Comparison of Hierarchical Network Design Shape Grammars for Roads and Intersections

Paper: 12-3240
Poster: P12-6579

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January 2012
Shape grammars – General grammar rules scheme

A

Necessary connection

B

Possible connection

C

Minor Arterial
Access Road
Local Road

Multiple level node
Roundabout
Light-signal system
T-junction
Crossing

Source: after Marshall (1)

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Motivation – ITE advise for access roads (1965) (2, 3)
Motivation

Diverse standards in network design, e.g.:


Missing evidence for network design standards

Growing urban systems, rural depopulation

Search space reduction for transport network design

Urban simulation and design

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Shape grammars – advantages and disadvantages

+ Application in planning processes
+ Robust, reliable and easy implementation
+ Low computational requirements
+ Inclusion of spatial planning and architecture shape grammars.

– Unknown impact of shape grammars
– Lack of fundamental evidence base
Method – Integrated Ant Colony and Genetic Algorithm

\[ p = f(\text{pheromone densities, random term}) \]
Method – Intermediate elites of iteration 20, 50, 200

Link Types:  
- Minor arterial
- Access road
- Local road

Intersection types:  
- Roundabout
- Signal control
- Right of way control

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Results – link loadings
## Evaluation – Differences of shape grammars

<table>
<thead>
<tr>
<th>Shape grammar</th>
<th>Average score</th>
<th>Relative difference</th>
<th>Wilcoxon rank-sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-143'200</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>-147'132</td>
<td>2.75%</td>
<td>0.0087%</td>
</tr>
<tr>
<td>C</td>
<td>-144'798</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>-157'690</td>
<td>8.90%</td>
<td>0.048%</td>
</tr>
</tbody>
</table>

Initial setting 1 (n = 53)
References


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at: Hilton, E04
    Jan 25, 2:45pm – 4:30pm

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