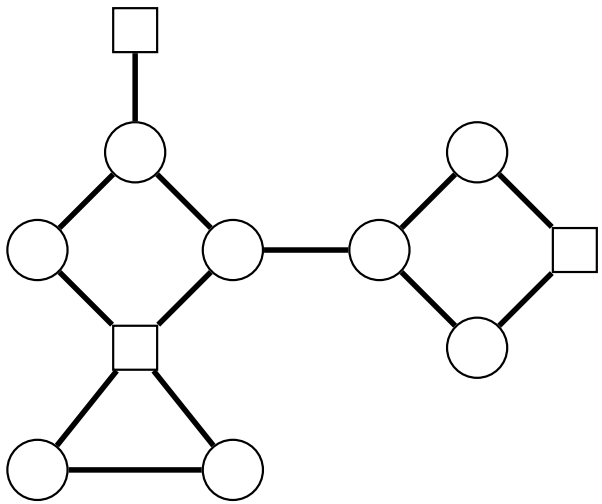
1.5 Approximation for Graphic Multi-Depot Multiple TSP

Niklas Dahlmeier, Philipp Pabst, **Raoul Luqué**, Laura Vargas-Koch

RWTH Aachen

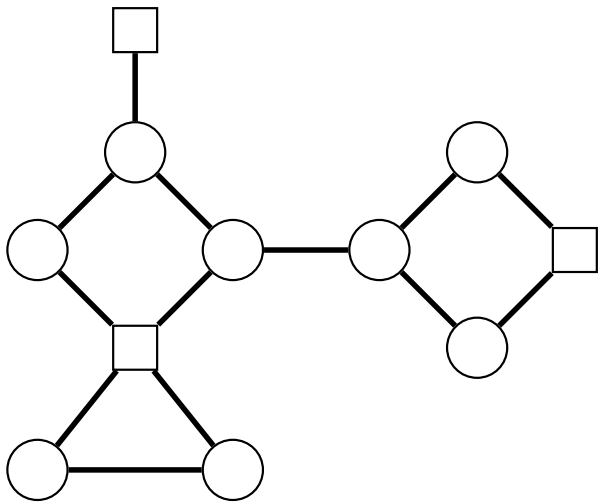
FRICO 2026 Pitch Talk

Graphic Multi-Depot Multiple TSP (GMDM-TSP)

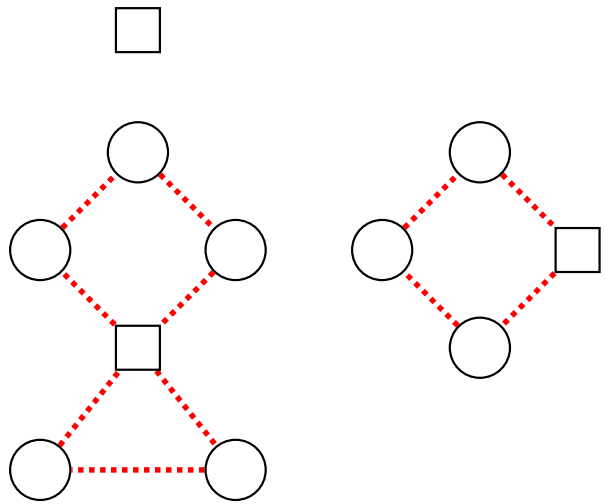


GMDM-TSP instance

Graphic Multi-Depot Multiple TSP (GMDM-TSP)



GMDM-TSP instance



Optimal solution to instance

Our results

Theorem.
There is a $\frac{3}{2}$-approximation algorithm for the graphic multi-depot multiple TSP.

