DLA Conference 2019 | Informed by Science, Shaped by Design



Towards Managing Visual Impacts on Public Spaces: A Quantitative Approach to Studying Visual Complexity and Enclosure Using Visual Bowl and Fractal Dimension

Dr Ata Tara Philip Belesky Dr Yazid Ninsalam

VOTE 1

Sustainable Australia Party

For your vote to count, remember to follow the instructions on your ballot paper.



Policies for better planning to stop over-development:

- Return real planning power to local communities
- Deliver new community infrastructure before more housing developments
- Reduce population pressures by lowering immigration from 200,000 p.a. back to 70,000

For more information visit: SustainableAustralia.org.au/planning

Vote for better planning to stop over-development.



Sustainable Australia is an independent party from the political centre. We stand for:

- A sustainable environment and population
- Better planning to stop over-development
- Affordable housing for first home buyers and renters
- Secure jobs via a more diverse economy

Policies and candidates: SustainableAustralia.org.au/vic



BIG COX mad MVRDV OMA CHB(L)









Dezeen.com (2018), BIG, MAD, MVRDV and OMA on shortlist to design Australia's tallest building [Online].https://www.dezeen.com/2018/07/27/big-mad-mvrdv-oma-unstudio-and-coop-himmelblau-shortlisted-melbourne-skyscraper/ [Accessed 3.05.2019]



REPRODUCTION WITHOUT WRITTEN PERMISSION IS FORBIDDEN

melbourne-1837-map-by-robert-hoddle-1837/WwFRhJzdjDKvow [Accessed 5.05.2019]









On-the-ground Locations



La Trobe Street (eastbound)

On-the-ground Locations



Concerted relationships or chaos?

La Trobe Street (eastbound)

On-the-ground Locations



La Trobe Street (eastbound)

Visual Bowl as the hollow three-dimensional **Space/Volume** around a defined observer point (TARA et al. 2018).



Tara, Ata (2017) Measuring visual attributes for assessing visual conflicts in urban environments. PhD thesis, Queensland University of Technology.

DLA 2018- Interrogating Urban Renewal Scenarios using Skyline Analysis in Fishermans Bend, Melbourne



Beyond Viewshed Existing Viewshed Analysis in ArcGIS (single function) Limitations: Gives you visible surfaces

State Library Forecourt









 θ = Elevation Angle / 3Dd= 3D Distance to skyline / 2Dd= 2D Distance to object / h= perceived height

Unwrapped Skyline Graph - Elevation Angle



Unwrapped Skyline Graph- Sightline Distance



Clouds are not spheres, mountains are not cones, coastlines are not circles, and bark is not smooth, nor does lightning travel in a straight line. (Mandelbrot, 1983)



How "complicated" a self-similar object is?

Background Coastline Paradox (Fractal Dimension)



$$D = \frac{\log(N)}{\log(r)}$$
Great Britain: D = 1.25
Australia: D = 1.13

Fractal Foundation (2015), Koch Curve and Coastlines [Online]. https://fractalfoundation.org/resources/fractivities/koch-curve/ [Accessed 5.05.2019]

Background Box-Counting Method (Quadtree decomposition)





FD= 1.81

FD= 1.95

Background Facade Articulation



FD= 1.69

FD= 1.74

FD= 1.83

FD= 1.82

MRI Of Brain Fractal Dimension of Brain Volume



JIMÉNEZ, J., LÓPEZ, A. M., CRUZ, J., ESTEBAN, F. J., NAVAS, J., VILLOSLADA, P. & RUIZ DE MIRAS, J. (2014), A Web platform for the interactive visualization and analysis of the 3D fractal dimension of MRI data. Journal of Biomedical Informatics, 51, 176-190.

FD= 2.678

Fractal Dimension which method?





Brain Of Public Space

MRI Of Public Space



5m / 251,388 voxels

6m / 145,489 voxels

8m / 62,424 voxels 10m / 32,191 voxels



4m / 486,338 voxels

30m / 1,359 voxels



40m / 601 voxels





70m / 601 voxels



80m / 320 voxels



90m / 61 voxels



100m / 49 voxels

50m / 320 voxels

60m / 1,359 voxels



Queen Victoria Market 🔍

State Library Forecourt

tilles.

Google Earth

Shrine of Remembrance

Selected Viewpoints for Analysis



Point Cloud 2018

City Model (LoD2)

Current Photo





Comparison of Two Public Spaces



Existing vs Future More complex?



Unwrapped Skyline Graph Elevation Angle

60 -

5-



Unwrapped Skyline Graph Sightline Distance

1,500 -

1,400 -

1,300 - 1,000 - 1,000 - 1,000 - 1,000 - 1,000 - 1,000 - 1,000 - 1,000 - 1,000 - 1,000 - 0,000

200 100

0



Negative Correlation Between Sky Ratio and Fractal Dimension



Hypothesis: higher heights = higher complexity?

Results & future:

- Quantification of variables (calculate magnitude of change);
- Numerical Comparison of spatial characteristics of public spaces;
- Limitations in estimating FD (bottom of bowl / setbacks)
- Medium Density-NIMBYISM (research on sense of overdevelopment by including public perceptions)



Visual Impact of Urban Form (Real World Project)

Client:City of Gold CoastDate:2019Aim:Review of City Plan Building Height OverlayOutcome:Study of 16 view corridors and defining height thresholds and impact levels





Azimuth Angle (0-360°)



Towards Managing Visual Impacts on Public Spaces

Dr Ata Tara ata.tara@rmit.edu.au