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Comparison of Hierarchical Network Design Shape Grammars for Roads and Intersections

Paper: 12-3240
Poster: P12-6579

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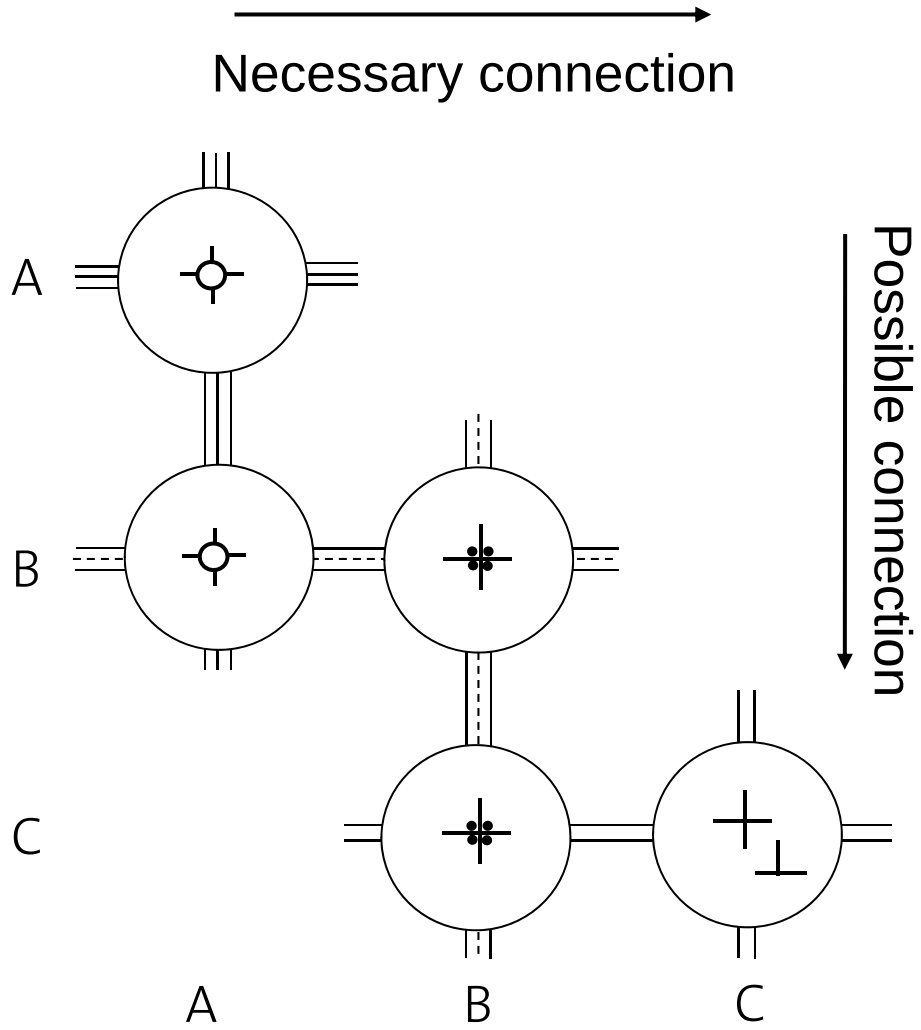
Shape grammars – General grammar rules scheme