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Our results

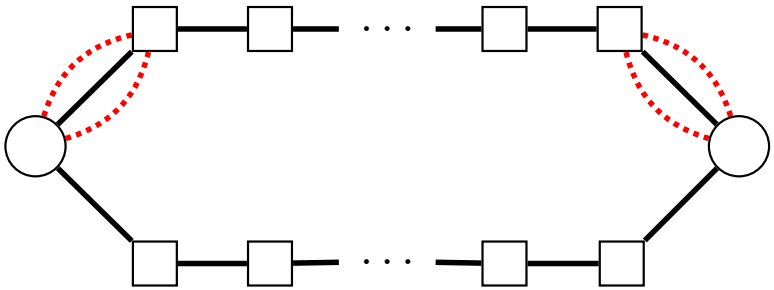
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State of the art:

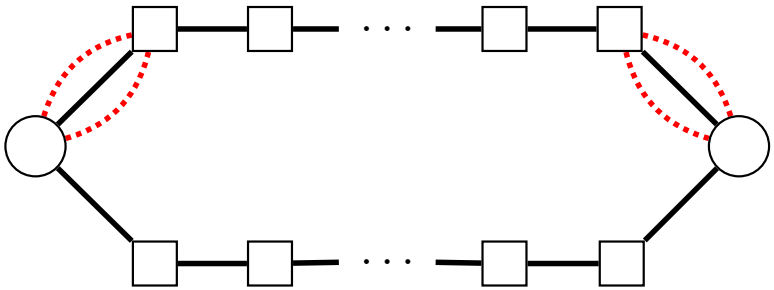
Theorem ([XXR11]).
There is a $2 - \frac{1}{|D|}$ approximation algorithm for the (graphic) multi-depot multiple TSP for instances with $|D| \geq 2$.

Christofides-Serdyukov Algorithm - Application to the GMDM-TSP

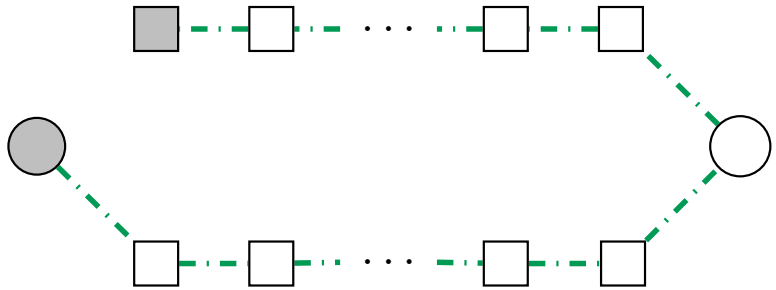


GMDM-TSP instance with
optimal solution in red

Christofides-Serdyukov Algorithm - Application to the GMDM-TSP

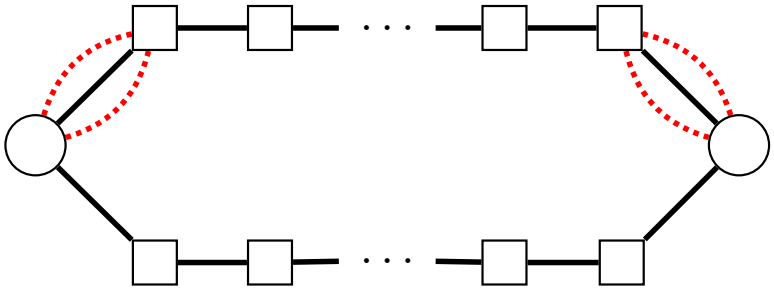


GMDM-TSP instance with optimal solution in red

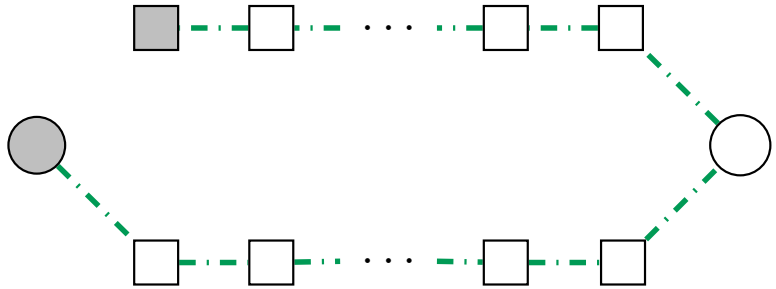


Spanning tree with odd-degree vertices in gray

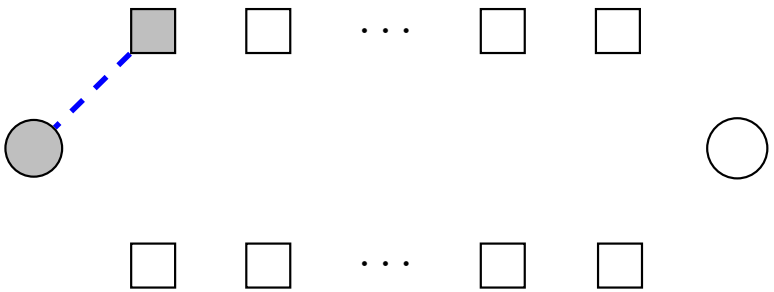
Christofides-Serdyukov Algorithm - Application to the GMDM-TSP



