi) Zusammenklappen!

SWR (RW Polygon) Alg. 1.9/Th. 1.27: $O(n)$



(i) Wesentliche Cuts

O(n)



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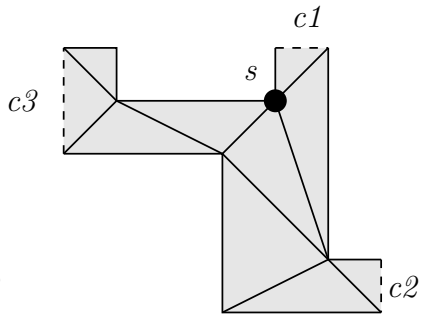

(iii) Triangulation

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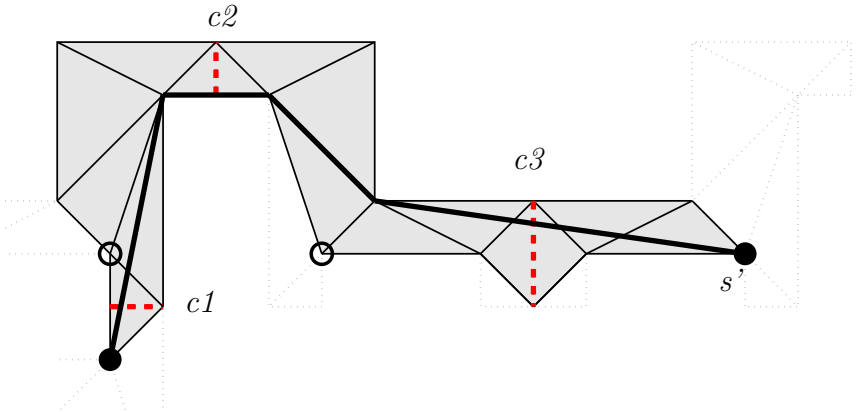

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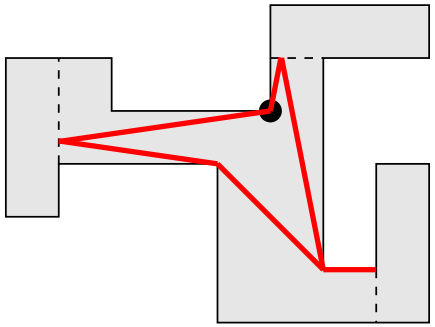

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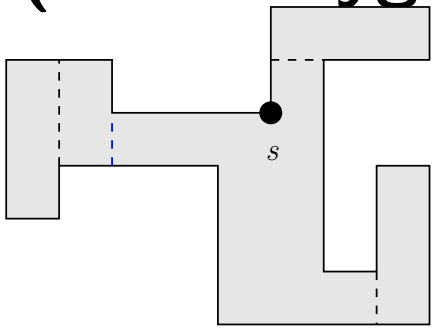

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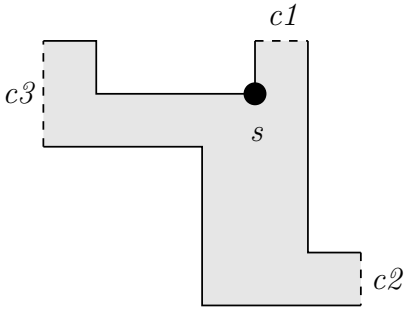

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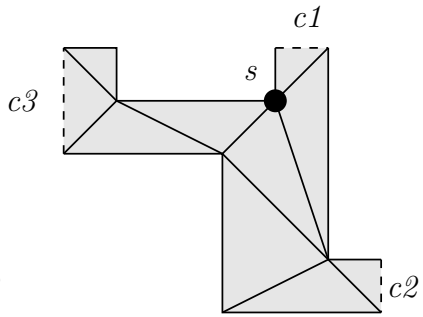

(iii) Triangulation

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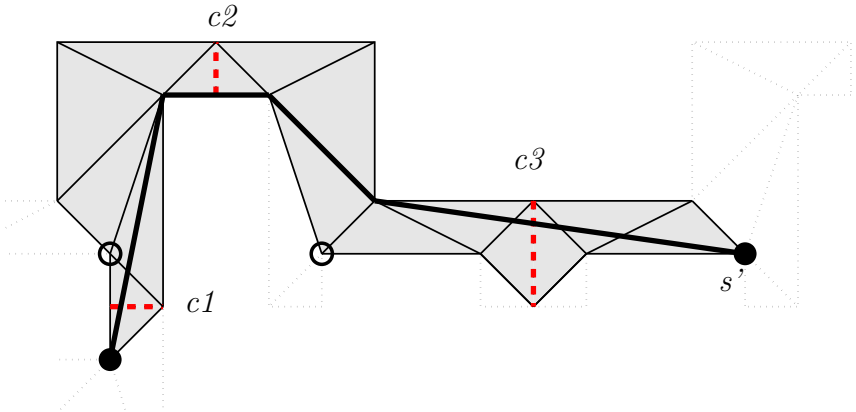

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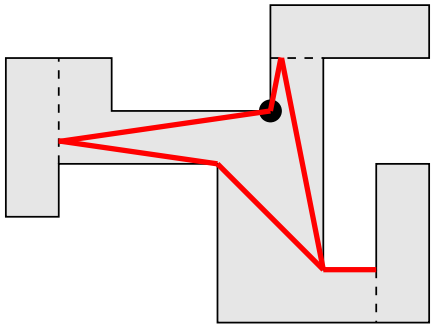

(vi) Zusammenklappen!

O(n)

SWR (Allgemeiner Fall)

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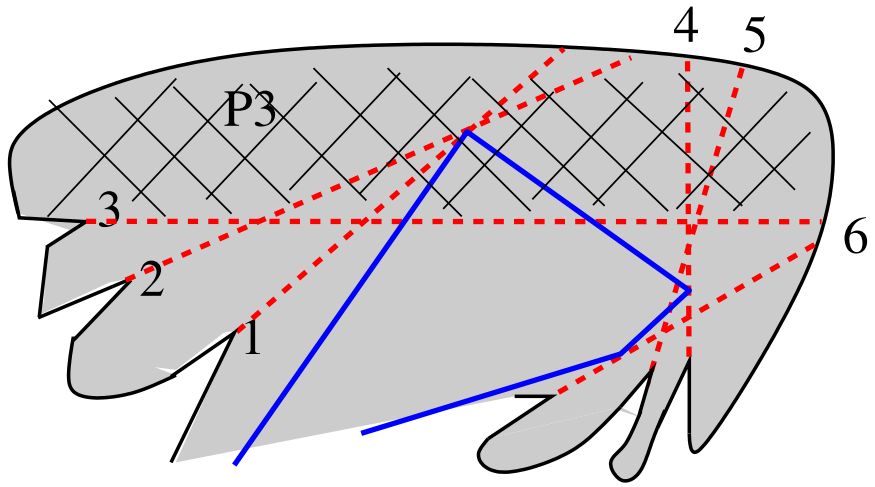

Lemma 1.29

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Die SWR besucht die Corner gemäß der Ordnung entlang des Randes!

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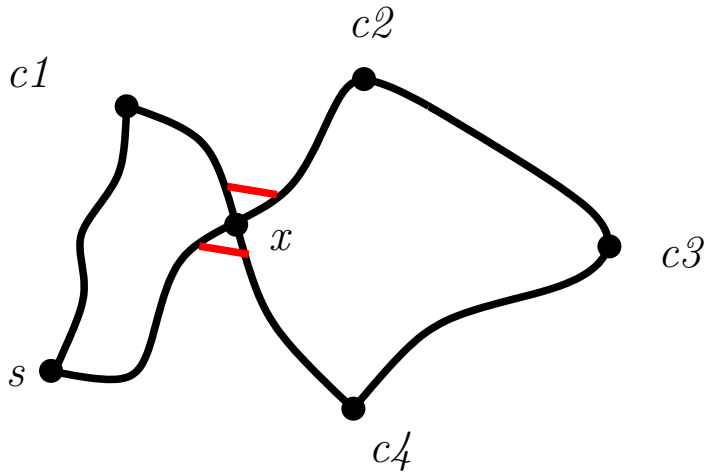

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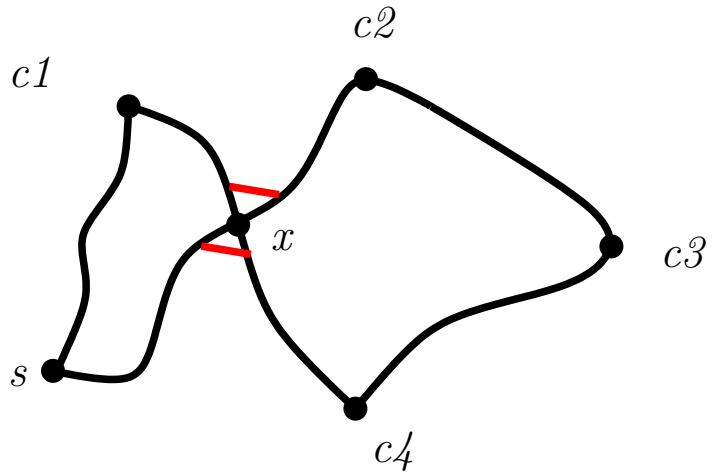

Anpassungen innerhalb der Corner: Fehleranfällig!!

Touring a sequence of polygons (TPP)

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- Sequenz konvexer Polygone

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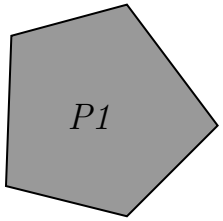

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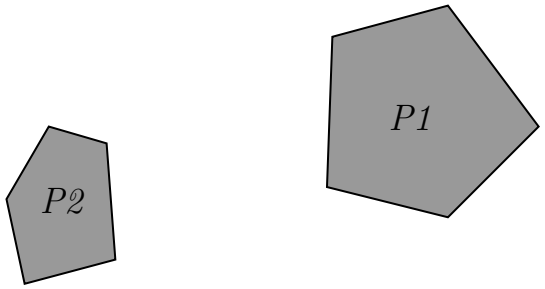

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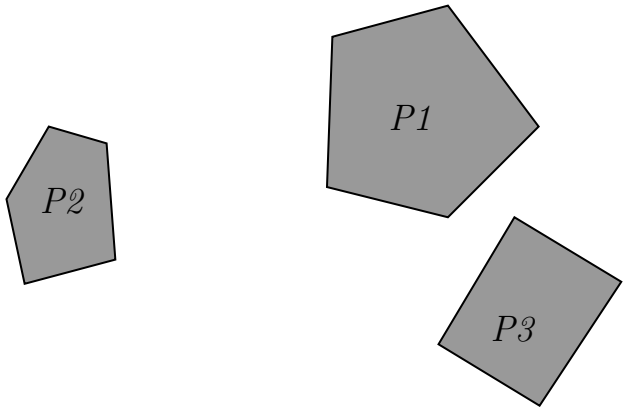

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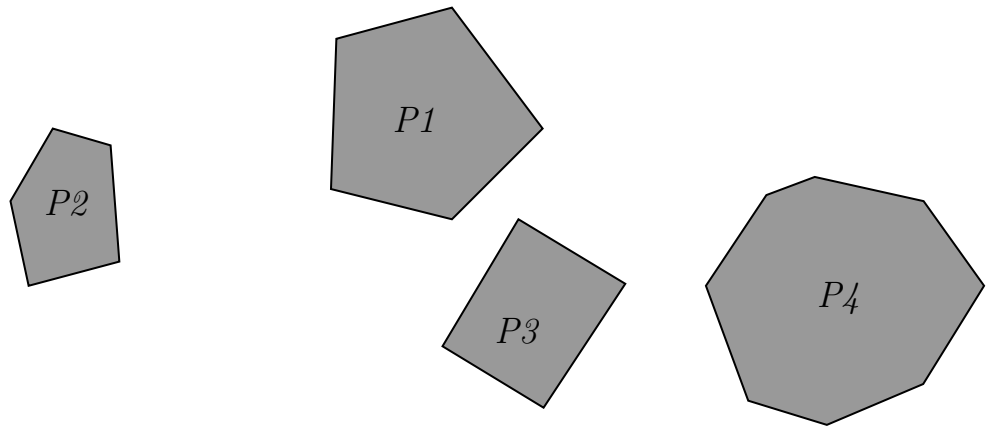

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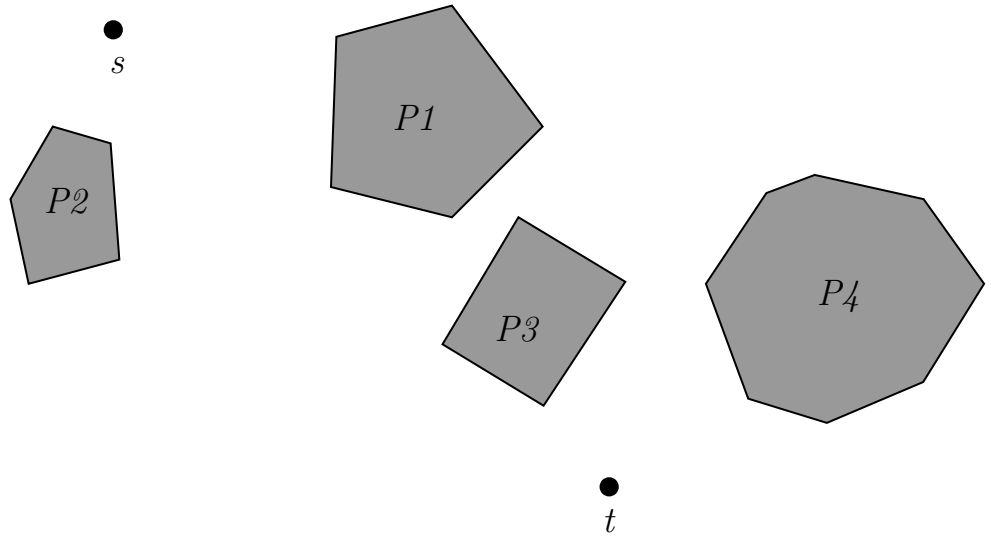

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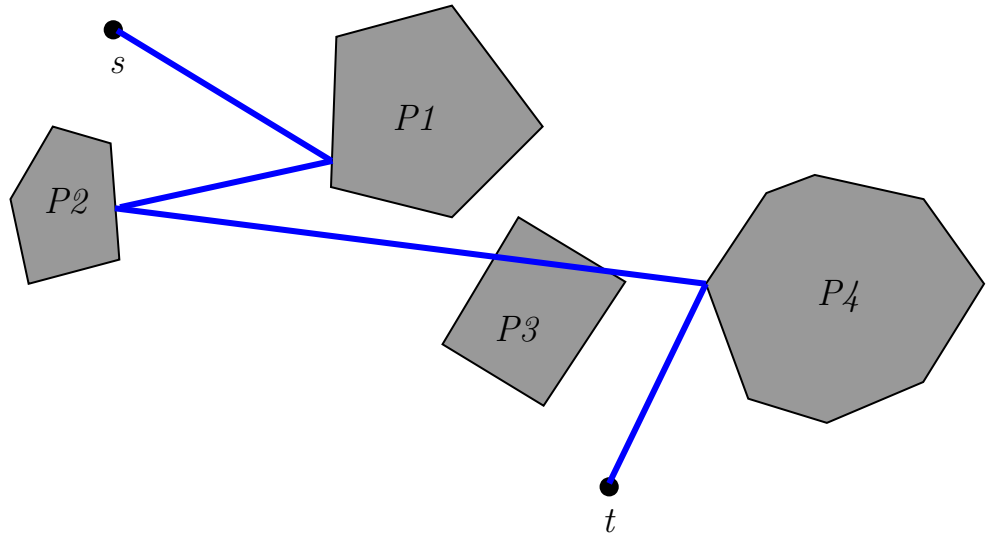

