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An evaluation of space partitioning methods and meta-heuristics based graph partitioning methods for partitioning road network simulations

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ABSTRACT

Abstract goes here.

1 MOTIVATION

Introduction goes here.

Our **key contributions** in this paper are:

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The rest of the paper is arranged as follows.

2 RELATED WORK

3 FORMALIZATION OF THE PROBLEM STATEMENT

In this paper we conduct a statistically significant comparison of different methods of partitioning a road network graph based on some metrics. This section defines what a road network graph is and presents the formal definition of the metrics in the context of this formal descriptions.

3.1 The Road Network Graph

The road network of a city can be represented by a directed cyclic graph (Holden and Risebro 1995) $G(V,E)$ where V denotes the vertex set and E denotes the edge set. Every edge $e_{ij} \in E$ in the graph represents a unidirectional road in the city that connects intersection v_i to intersection v_j. Every vertex $v_i \in V$ denotes an intersection of two or more roads. A weight w_{ij} is associated with the edge e_{ij} that is representative of the traffic that flows through that road. As discussed in Section 5, we plan on increasing the number of weights that can be associated with every edge to be able to represent the number of lanes, length of the road, importance of the road etc.

3.2 Partitioning a graph

For the sake of completeness of the graph definition, we also assign weights to the vertices denoted by W_i, which is defined as follows :

$$W_i = \sum_{\forall j \in neighbours(i)} w_{ij} \tag{1}$$

where $neighbours(i)$ is the set of all nodes in V that receive an outgoing edge from v_i.

3.3 Formalizing the objective function

We define a partitioning scheme, ζ as

The objective of our framework is to minimize the total application latency as described in Equation (**??**).

4 EXPERIMENTS AND RESULTS

5 FUTURE WORK

- One of the limiting factor in this comparison is the limited representation of the road network. We plan to extend out model by allowing edges and vertices in our road network graph to have more than one weight associated with them. In doing so, we can allow for a finer and more accurate representation of the road network which in turn allows us to partition the graph better.
- In the modified move function, we currently move edges(the neighbour correspoding to the edge) if it has a weight which is 2σ away from μ. This is under the assumption that traffic is normally distributed across the edges. One of the improvements that we could do is to fit the distribution of traffic across edges and move edges according to this regressively found curve that fits the traffic distribution.

6 CONCLUSION

In this paper we have outlined the comparison of space and graph partitioning techniques in the context of partitioning road network graphs for simulation. We have discussed

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A APPENDICES

Place any appendices after the acknowledgments and label them **A**, **B**, **C**, and so forth.

REFERENCES

Holden, H., and N. H. Risebro. 1995. “A mathematical model of traffic flow on a network of unidirectional roads”. *SIAM Journal on Mathematical Analysis* 26 (4): 999–1017.

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