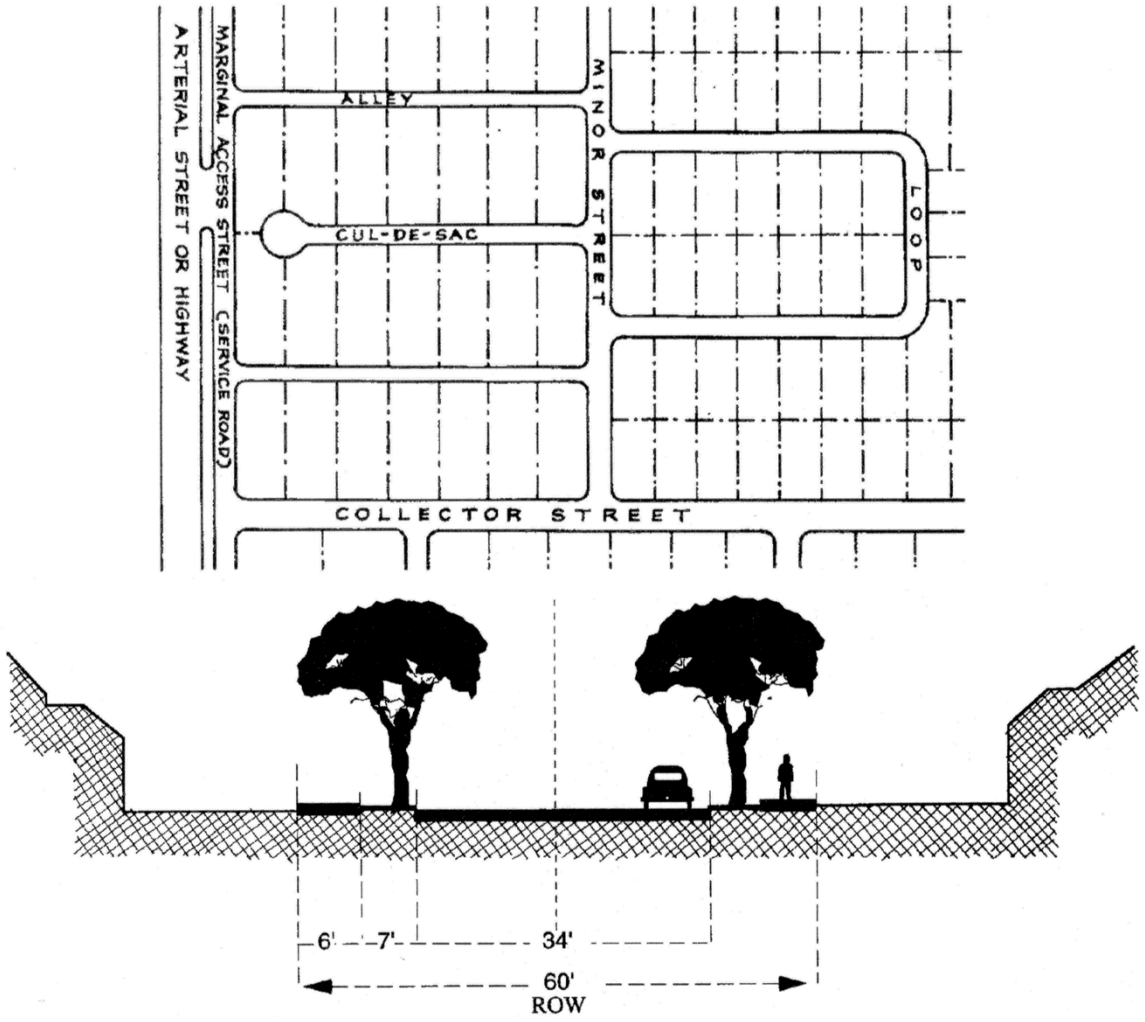
Minor Arterial
Access Road
Local Road

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

Source: after Marshall (1)

Paper:12-3240 / Poster: P12-6579

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



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Motivation

Diverse standards in network design, e.g.:

AASHTO (2004), IHT (1997), VSS (1994), FGSV(2008)

Missing evidence for network design standards

Growing urban systems, rural depopulation

Search space reduction for transport network design

Urban simulation and design

Shape grammars – advantages and disadvantages

+ Application in planning processes

+ Robust, reliable and easy implementation

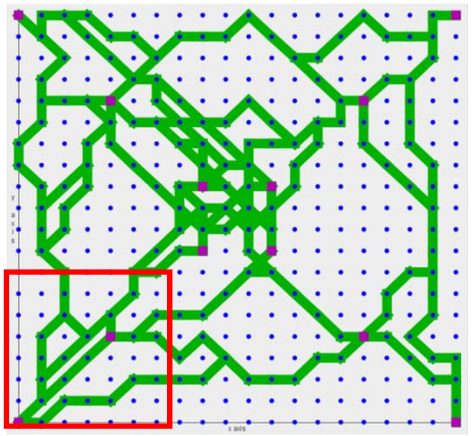
+ Low computational requirements

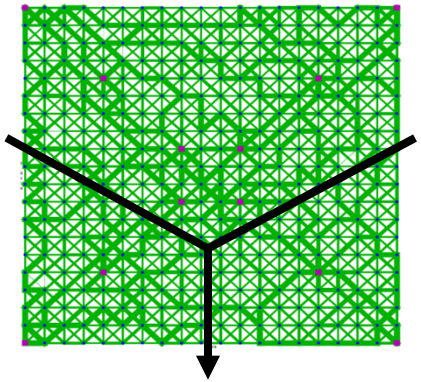
+ Inclusion of spatial planning and architecture shape grammars.

