<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Multi-Agent Cooperative Vehicle Routing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Seshadri, Madhavan</td>
</tr>
<tr>
<td><strong>Citation</strong></td>
<td>Seshadri, M. (2017, March). Multi-Agent Cooperative Vehicle Routing. Presented at Discover URECA @ NTU poster exhibition and competition, Nanyang Technological University, Singapore.</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>2017</td>
</tr>
<tr>
<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10220/42832">http://hdl.handle.net/10220/42832</a></td>
</tr>
<tr>
<td><strong>Rights</strong></td>
<td>© 2017 The Author(s).</td>
</tr>
</tbody>
</table>
Observation:
1. Certain parts of the city are more popular than the other (city centre), tourist spots, major interconnections etc.
2. Almost every vehicle has inbuilt internet communication capabilities.
3. Many parts of the network are under-utilised.

The traffic in the road-network will be significantly reduced when all the vehicles using it can collaboratively utilise the network better and better decide routes based on the updated traffic information.

This project is aimed at proposing a novel node-pressure based cooperative routing with Auction based rerouting

Problem Formulation

\[
\min \frac{1}{N} \sum_{i=1}^{n} t^T x_i | A x_i = b_i \quad x_i \in \{0,1\}^n;\quad A^+ \sum_{i=1}^{n} x_i \leq c
\]

Where
\( \lambda \) is the traffic towards each of the node
\( A \) is the representation of the network as a matrix
\( x \) is the vector specifying optimal route

Multi-Agent System

Vehicle agents calculate their route independently based on the current environment conditions and based on the price.
To change the routes, the vehicle agents have to participate and win the auction.

\[ \text{Auction Problem} \quad \max \sum_{i=1}^{n} \sum_{b_{i|l} \in B_i} v_i S_{i|l} x_{i|l} \]

Where
\( V_i \) is the value of the multiset which is the new path
\( S_{i|l} \) is the representation of the multiset
\( b_{i|l} \) is the \( l^{th} \) bid by the vehicle agent \( i \)

Results

The Multi-Unit MAS model performs significantly better than the other MAS models in reducing Traffic Severity and terminates 15% faster.