# 3D et analyse visuelle des environnements urbains

## GdR MAGIS — Webinar « Autour de la 3D »

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# Place Royale, Nantes

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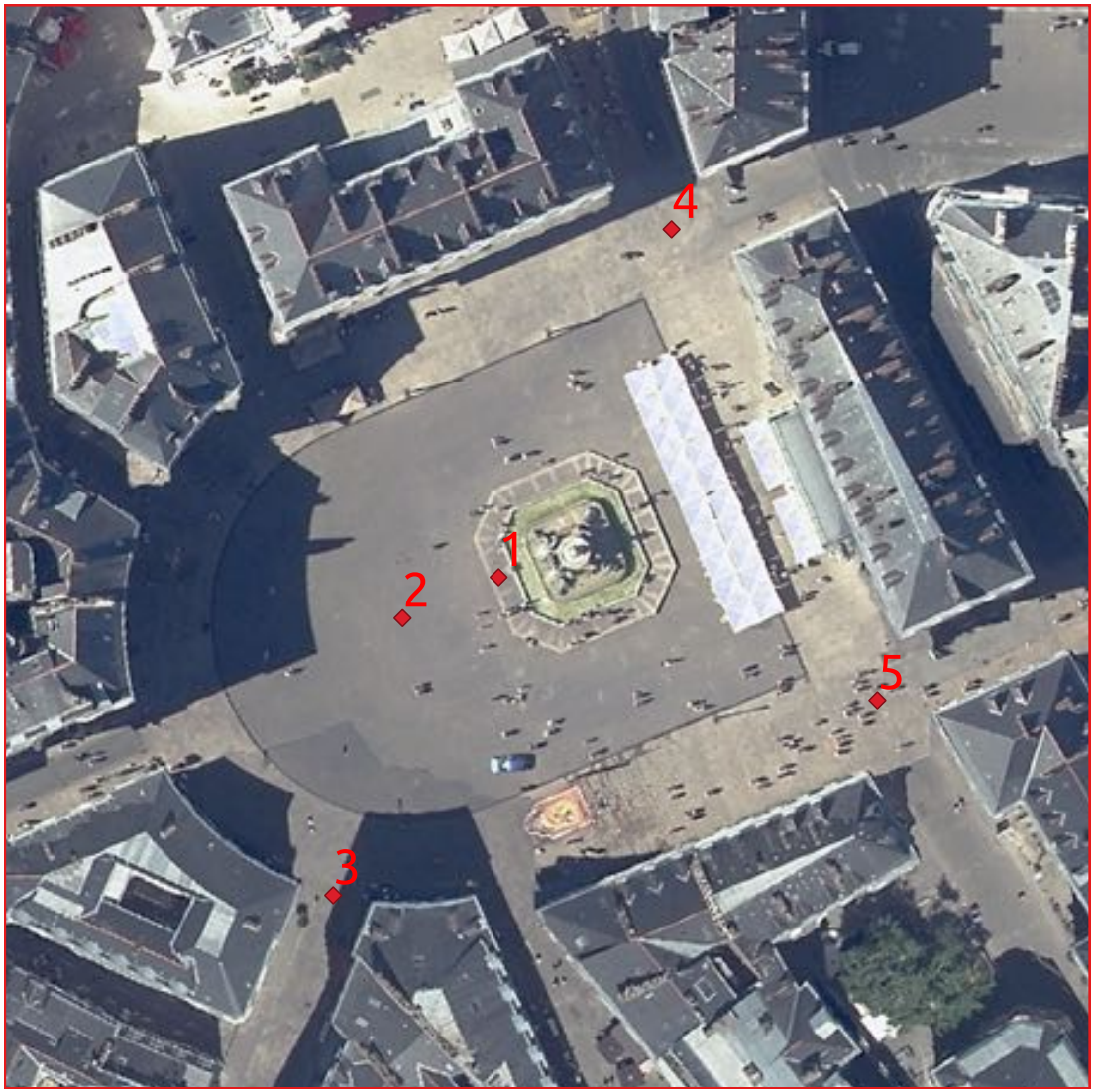