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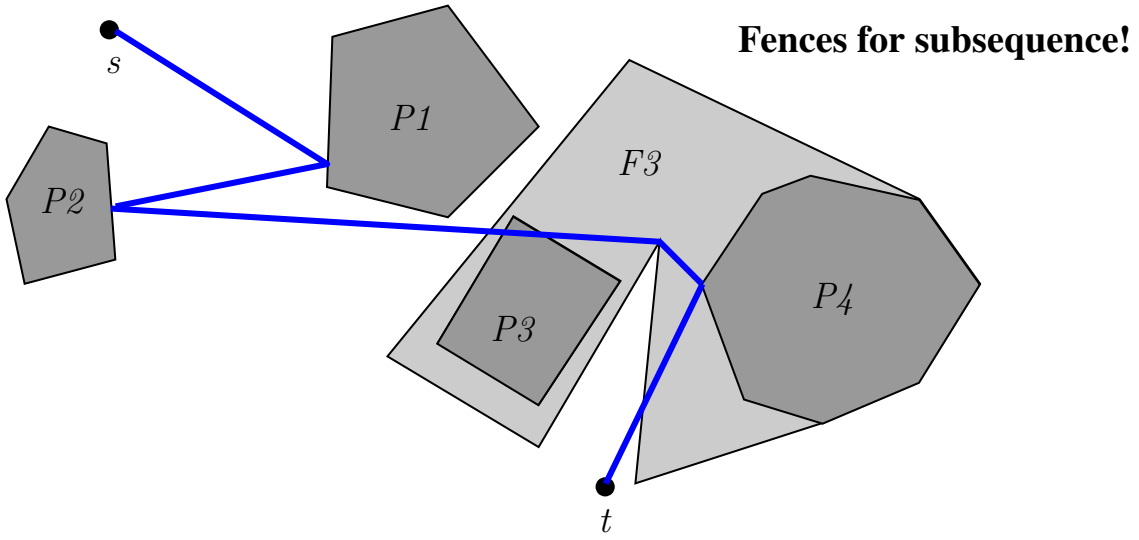

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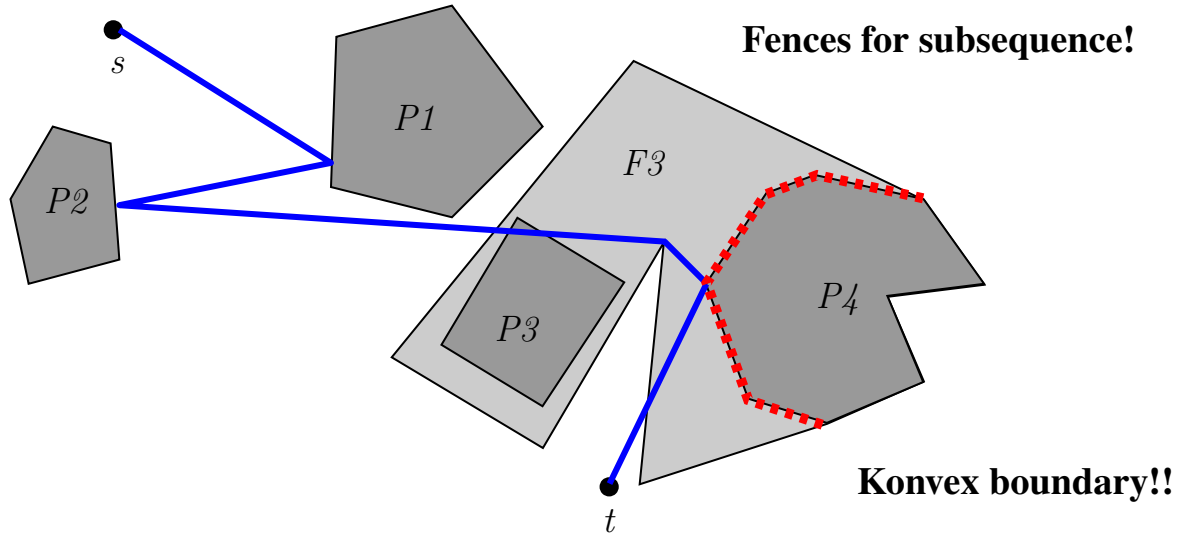

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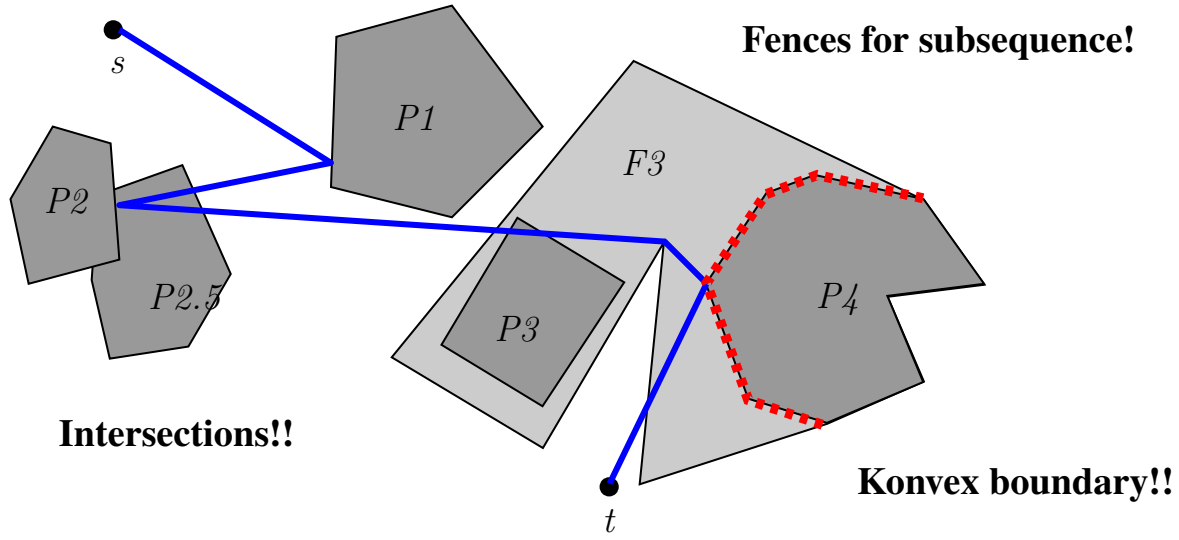

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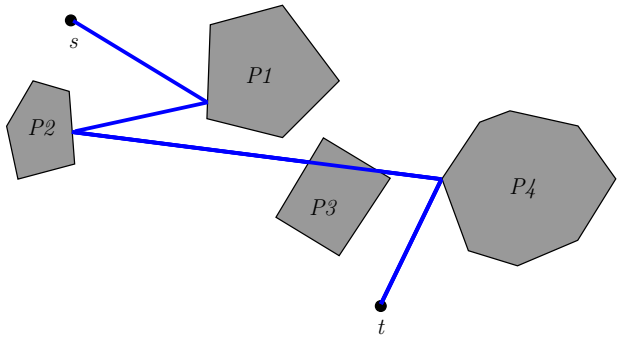

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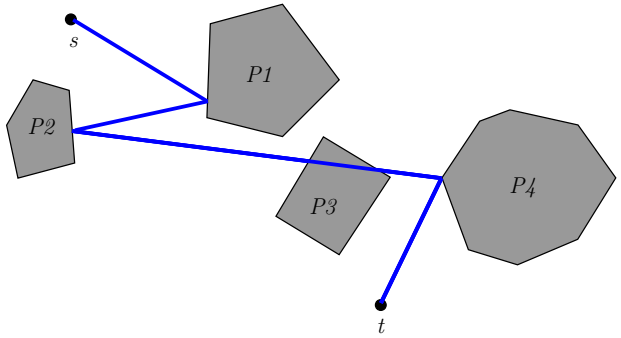
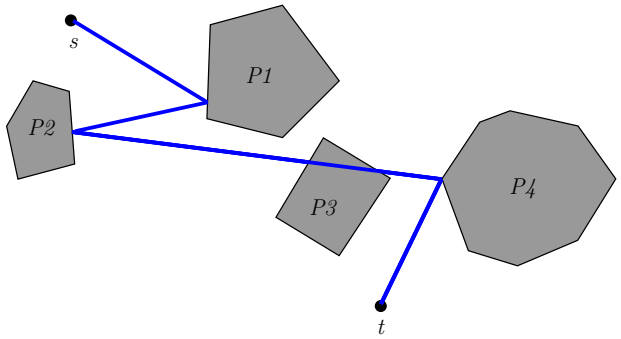


- Einfache Version:
- $O(nk \log \frac{n}{k})$

TPP



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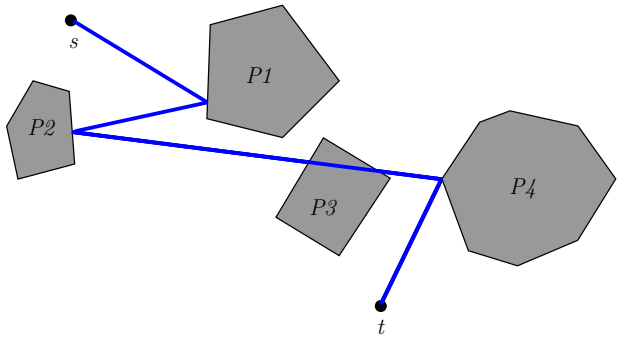

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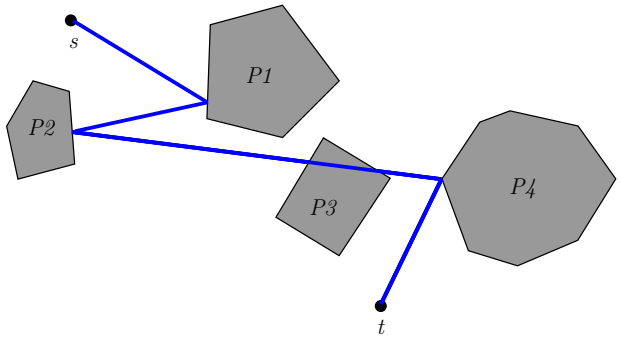

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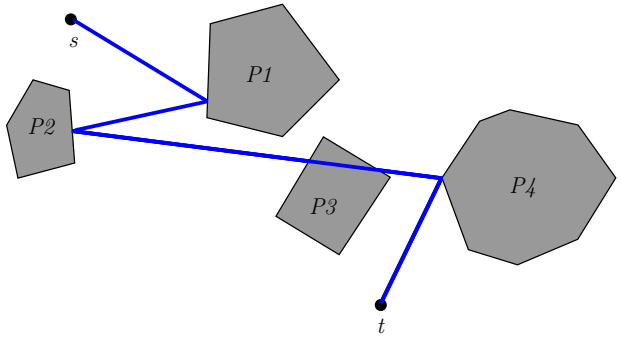
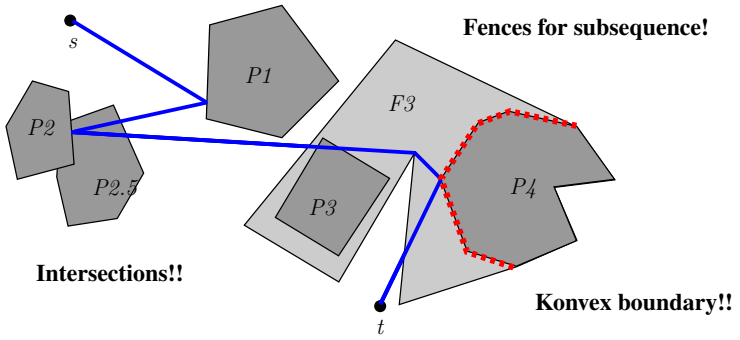
TPP





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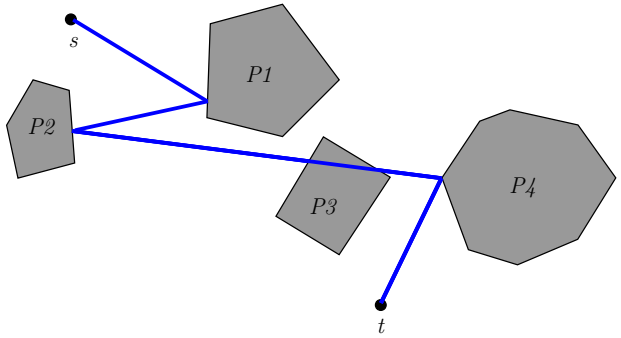

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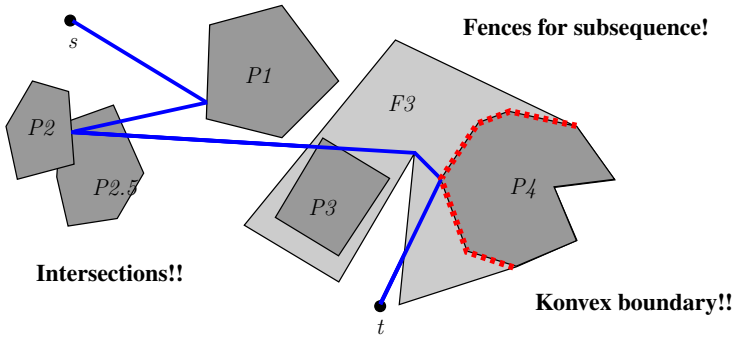

- Allgemeine Version:
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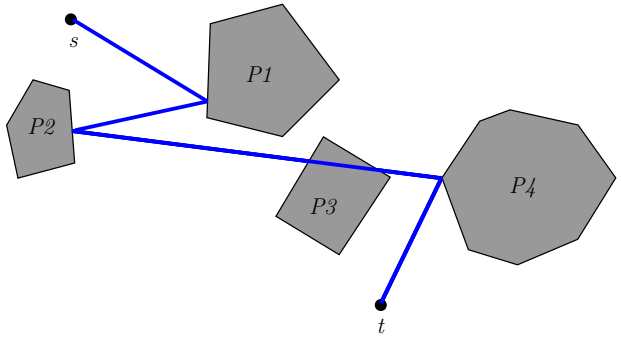
TPP



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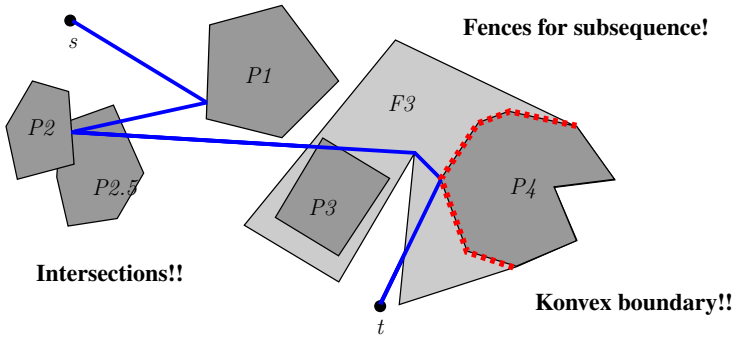

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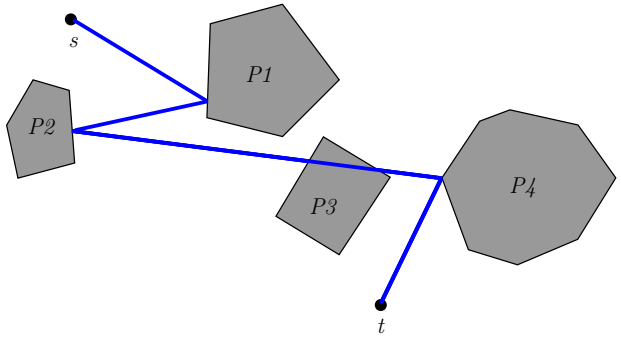
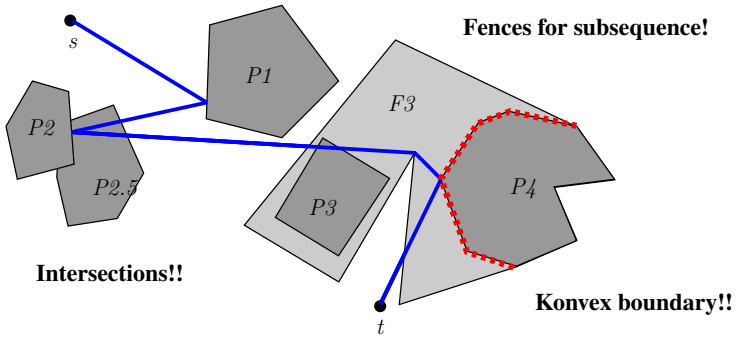
- $O(nk^2 \log n)$