GMDM-TSP instance with optimal solution in red

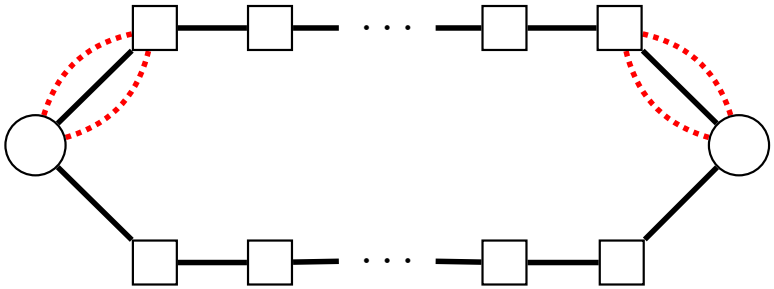


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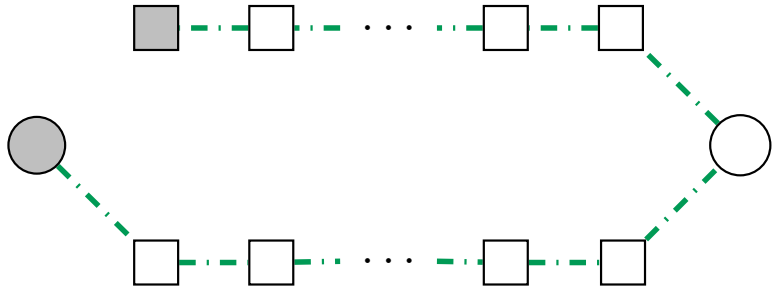


Parity correction

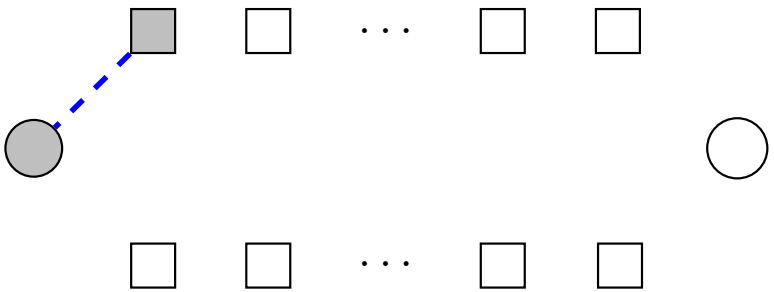
Christofides-Serdyukov Algorithm - Application to the GMDM-TSP



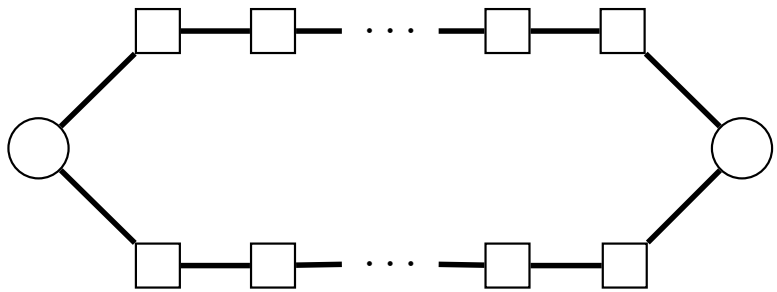
GMDM-TSP instance with optimal solution in red