# Place Royale, Nantes





# Rue du Port-au-Vin, Nantes

# Quelques enseignements (1)

- Ne pas confondre *champ visuel* (image rétinienne statique, limitée et instantanée - non-conscientisée) et perception du *monde visuel* (étendu, stable)
  - *Unquestionably the panoramic visual world depends on a temporal series of excitations and just as unquestionably the succession of excitations is not represented in the final experience* [Gibson, 1950]

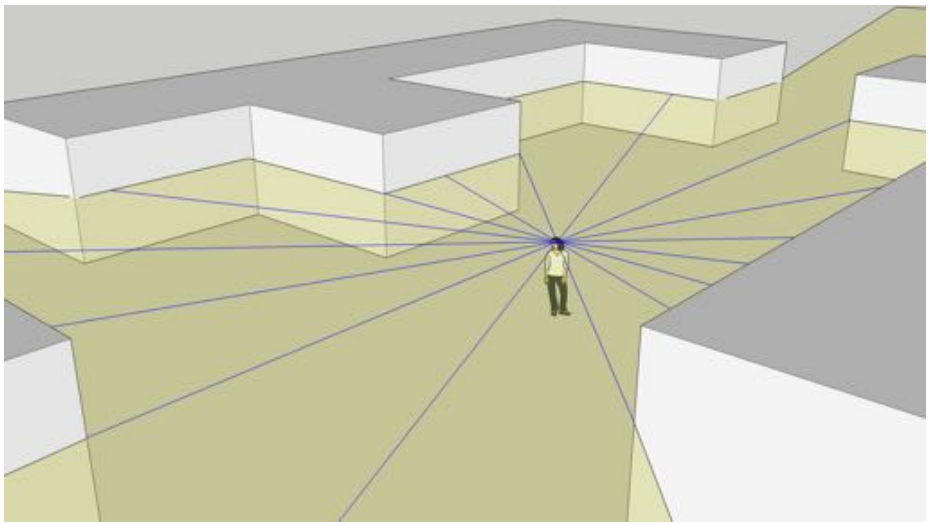
- L'espace urbain ouvert - espace interstitiel, vide qui sépare les formes construites - est continu. Ses limites sont souvent ambiguës.
  - Concept de « boîte urbaine » par analogie aux espaces architecturaux [Teller, 2001, p. 175]

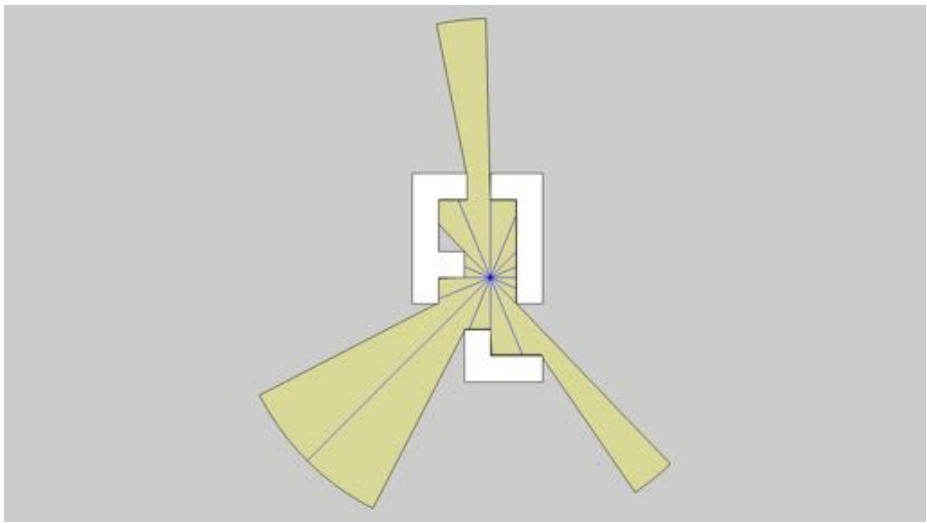
# Quelques enseignements (2)