TPP





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- Kompl.: $O(n)$
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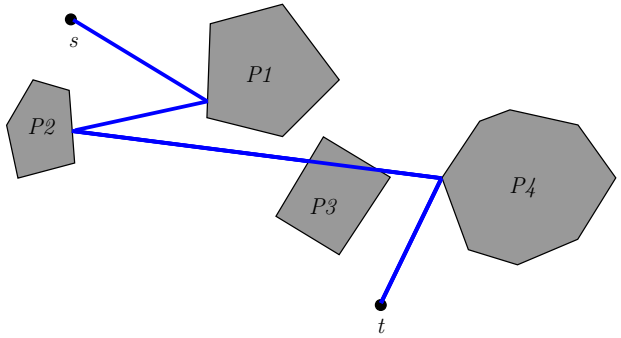
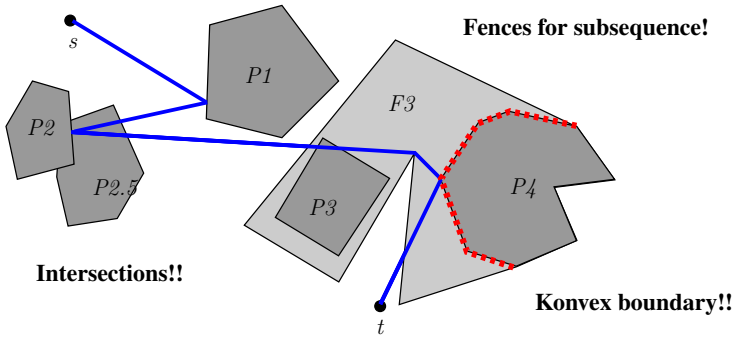
- Build(Query): $O(nk^2 \log n)$

TPP





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- $O(nk \log \frac{n}{k})$
- Build(Query): $O(nk \log \frac{n}{k})$
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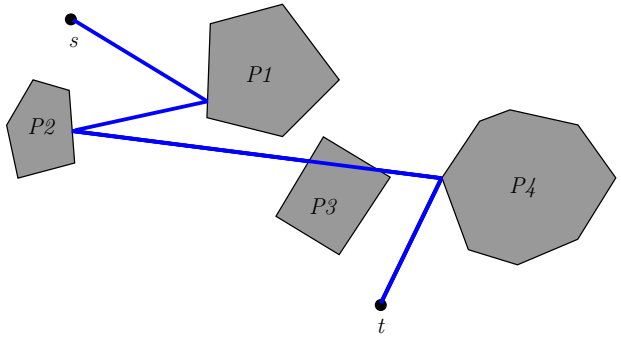
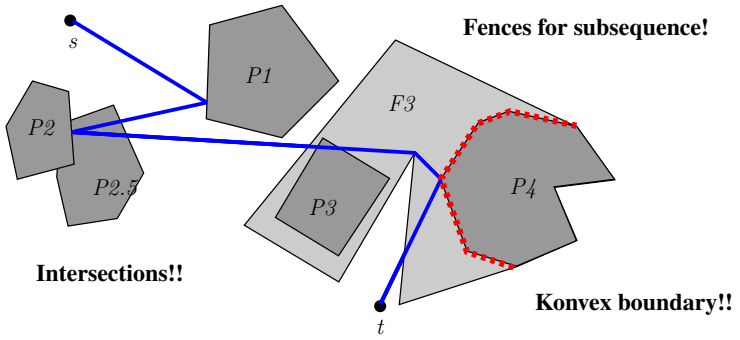
- Build(Query): $O(nk^2 \log n)$
- Kompl.: $O(nk)$

TPP

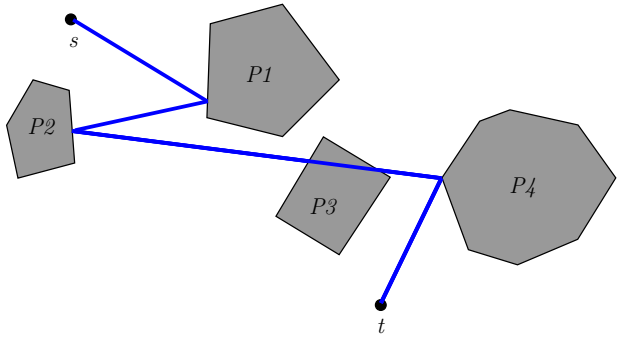


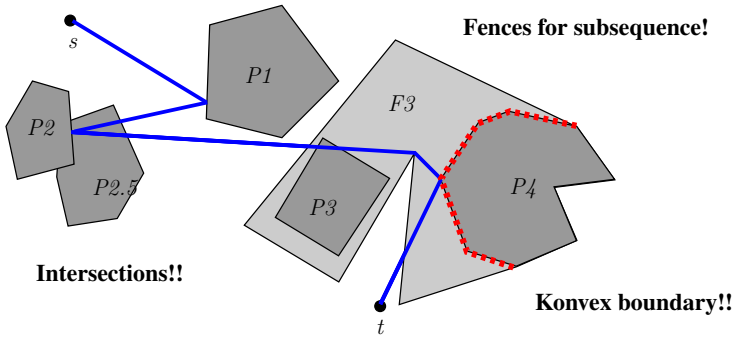


- Einfache Version:
- $O(nk \log \frac{n}{k})$
- Build(Query): $O(nk \log \frac{n}{k})$
- Kompl.: $O(n)$
- Query (festes s): $O(k \log \frac{n}{k})$

- Allgemeine Version:
- Zäune, Rand konvex, etc.
- $O(nk^2 \log n)$
- Build(Query): $O(nk^2 \log n)$
- Kompl.: $O(nk)$
- Query (festes s): $O(k \log n + m)$

TPP





- Einfache Version:
- $O(nk \log \frac{n}{k})$
- Build(Query): $O(nk \log \frac{n}{k})$
- Kompl.: $O(n)$
- Query (festes s): $O(k \log \frac{n}{k})$

- Allgemeine Version:
- Zäune, Rand konvex, etc.
- $O(nk^2 \log n)$
- Build(Query): $O(nk^2 \log n)$
- Kompl.: $O(nk)$
- Query (festes s): $O(k \log n + m)$

Ergebnisse von: Dror, Efrat, Lubiw, Mitchell 2003!!

Anwendung: Safari-Problem

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Kürzester Weg,
innerhalb eines Polygones, der eine
Menge von schnittfreien Polygonen
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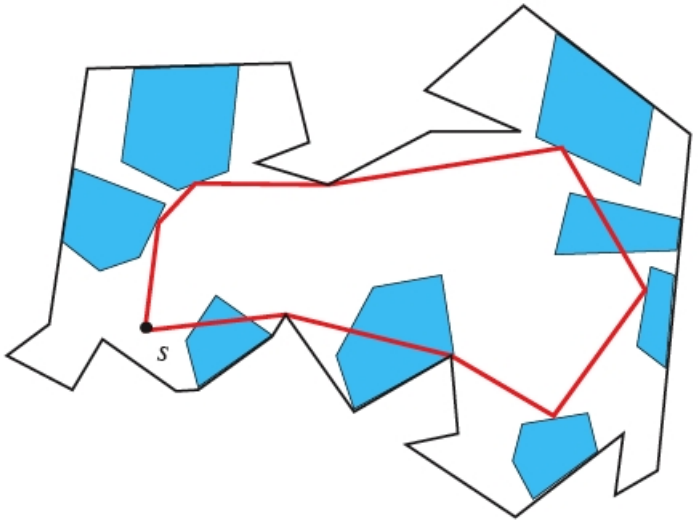

Ordnung entlang des Randes!

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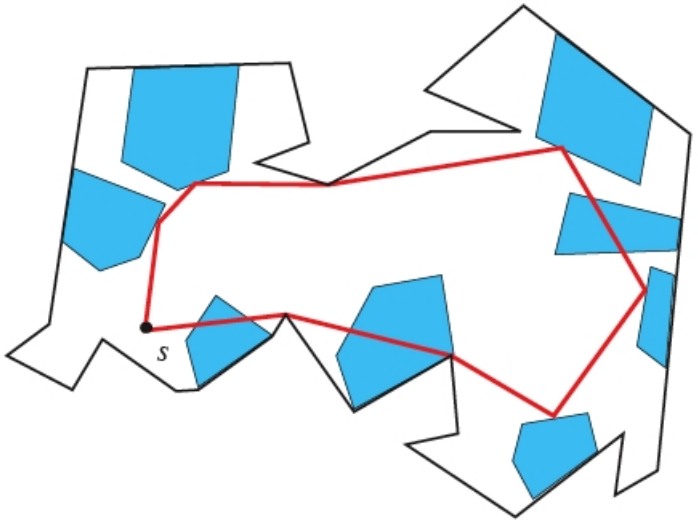

- $O(n^2)$ '92
- $O(n^3)$ '94
- $O(n^3)$ Tan Hirata '01
- $O(n^2 \log n)$ jetzt! Anpassen!!

Ordnung entlang des Randes!

Anwendung: SWR

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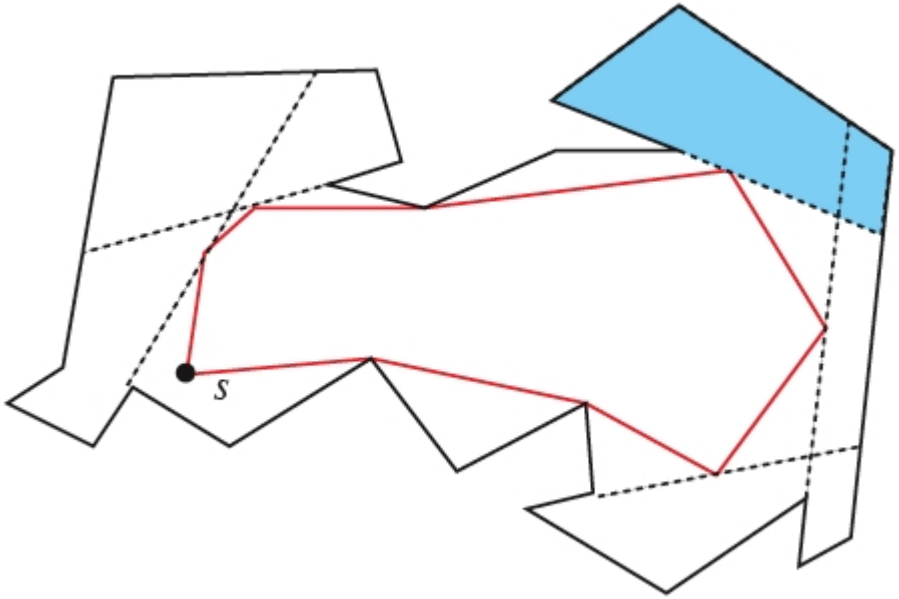
Wesentlichen Teile!



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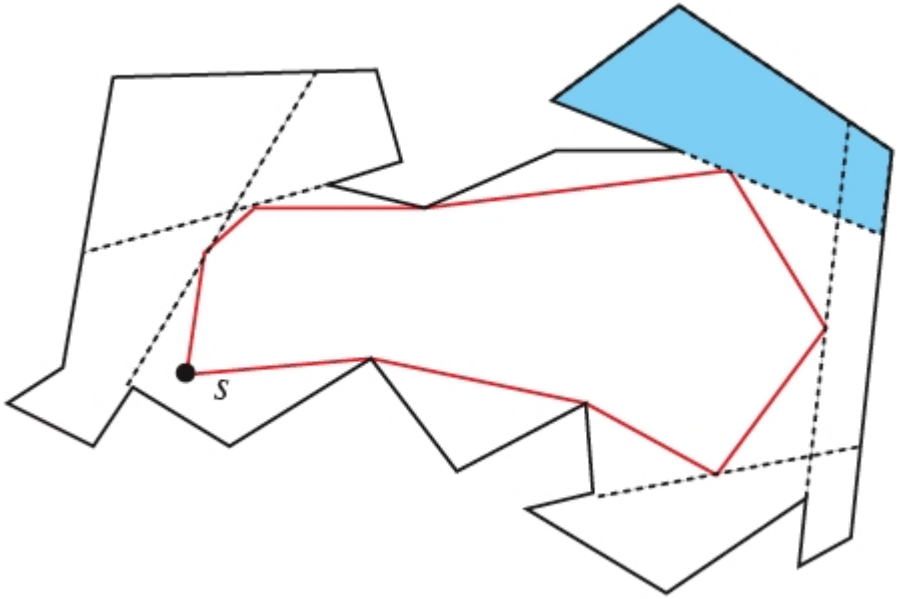

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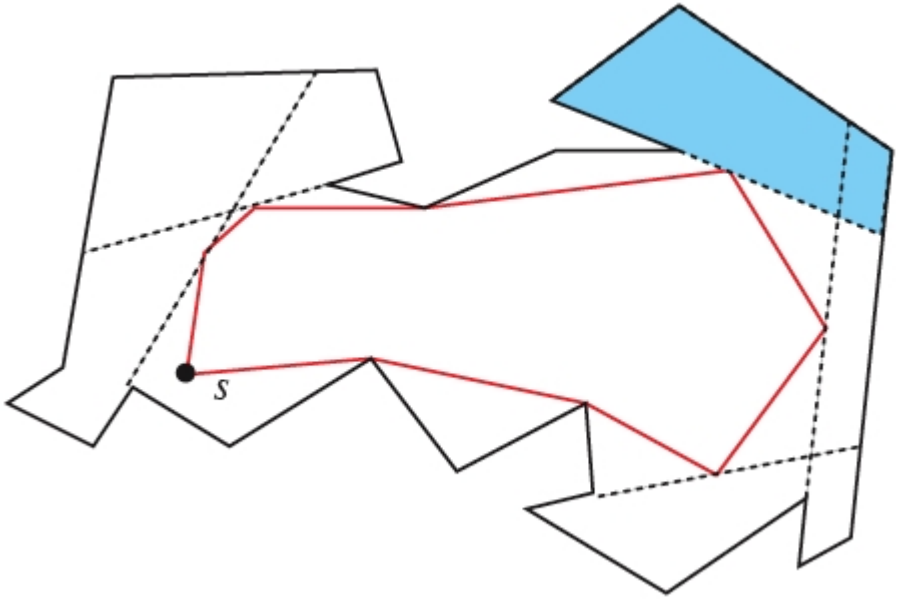

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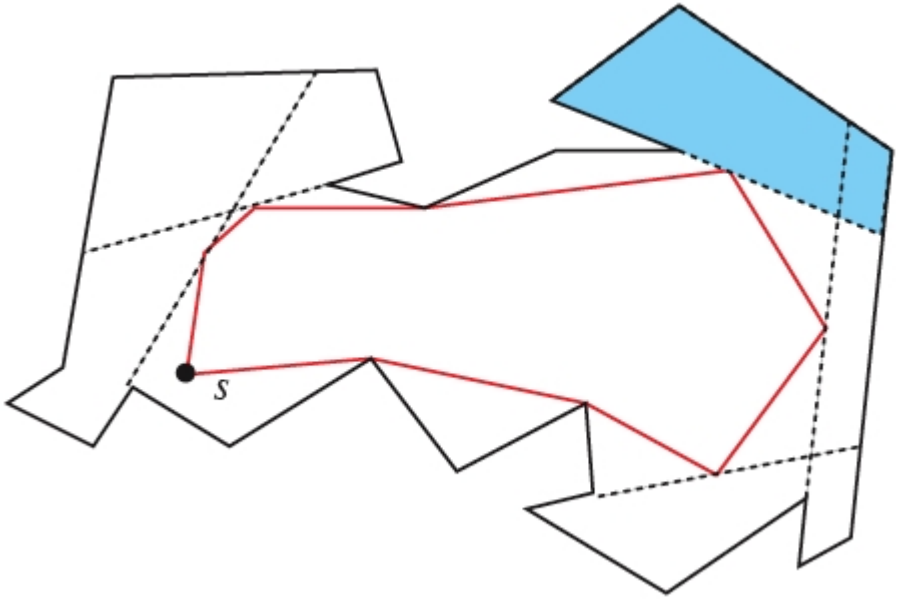

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Lokale Eigenschaften: Lemma 1.31(i)