Spanning tree with odd-degree vertices in gray

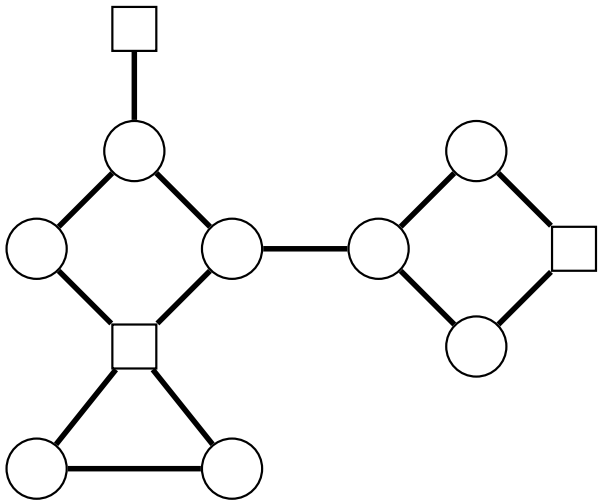


Parity correction

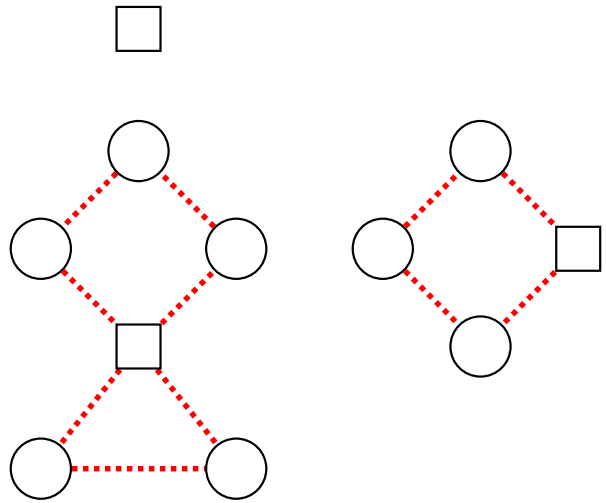


Resulting solution

Bounding the cost of the parity correction

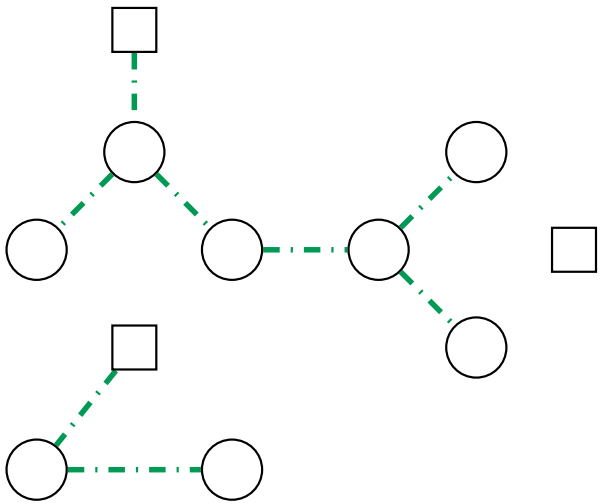


GMDM-TSP instance

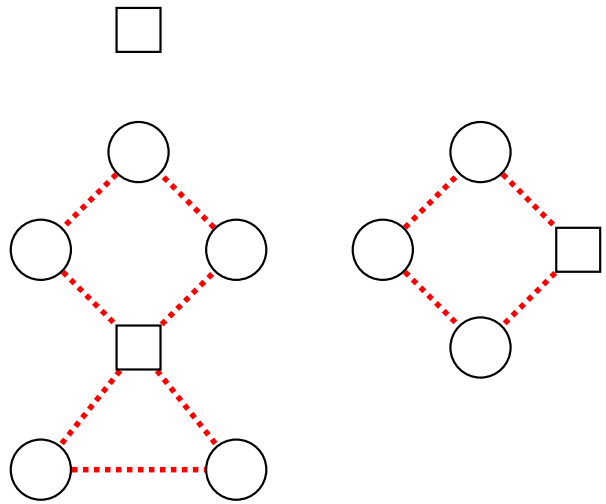


Optimal solution

Bounding the cost of the parity correction

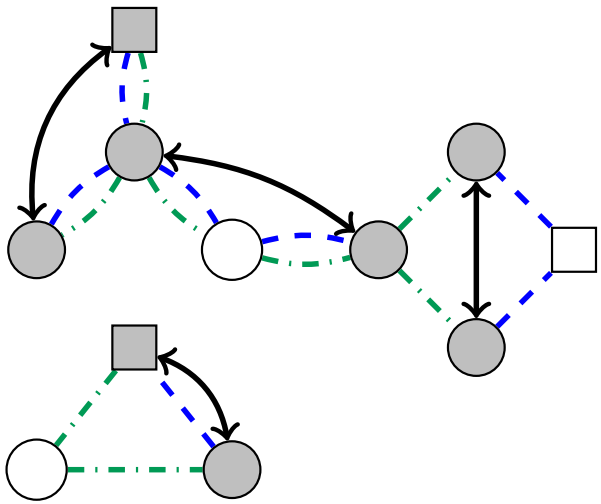


Constrained spanning forest

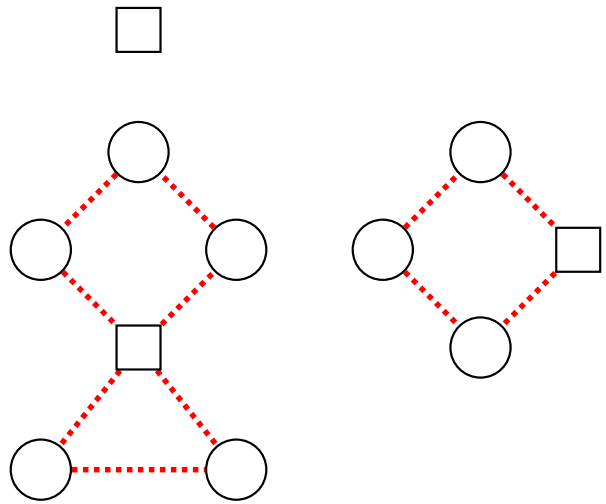


Optimal solution

Bounding the cost of the parity correction

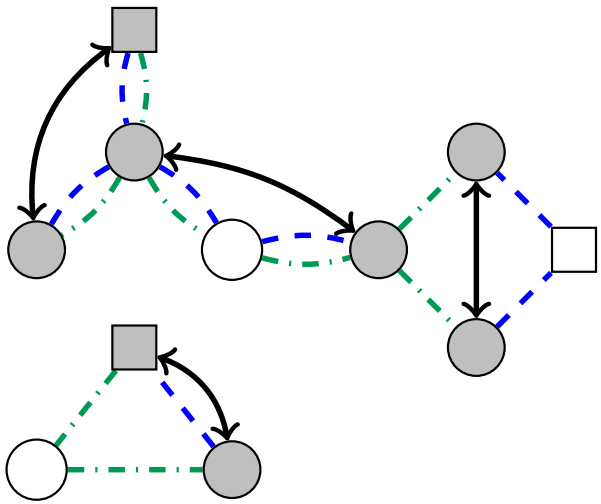