- Dans une conception *plenum* [Couclelis, 1992] de l'espace ouvert, ce dernier résulte de combinaisons singulières (organisation des fronts bâtis, axialités, etc.). Ses limites sont mouvantes, des recouvrements sont possibles.
  - L'espace ouvert comme champ d'attributs [Teller, 2001, p. 183]
    - Lignes et cartes axiales [Hillier and Hanson, 1984], champs d'isovists [Benedikt, 1979], s- et e-partitionnements [Peponis et al., 1997], espace des proximités ou diagramme de Voronoi, graphes de visibilité [Turner et al., 2001], ouvertures et vues du ciel [Teller and Azar, 2001], etc.
- La conjonction de points de vue tangentiels et zénitaux permet de mieux appréhender divers registres de forme [Lévy, 2005] : tissu, tracés, paysage

# « Aplanir » l'environnement : isovist [Benedikt, 1979]

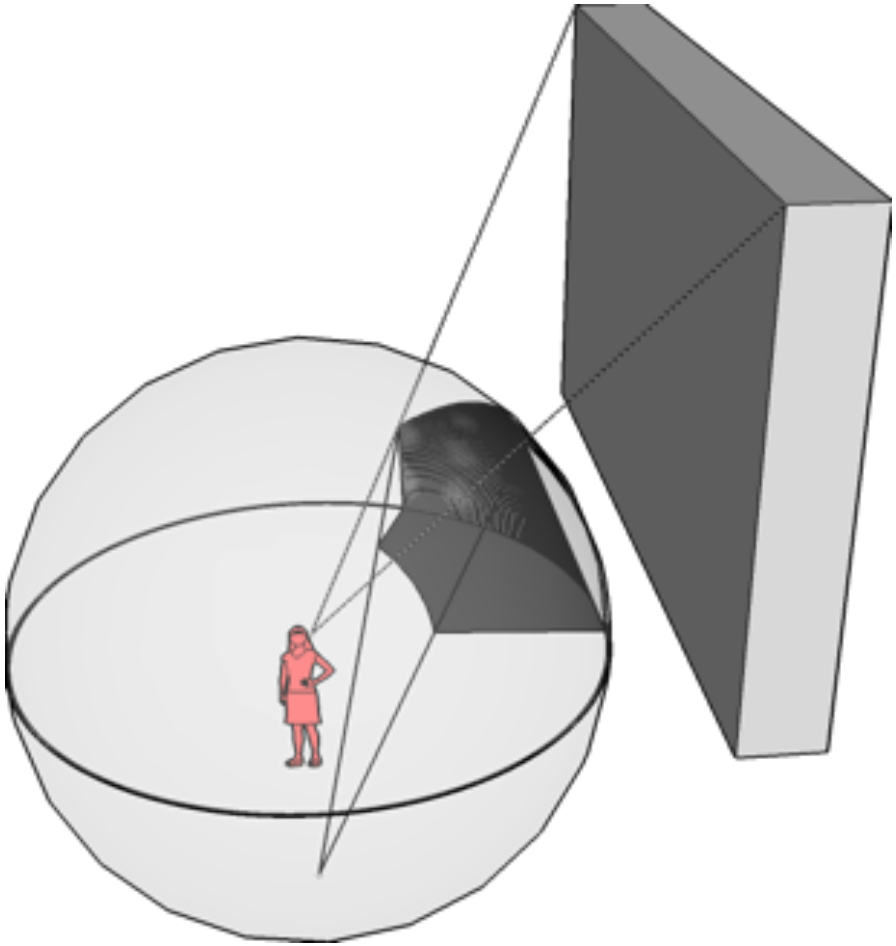
- Ensemble des points d'un plan horizontal, à hauteur du regard, qui séparent le point de vue des prochaines façades opaques dans toutes les directions (panoptique).