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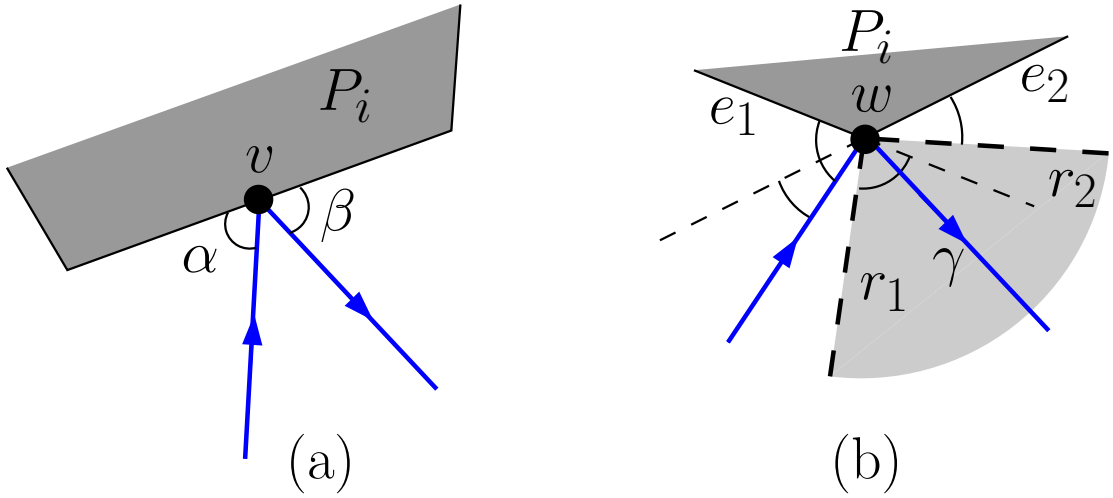

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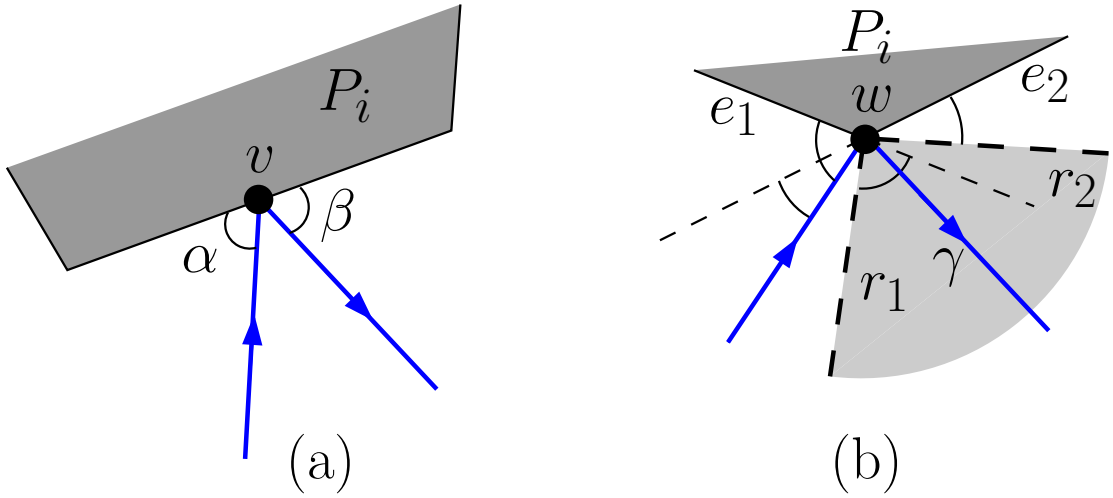

- (a) Reflektion an Kante e:

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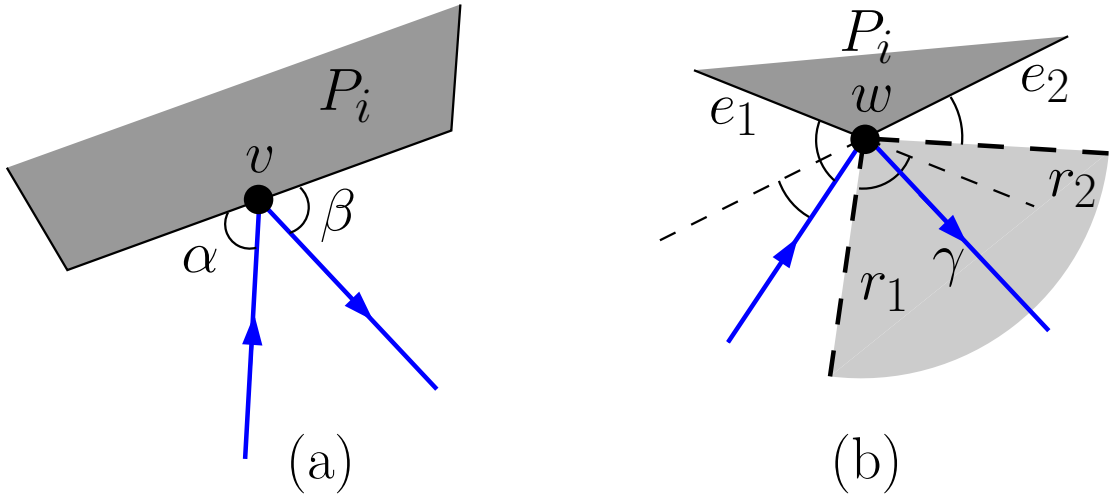

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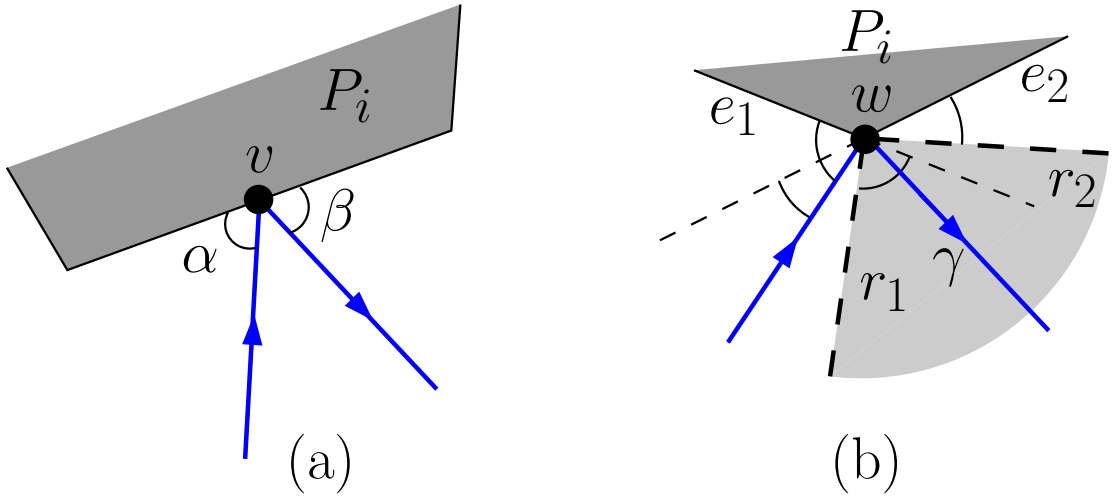

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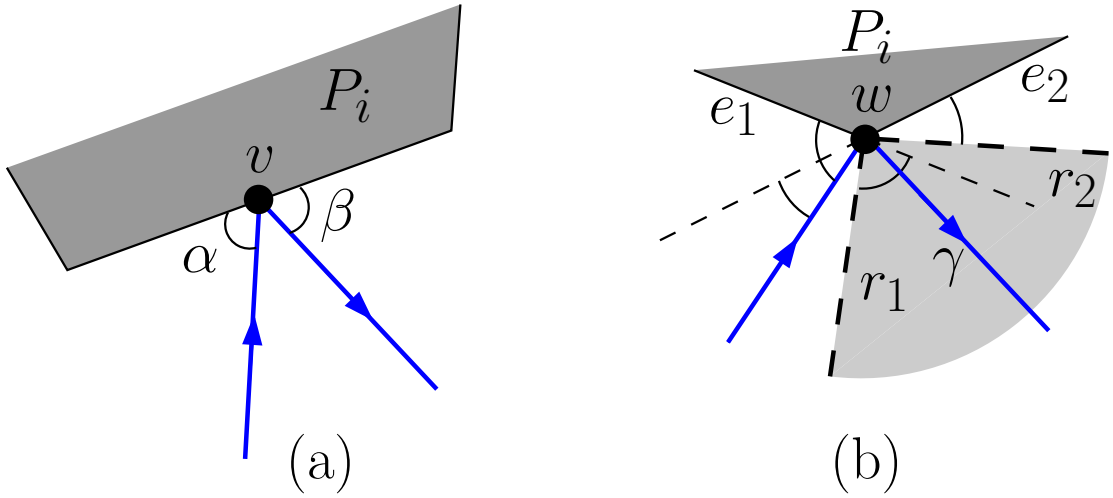

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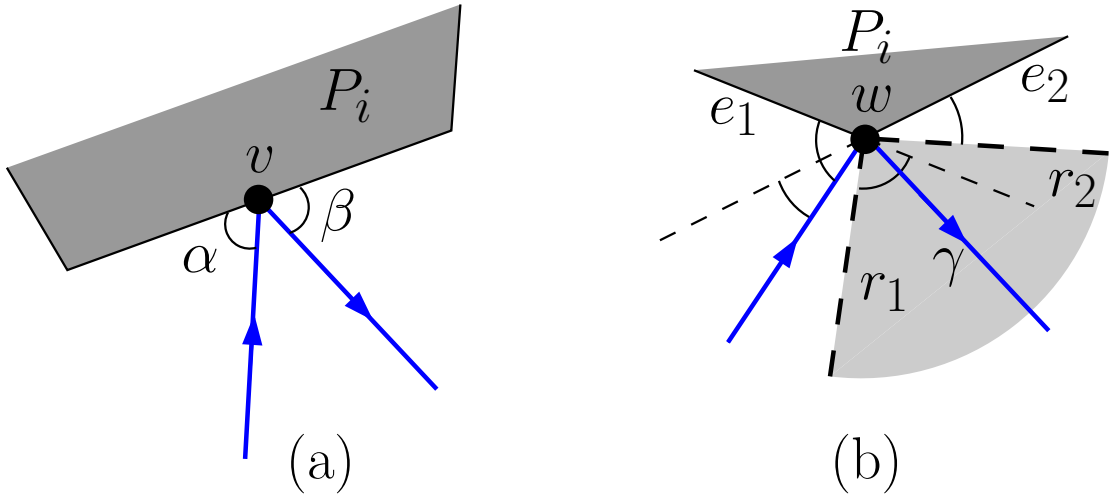

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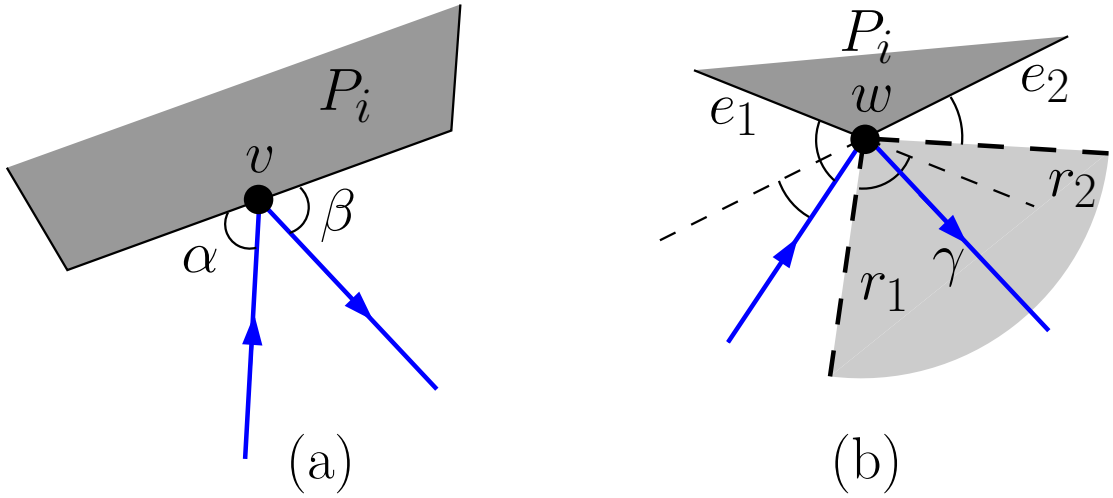

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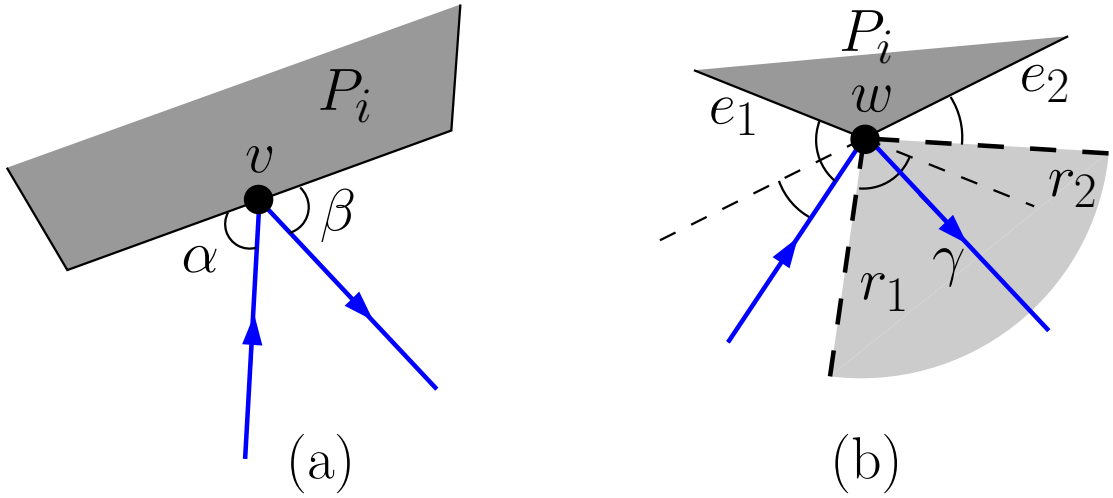

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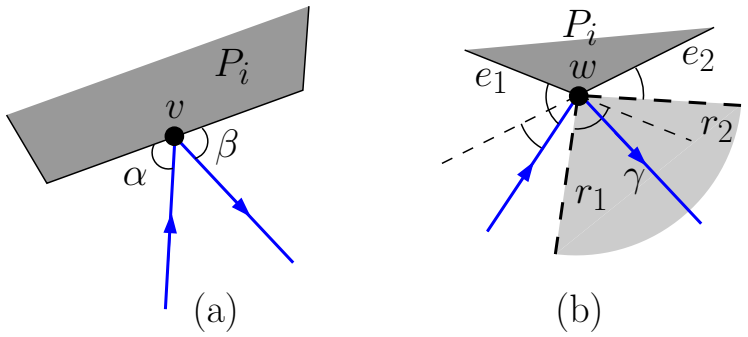
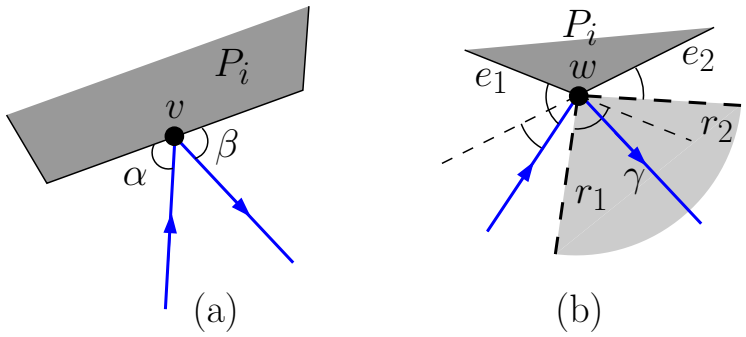
Lemma 1.31 (ii) und (iii)



Lemma 1.31 (ii) und (iii)

- Bezeichnung $\pi_i(p)$:



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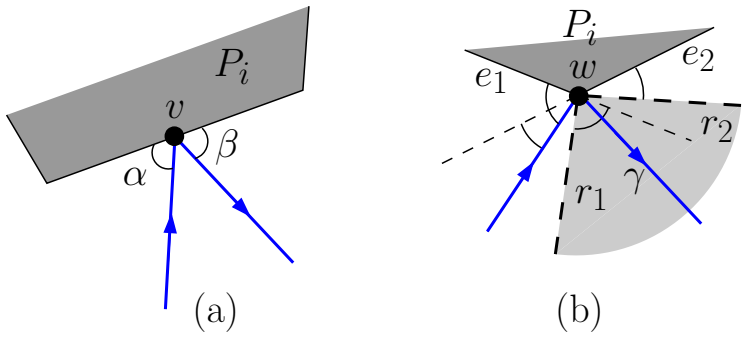

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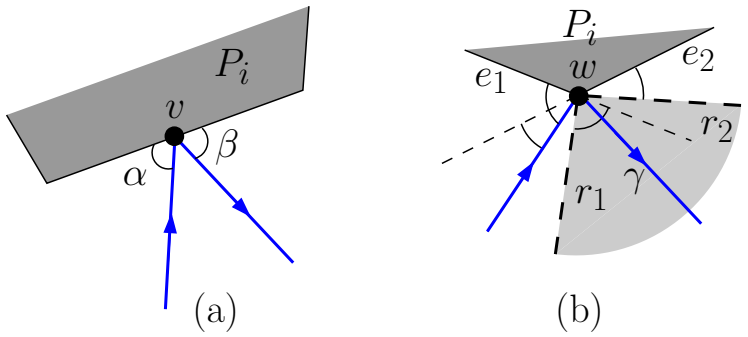

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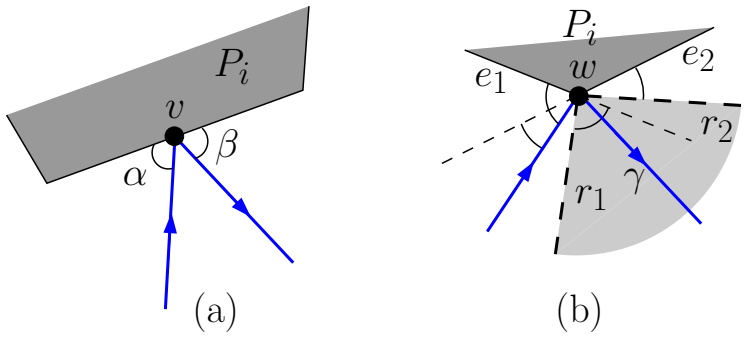

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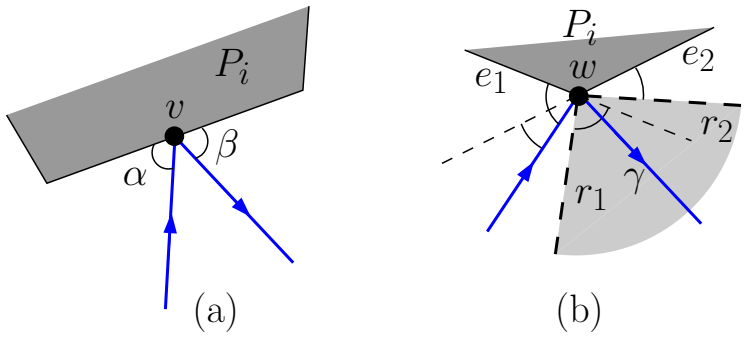

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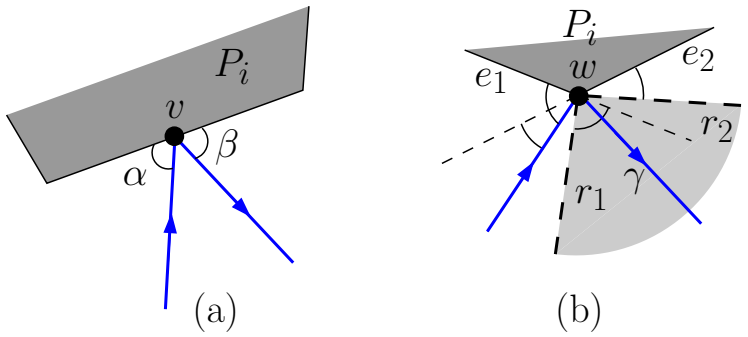

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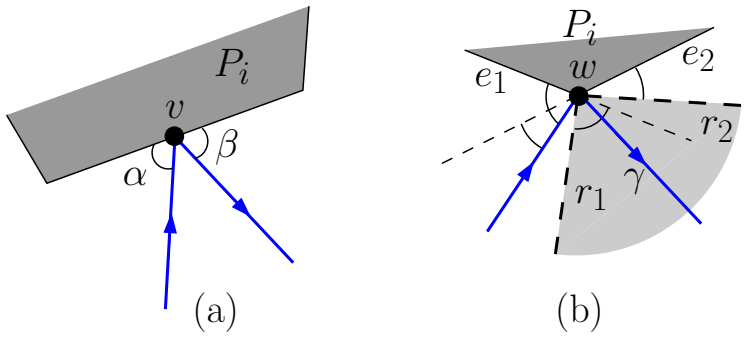

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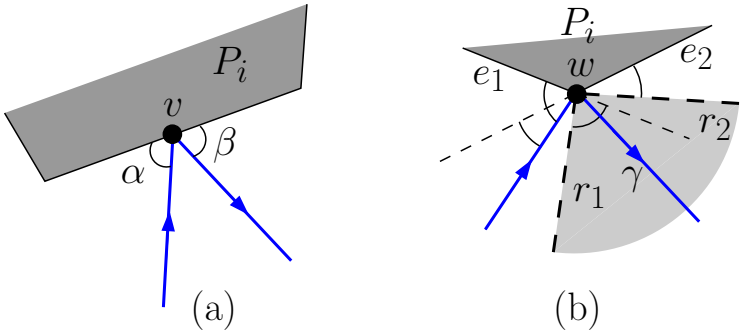
Beweis (iii): Jeder global optimale Weg muss lokal optimal sein!



Full comb. shortest path map: Beispiel

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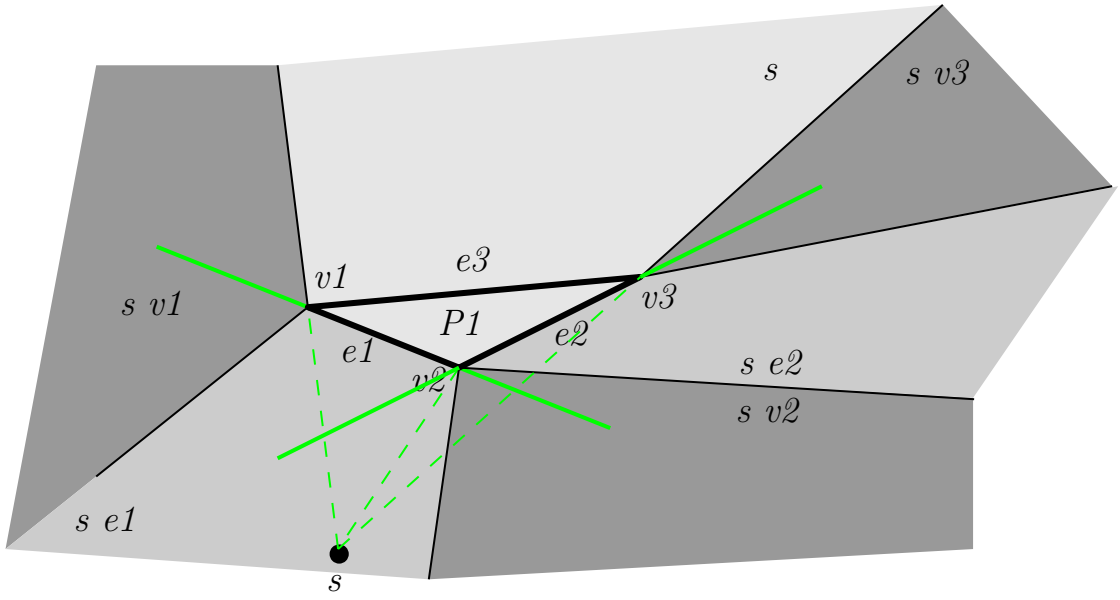

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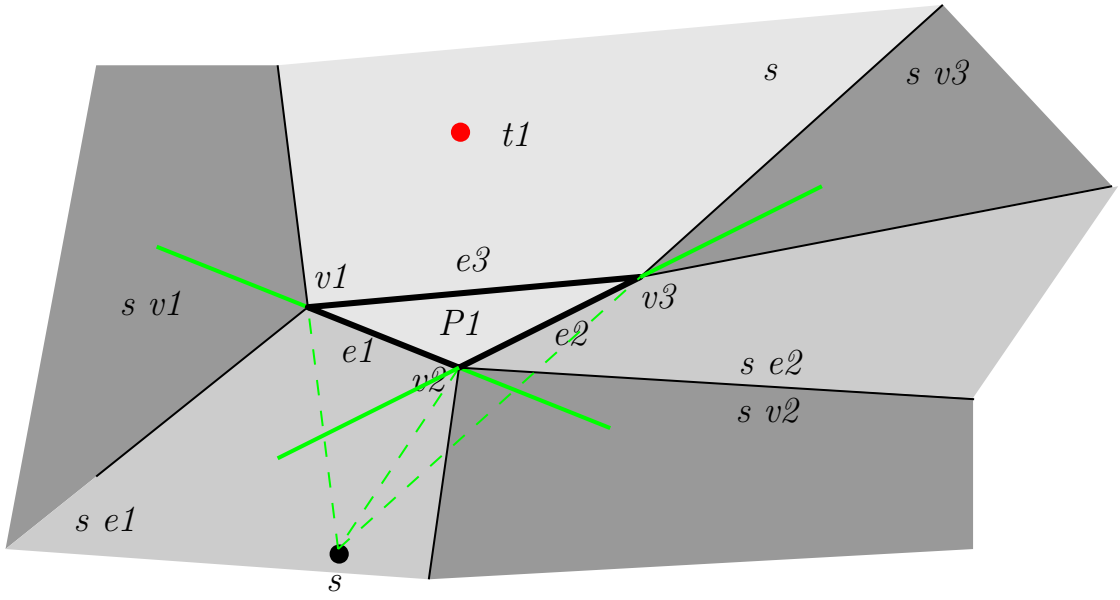

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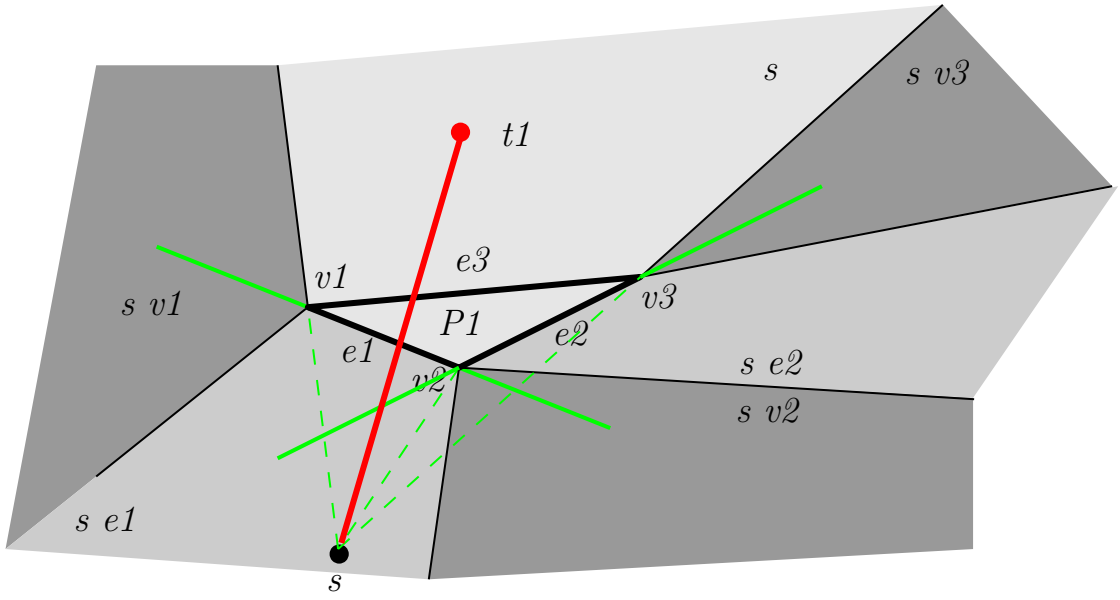

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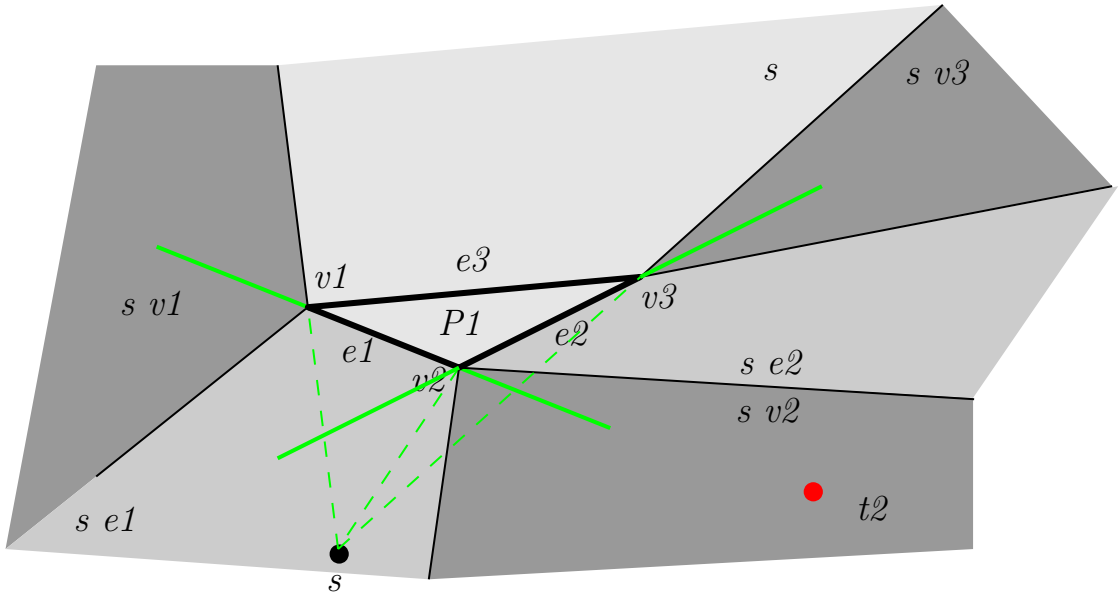

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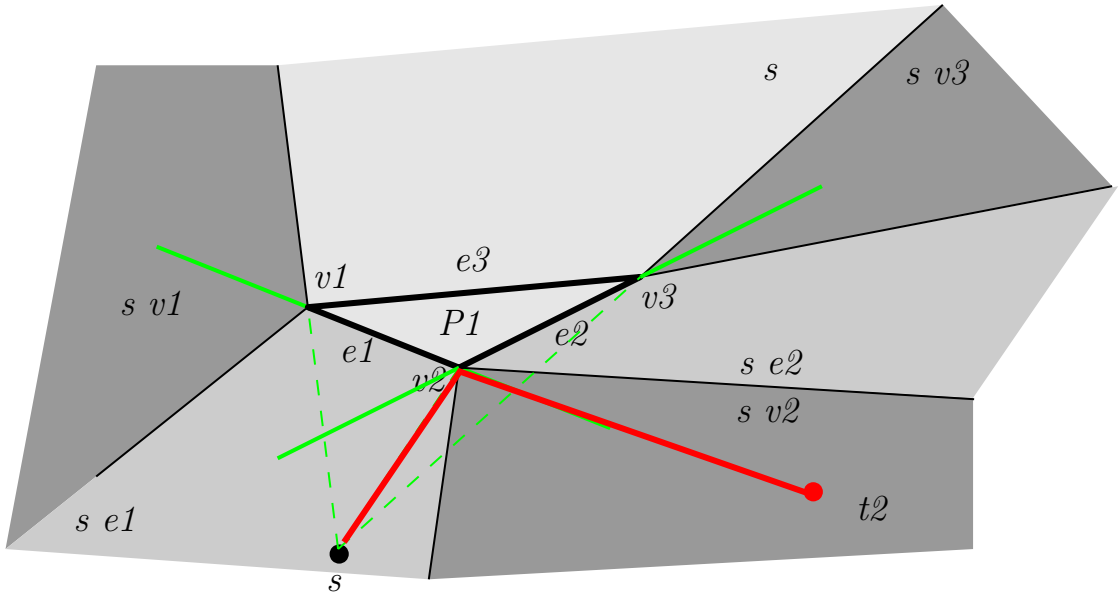

