



Minimum k-Chinese Postman Problem

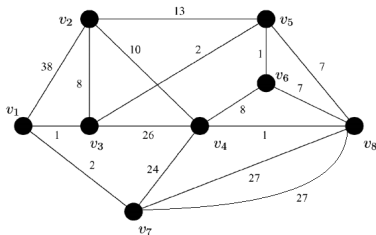
First Presentation

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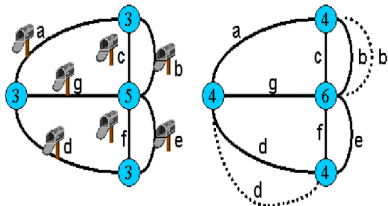
- s , initial vertex
- k , given positive number
- $l(e)$, length for each edge
- n , number of vertices(nodes)

Given a multigraph $G = (V, E)$ initial vertex $s \in V$ length $l(e) \in \mathbb{N}$ for each $e \in E$ the *minimum k -Chinese postman problem* is to find k tours such that each edge of the graph has been traversed at least once and the most expensive tour is minimized.[1]





This problem can be viewed upon as having multiple mailmen delivering mail to all streets in a city. It is sufficient that only one mailman visits a street but all streets has to be handled by at least one mailman, and the most expensive tour traveled should be minimal.[1]



Project Design Plan



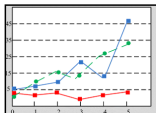
Literature Research



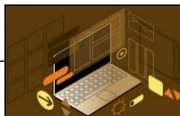
Determining and
choosing algorithm



Implementing algorithm



Comparing results with
the results in the literature



Preparing a Graphical
User Interface.



- Testing with different parameters.
- Optimizing algorithm and making some improvements.



- ▶ Making literature research and understanding the problem.
- ▶ Determining and choosing algorithm.
- ▶ Implementing algorithm.
- ▶ Creating different random graphs.
- ▶ Testing with different parameters.
- ▶ Showing the average results on the charts.
- ▶ Preparing a Graphical User Interface.
- ▶ Comparing results with the results in the literature.



Project Non-functional Requirements

- Python 3.10 will be used as Programming Language
- Windows 10 will be used as Operating System
- PyCharm IDE will be used as Development Environment
- Python libraries will be used to make GUI and create random graphs and visualize them.



1 st Meeting	●	Making literature research. Understanding the problem.
2 nd Meeting	●	Continue literature research. Determine and examine steps of the algorithm. Start to Implement Algorithm.
3 rd Meeting	●	Finish Algorithm. Test with different parameters. Show the results on charts.
4 th Meeting	●	Creating Different Random Graphs. Preparing a Graphical User Interface. Comparing results with the literature results.



1. Implementing at least 1 algorithm for this problem.
2. Implementing a polynomial-time heuristic algorithm.
(The exact complexity time will be determined after a deep analysis).
3. Creating at least 5 different graphs.
4. Getting algorithm results in less than 60 seconds with small parameters which means when $n < 10$ and $k < 5$.



- [1] A. Hölscher, *A cycle-trade heuristic for the weighted k -chinese postman problem*, 2018.
- [2] D. Ahr, *A tabu search algorithm for the min-max k -chinese postman problem*, 2005.
- [3] S. Liu, *A genetic algorithm for minmax k -chinese postman problem with applications to bridge inspection*, 2019.
- [4] <https://github.com/zafeirakopoulos/gtu-presentation>.
- [5] <https://en.wikipedia.org/wiki/Multigraph>.
- [6] <https://www.youtube.com/watch?v=paMcKZlcv78>.
- [7] https://www.researchgate.net/publication/228767978_Graph_theory_techniques_in_model-based_testing/figures?lo=1.



Thank You