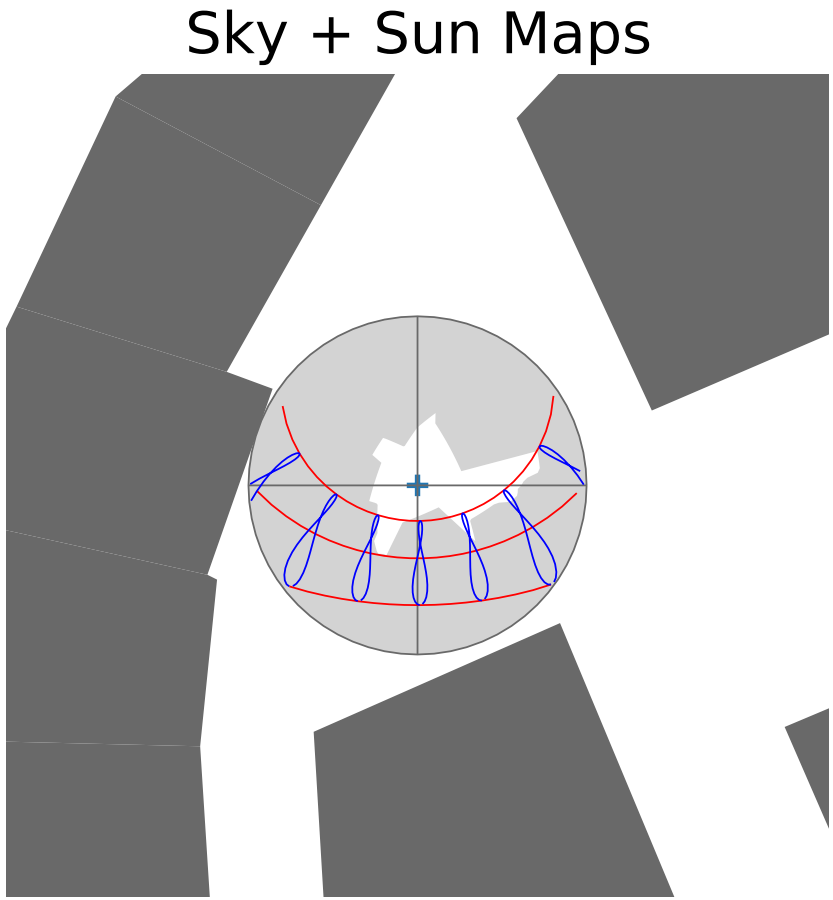




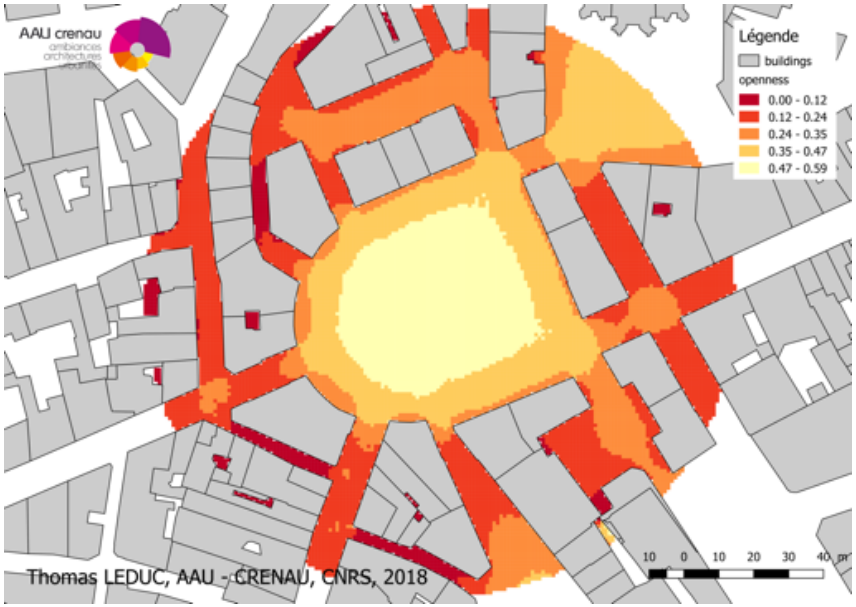
# « Aplanir » l'environnement : carte de vue du ciel [Teller and Azar, 2001]