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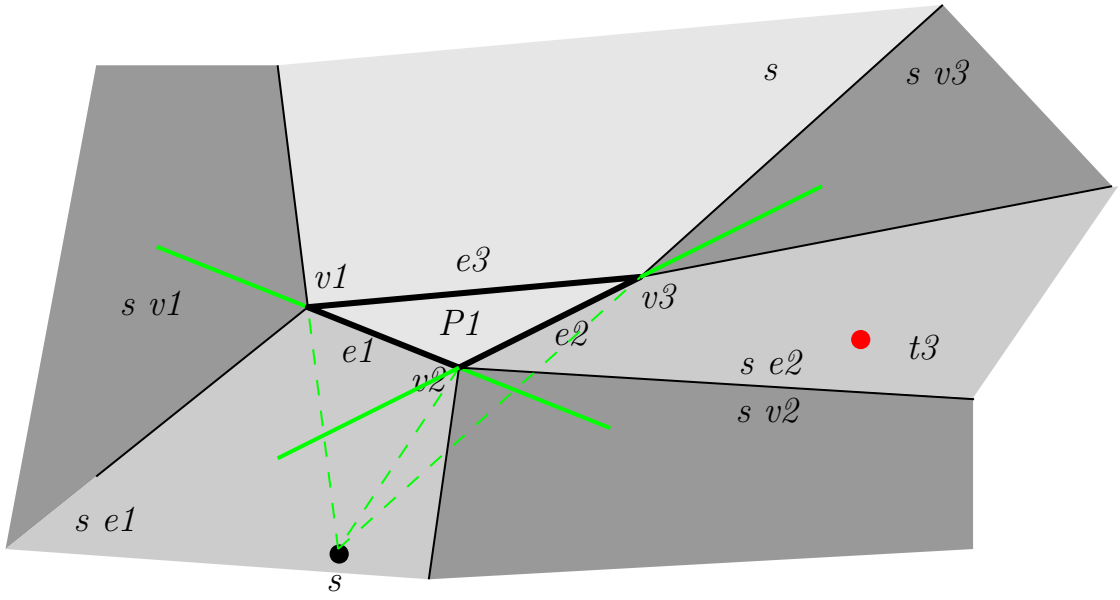

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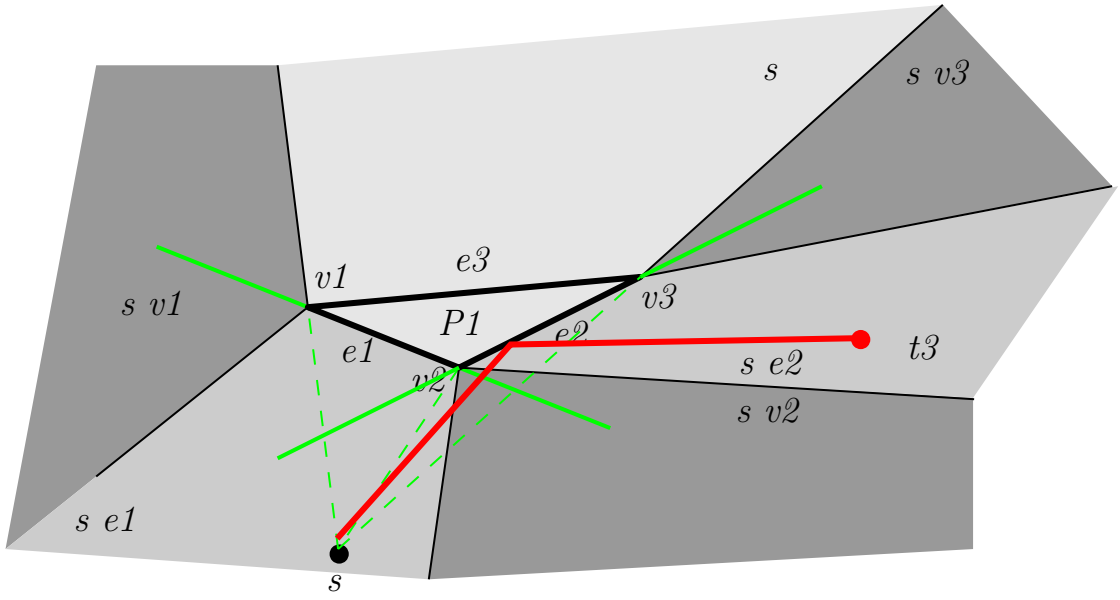

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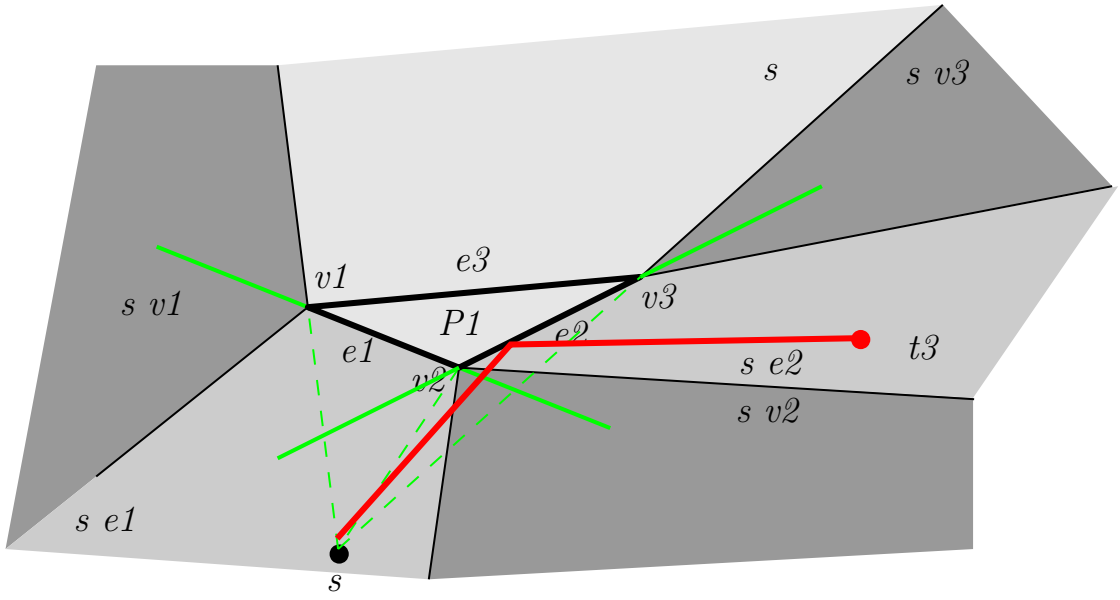

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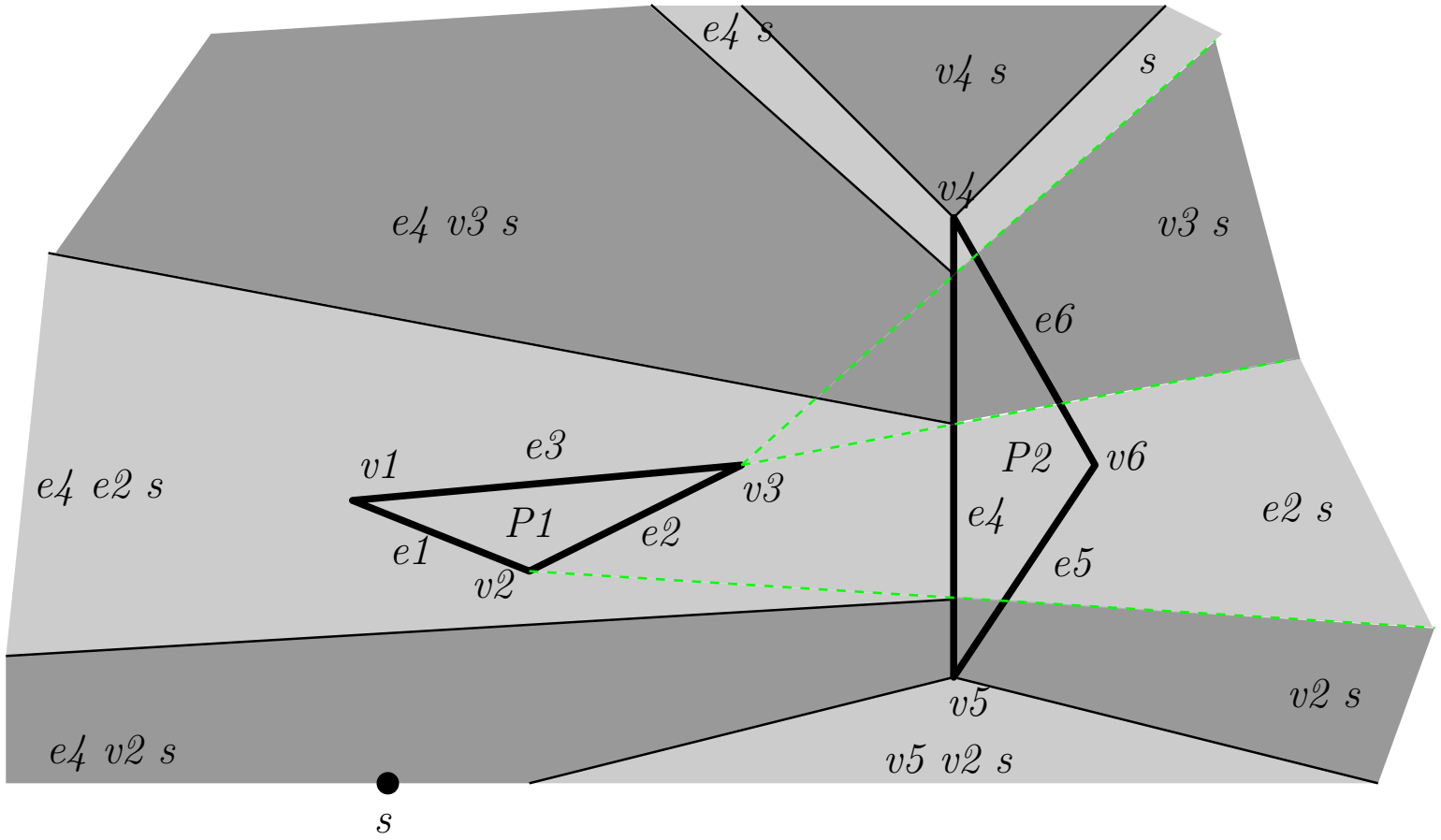

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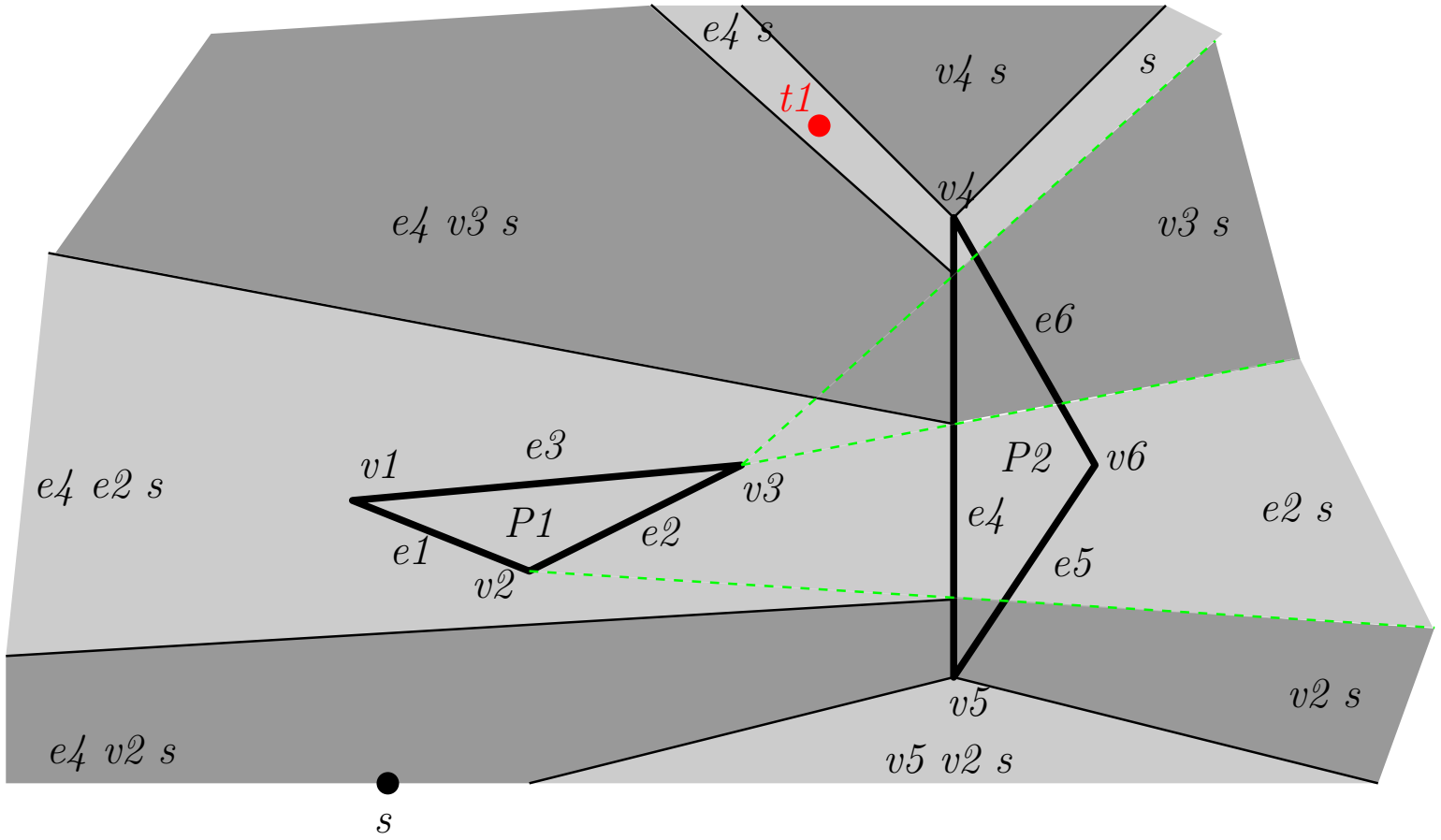