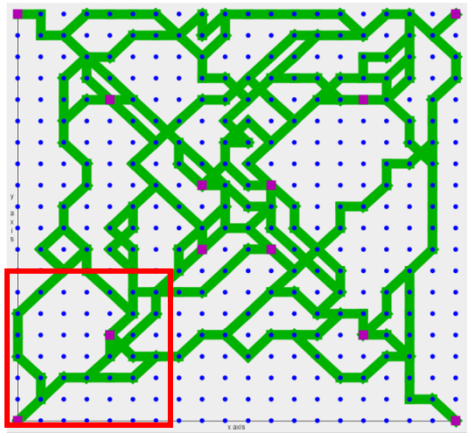
– Unknown impact of shape grammars

– Lack of fundamental evidence base

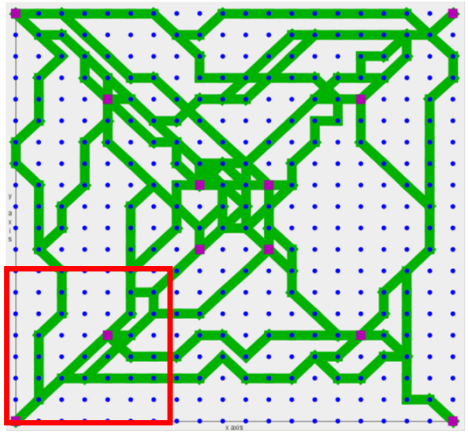
Method – Integrated Ant Colony and Genetic Algorithm