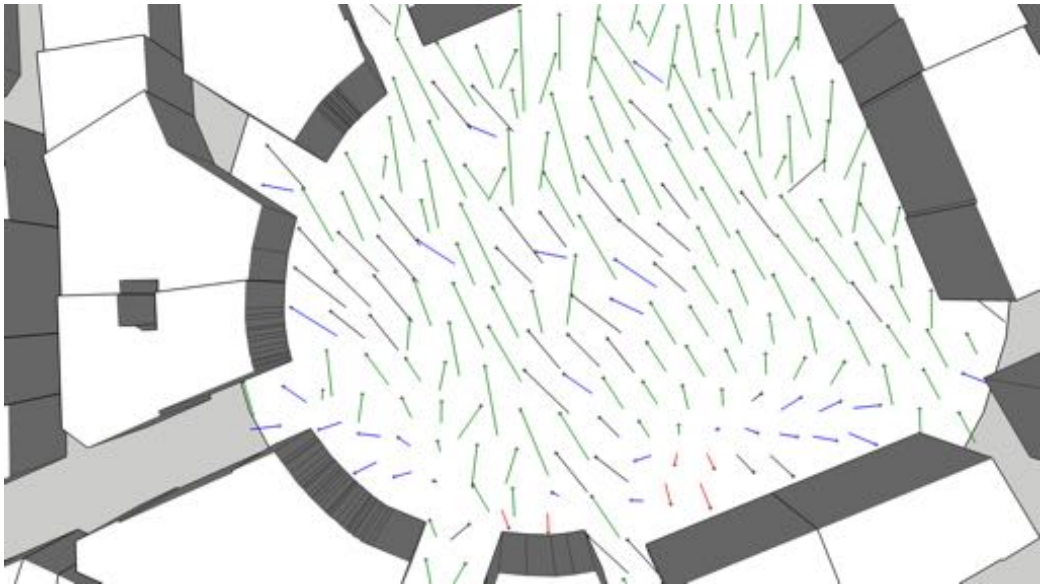
- Analyse sphérique : mécanisme de double projection (sphérique puis d'aplanissement : stéréographique, isoaire, équidistante).