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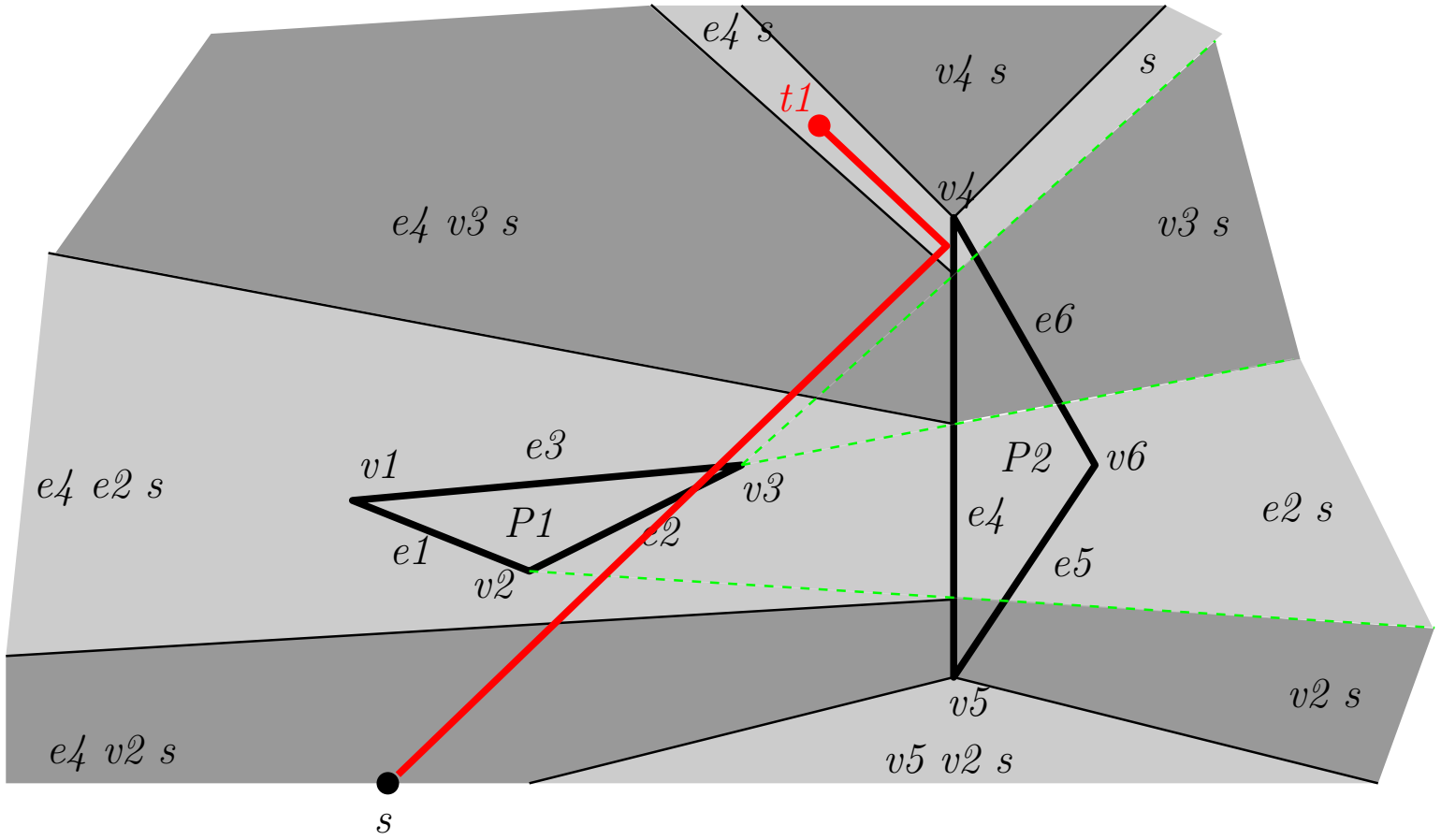

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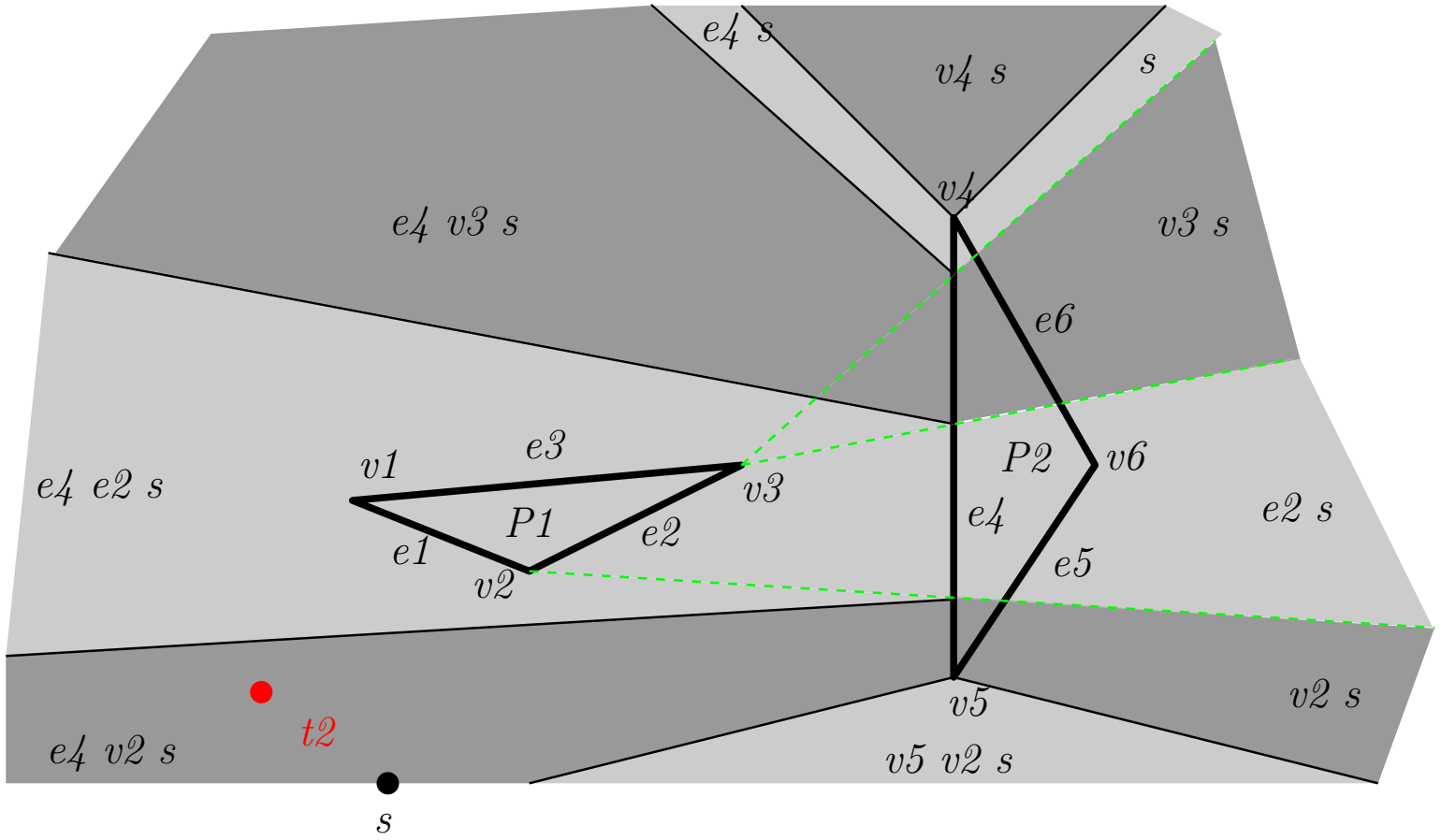

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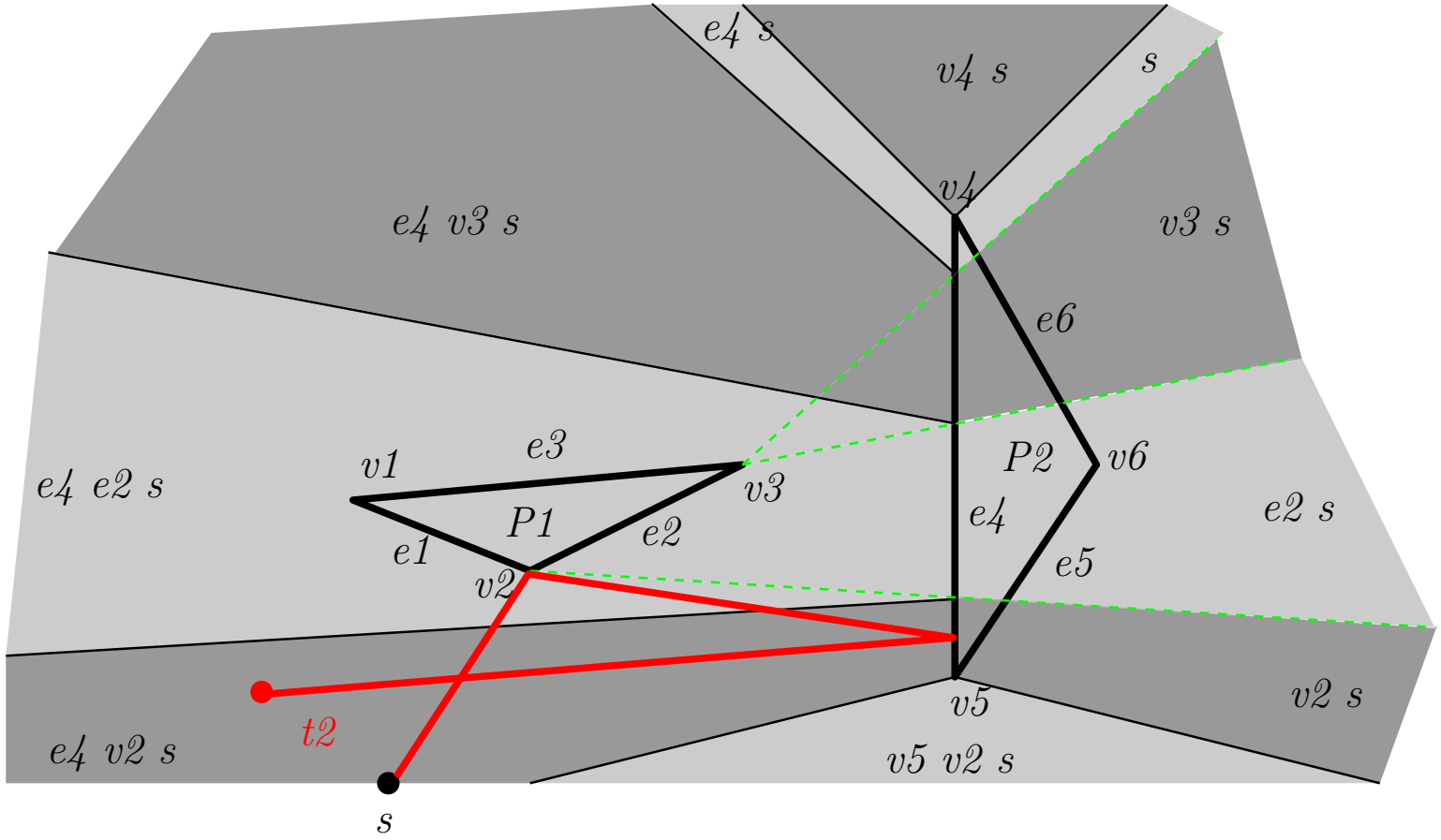

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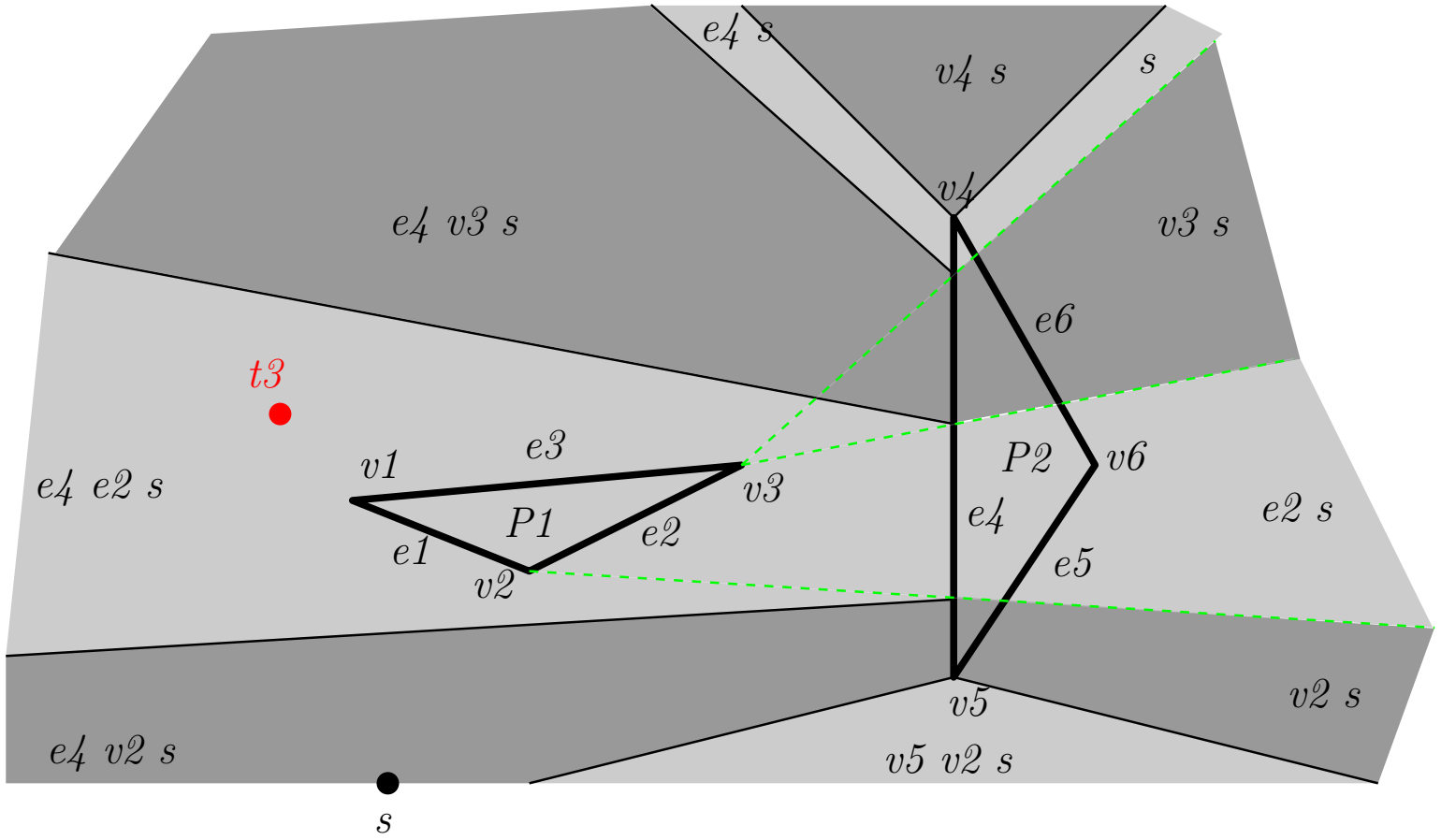
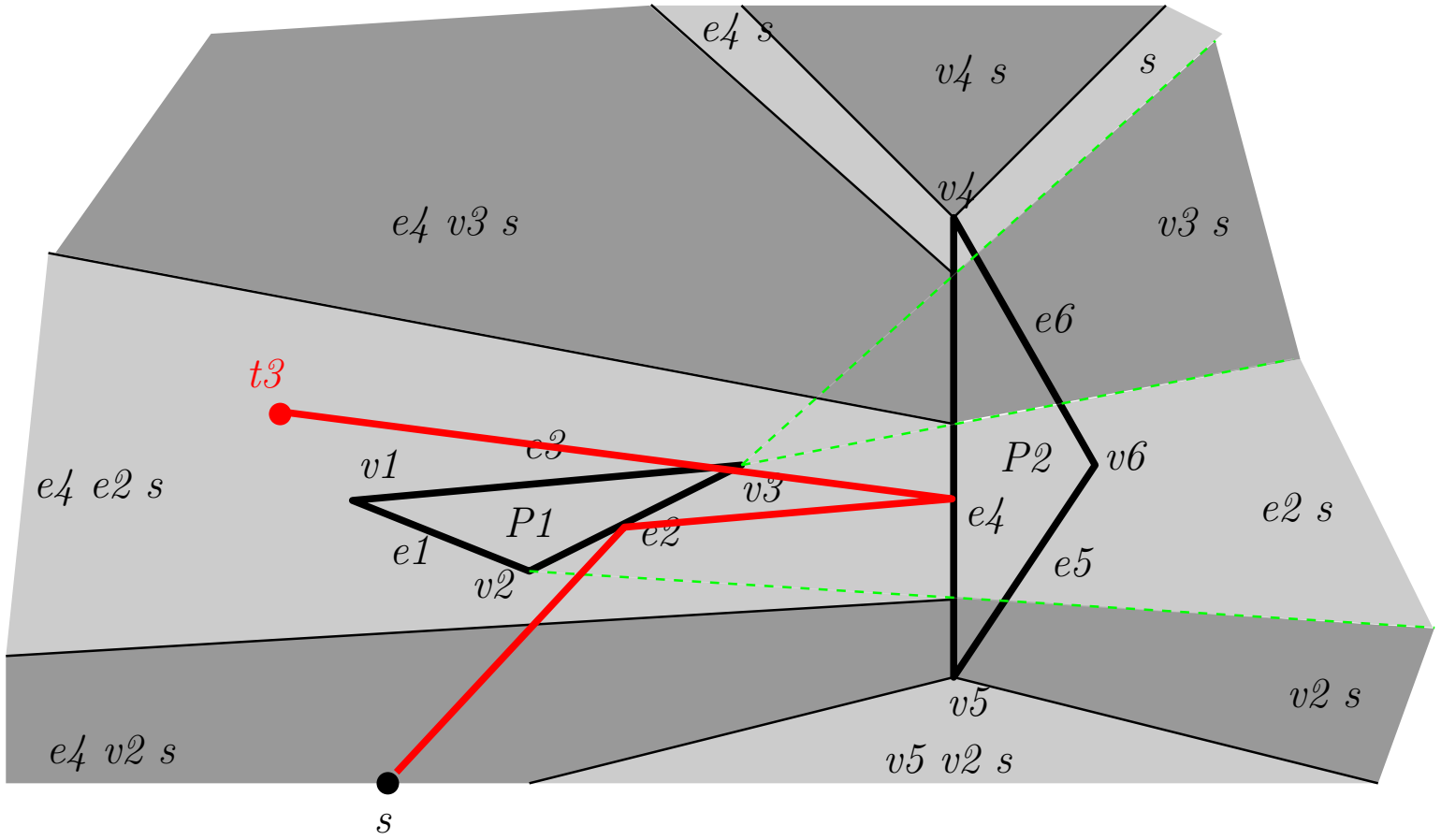
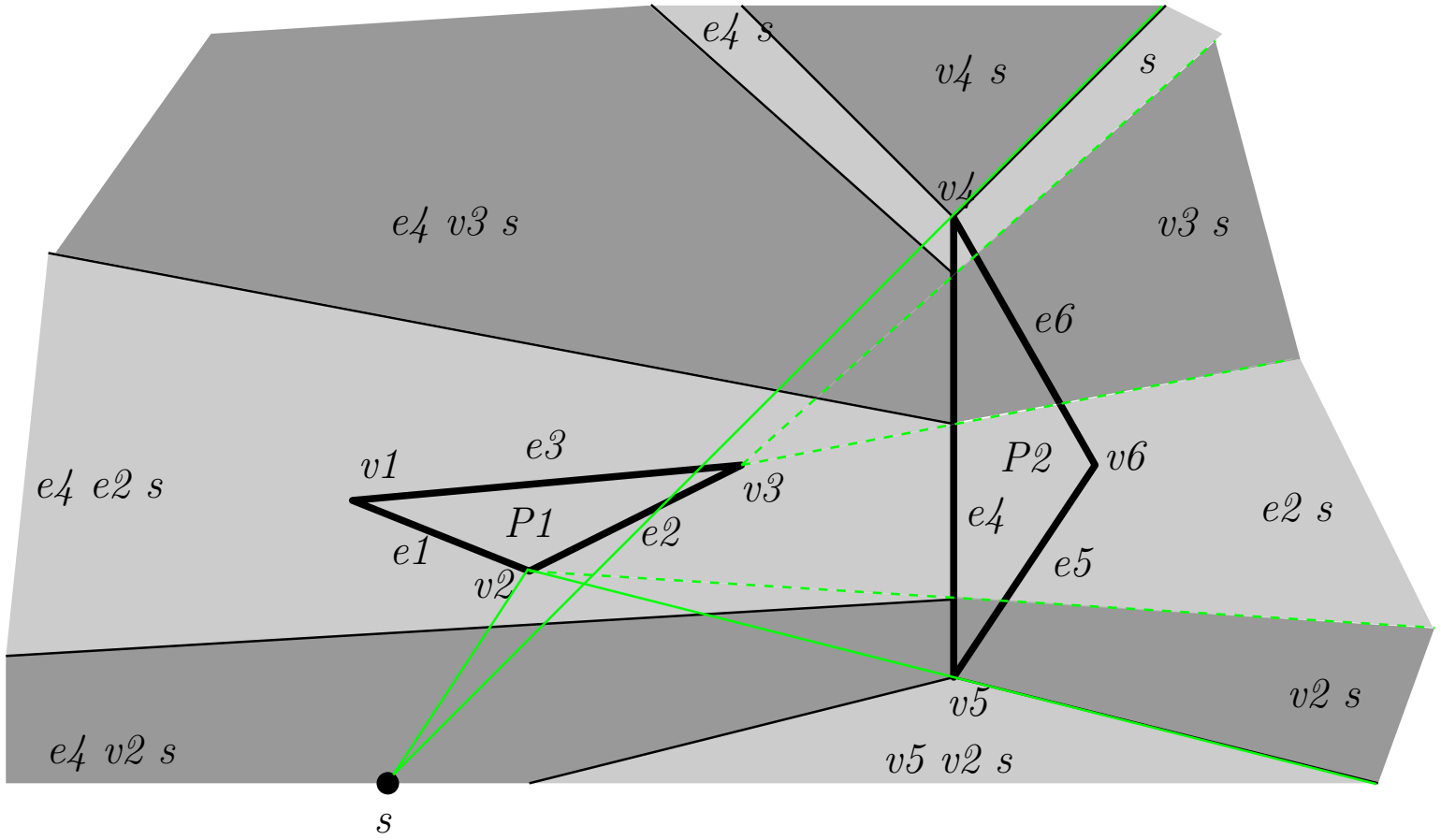