Algorithm solution with odd-degree vertices in gray and parity correction matchings indicated by arrows.

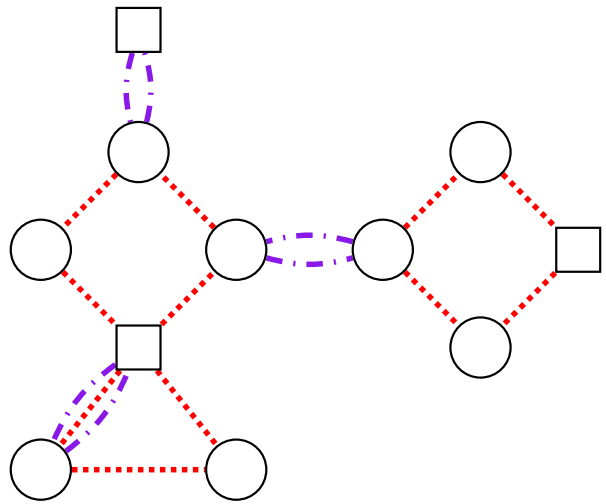


Optimal solution

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Algorithm solution with odd-degree vertices in gray and parity correction matchings indicated by arrows.



Optimal solution in red and auxiliary edges in purple

Our results

Theorem.
There is a $\frac{3}{2}$-approximation algorithm for the graphic multi-depot multiple TSP.

Literature I

[XXR11] Zhou Xu, Liang Xu, and Brian Rodrigues. "An analysis of the extended Christofides heuristic for the k-depot TSP". In: *Operations Research Letters* 39.3 (2011), pp. 218–223. ISSN: 0167-6377.