# Approche orientée champ



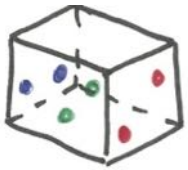



# Champ d'isovist pour un parcours piéton

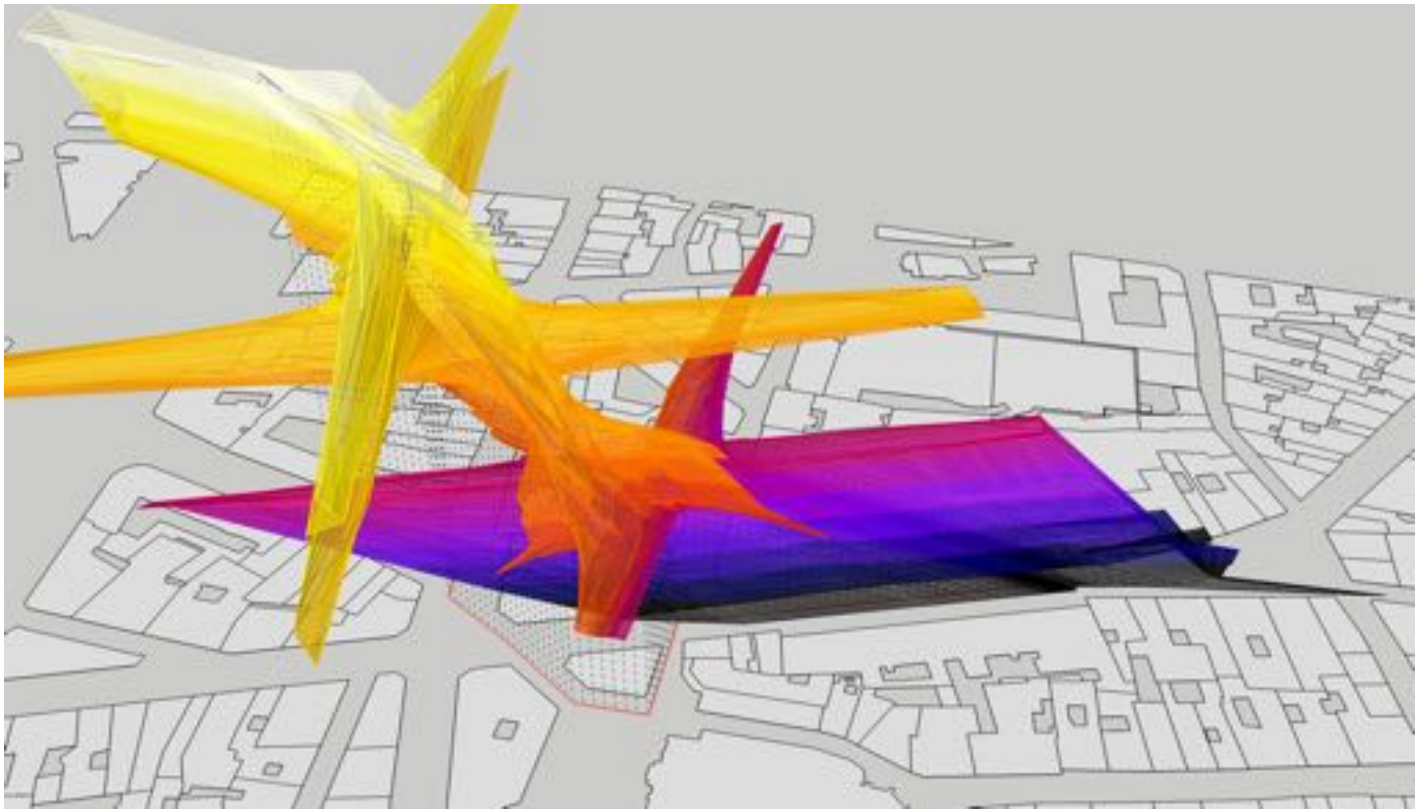
time-cutting

time-flattening

time-scaling



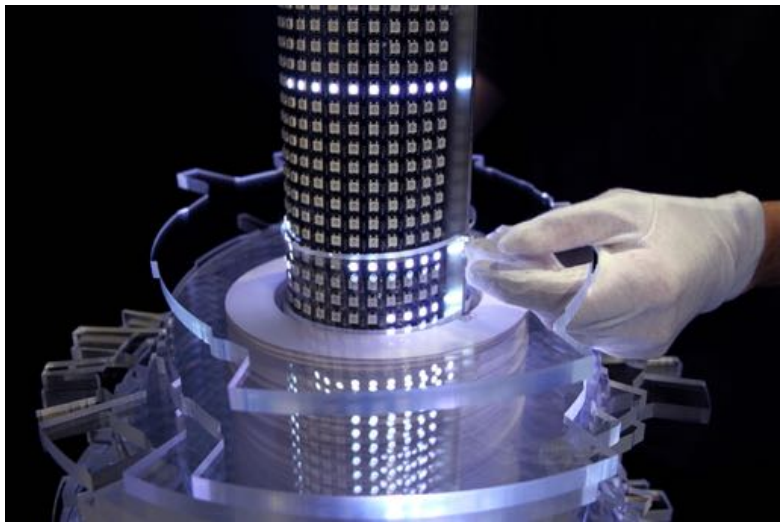
time-coloring



Formalisme du cube spatio-temporel
[Leduc et al., 2019]
Op=(time cutting // space shifting // time colouring)*
+ time scaling + 3D Rendering