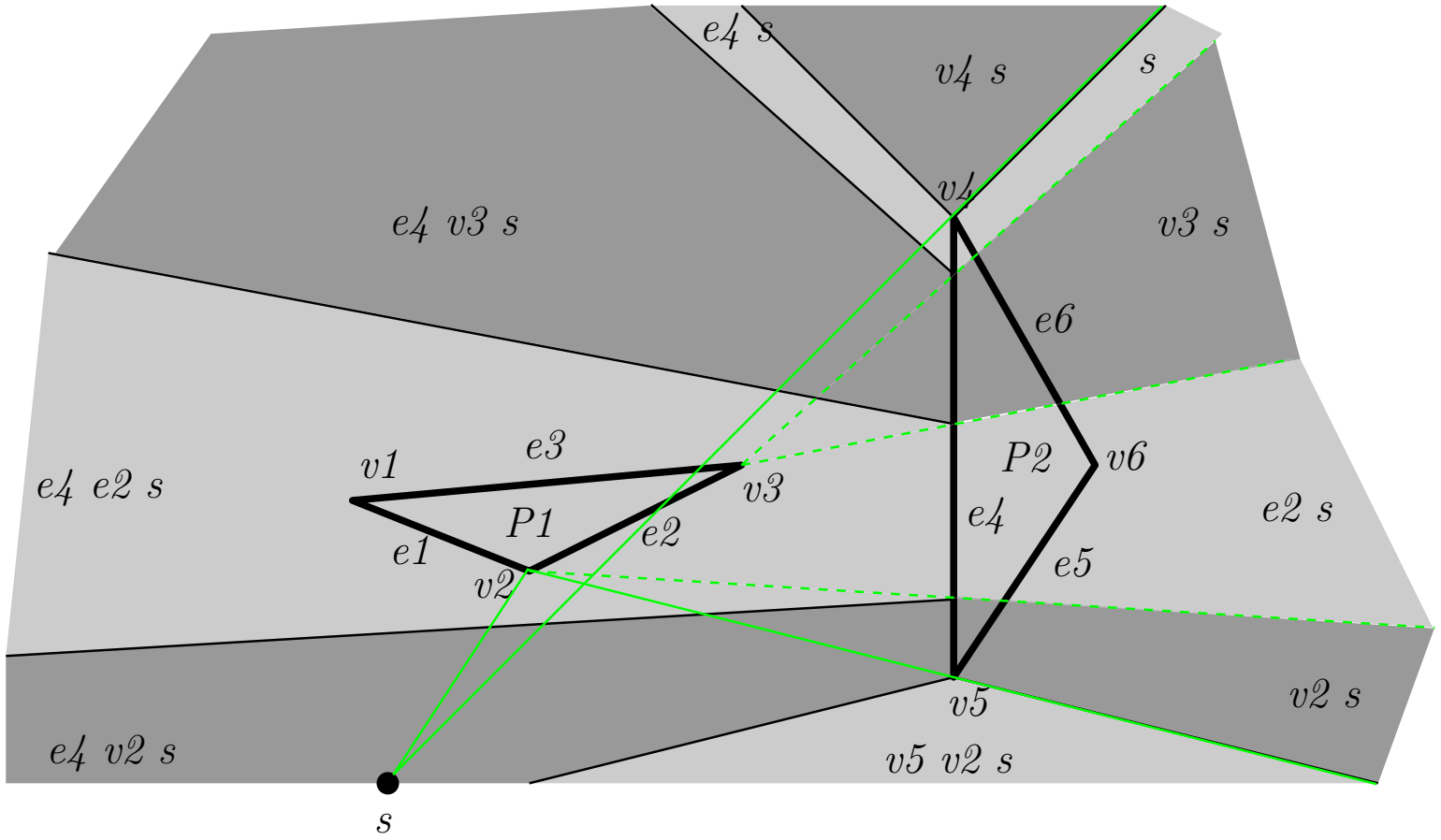
Full comb. shortest path map: Zwei Polygone



Full comb. shortest path map: Zwei Polygone



Full comb. shortest path map: Zwei Polygone



Komplexität der FC SPM

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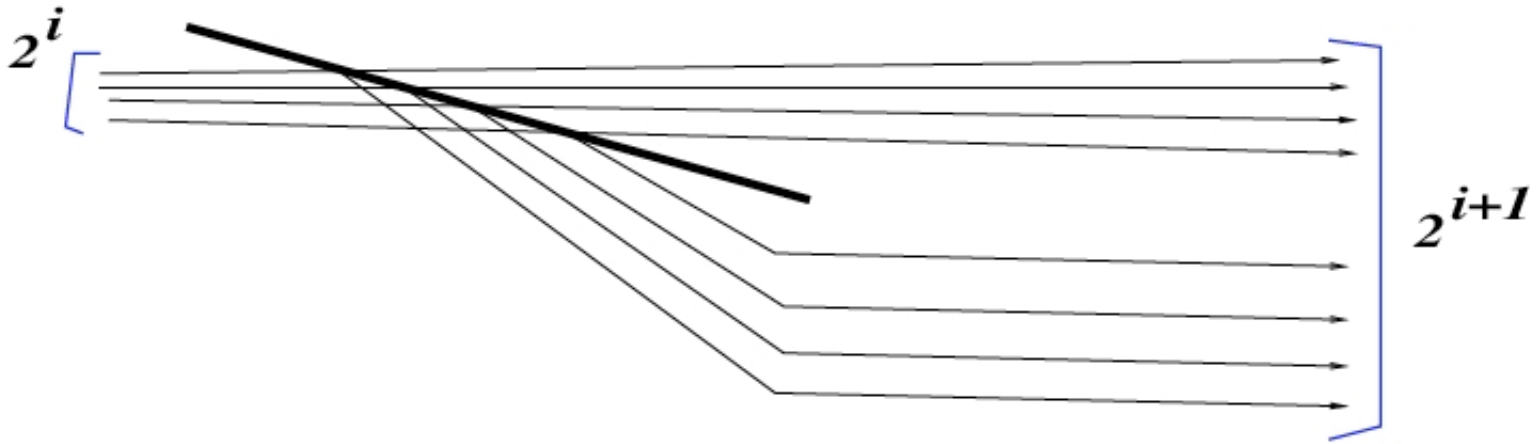
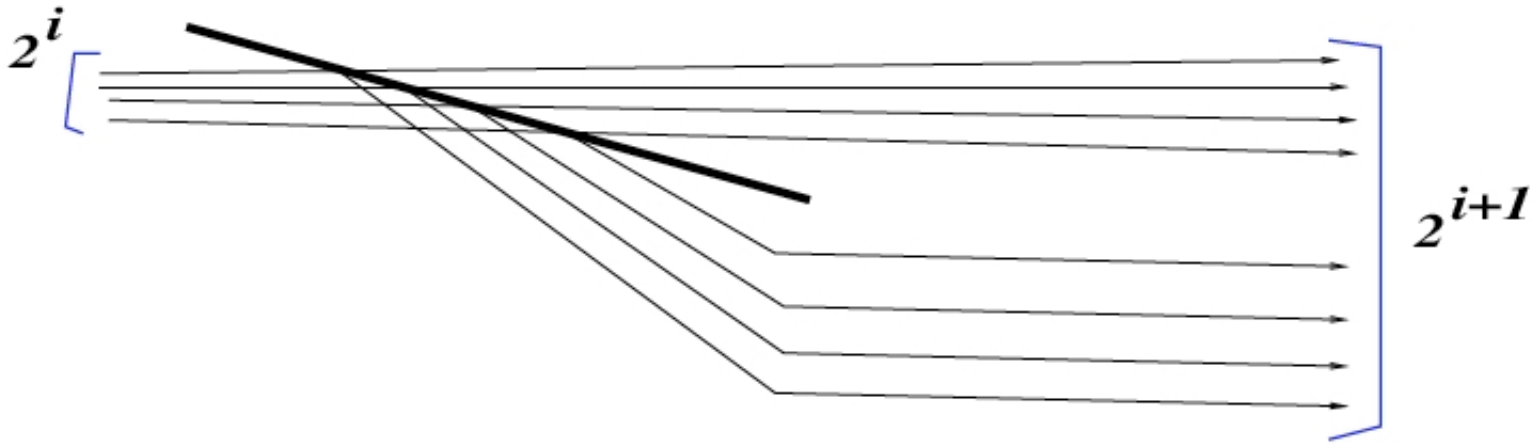
Anzahl der Kanten: Verdoppeln für jedes Polygon!



Komplexität der FC SPM

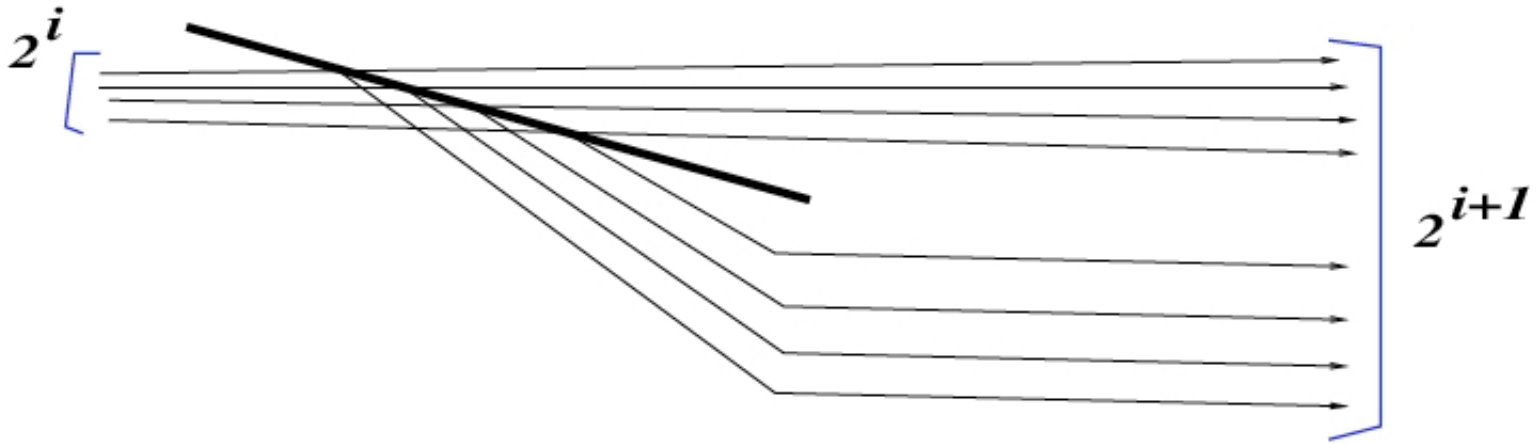
Anzahl der Kanten: Verdoppeln für jedes Polygon!



Mehr als $\Omega((n-k)2^k)$ Kanten!

Komplexität der FC SPM

Anzahl der Kanten: Verdoppeln für jedes Polygon!



Mehr als $\Omega((n-k)2^k)$ Kanten! Zu viele!