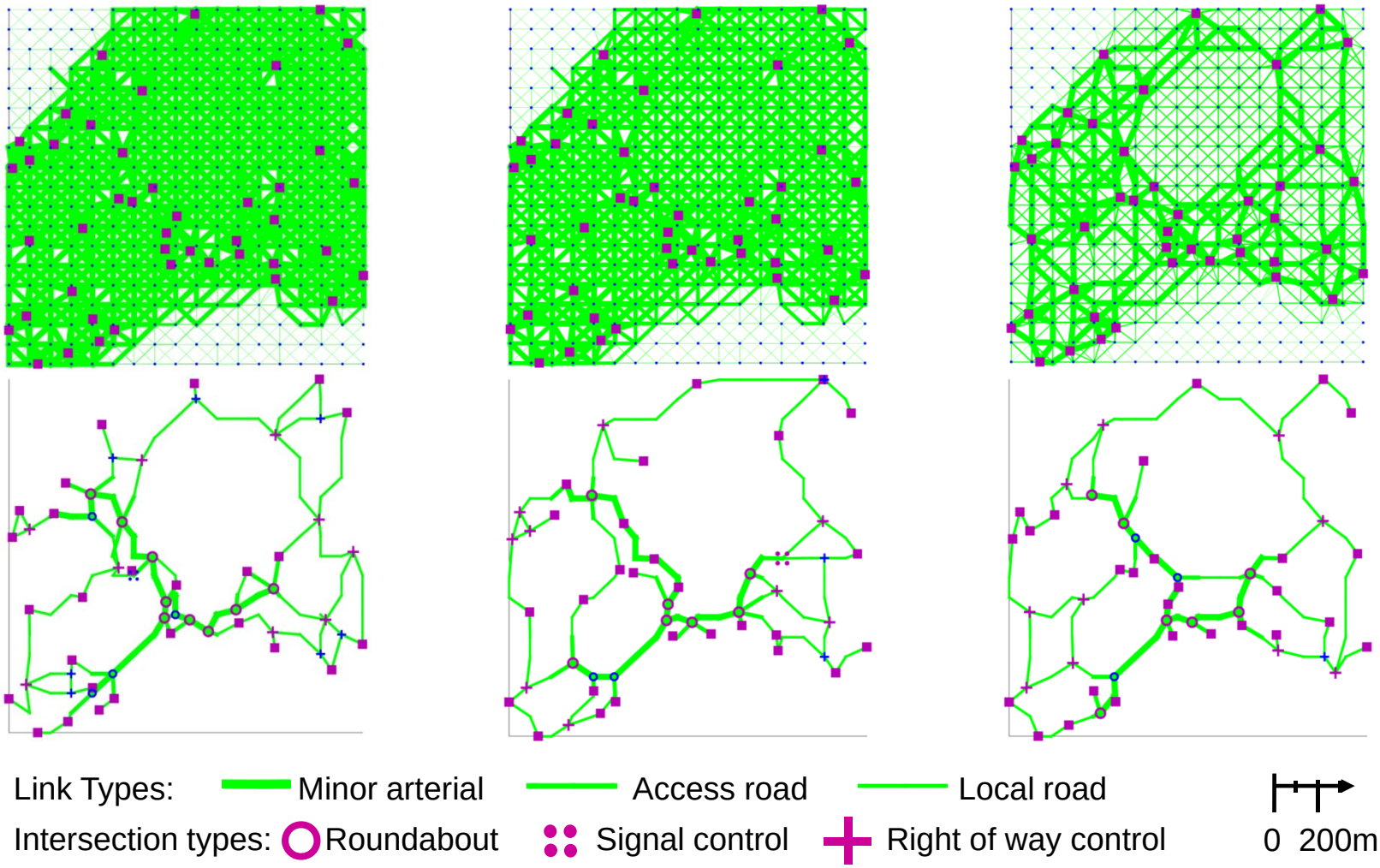




$$p = f(\text{pheromone densities, random term})$$

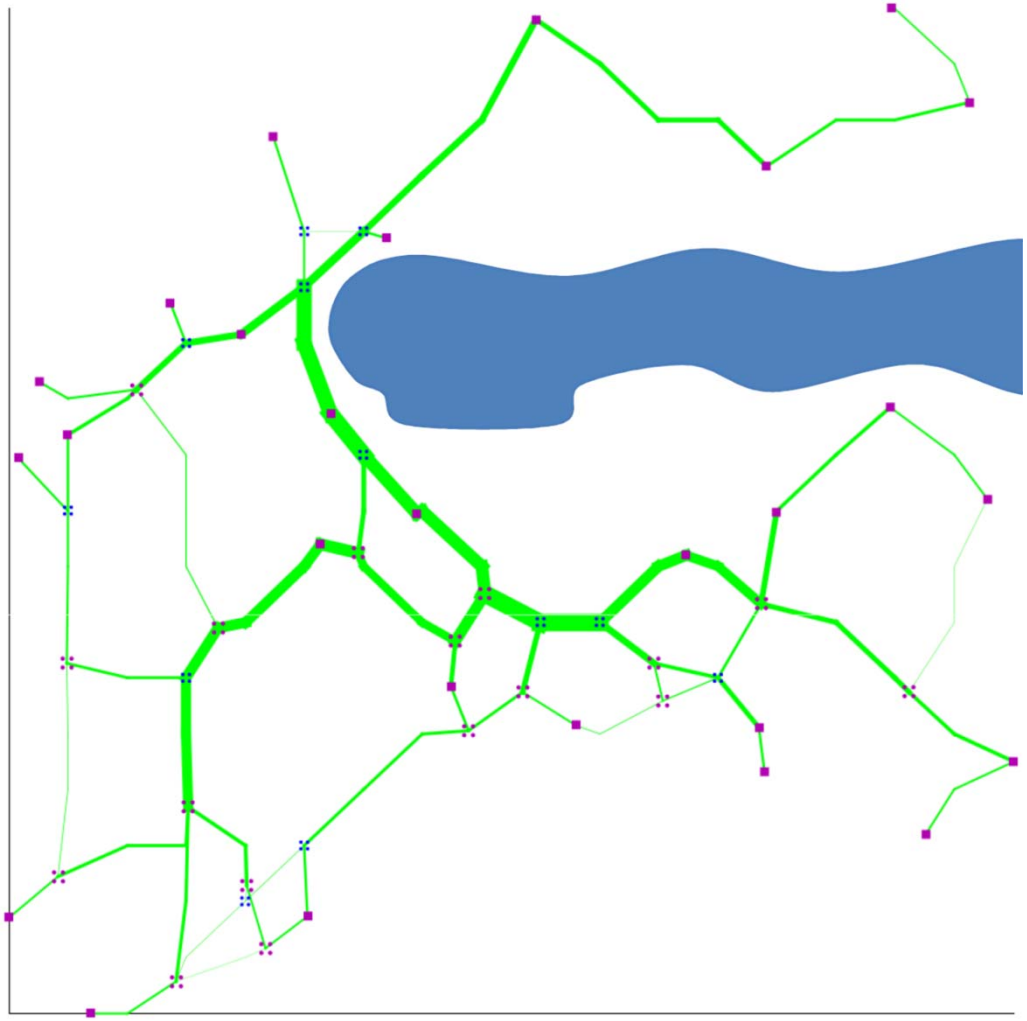


Method – Intermediate elites of iteration 20, 50, 200



Paper:12-3240 / Poster: P12-6579

Results – link loadings



Paper:12-3240 / Poster: P12-6579

Evaluation – Differences of shape grammars

	Initial setting 1 (n = 53)		
Shape grammar	Average score	Relative difference	Wilcoxon rank-sum
A	-143'200	-	
B	-147'132	2.75%	0.0087%
C	-144'798	-	
D	-157'690	8.90%	0.048%

References

(1) Marshall, S. (2005) *Streets & Patterns*, Spon Press, London.

(2) Southworth, M. and E. Ben-Joseph (2003) *Streets and the Shaping of Towns and Cities*, Island Press, Washington D.C..

(3) ITE (1965) *Traffic Engineers Handbook*, Institute of Traffic Engineers, Washington D.C.

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

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