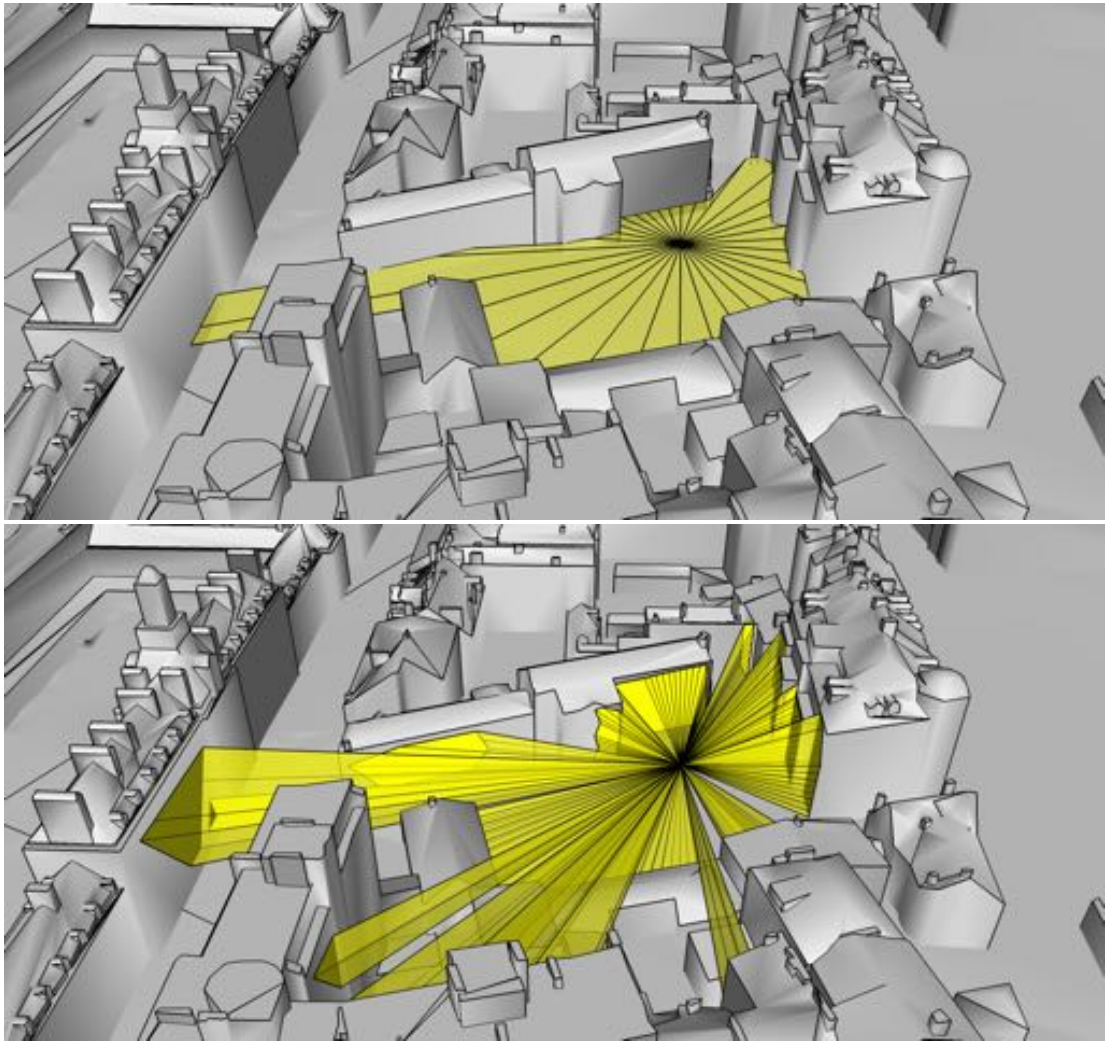
# Champ de *skymaps* pour un parcours piéton

Projet *Bassins de lumière*, partenariat Chevalvert, Stereolux, AAU, 2018.



https://vimeo.com/342044011

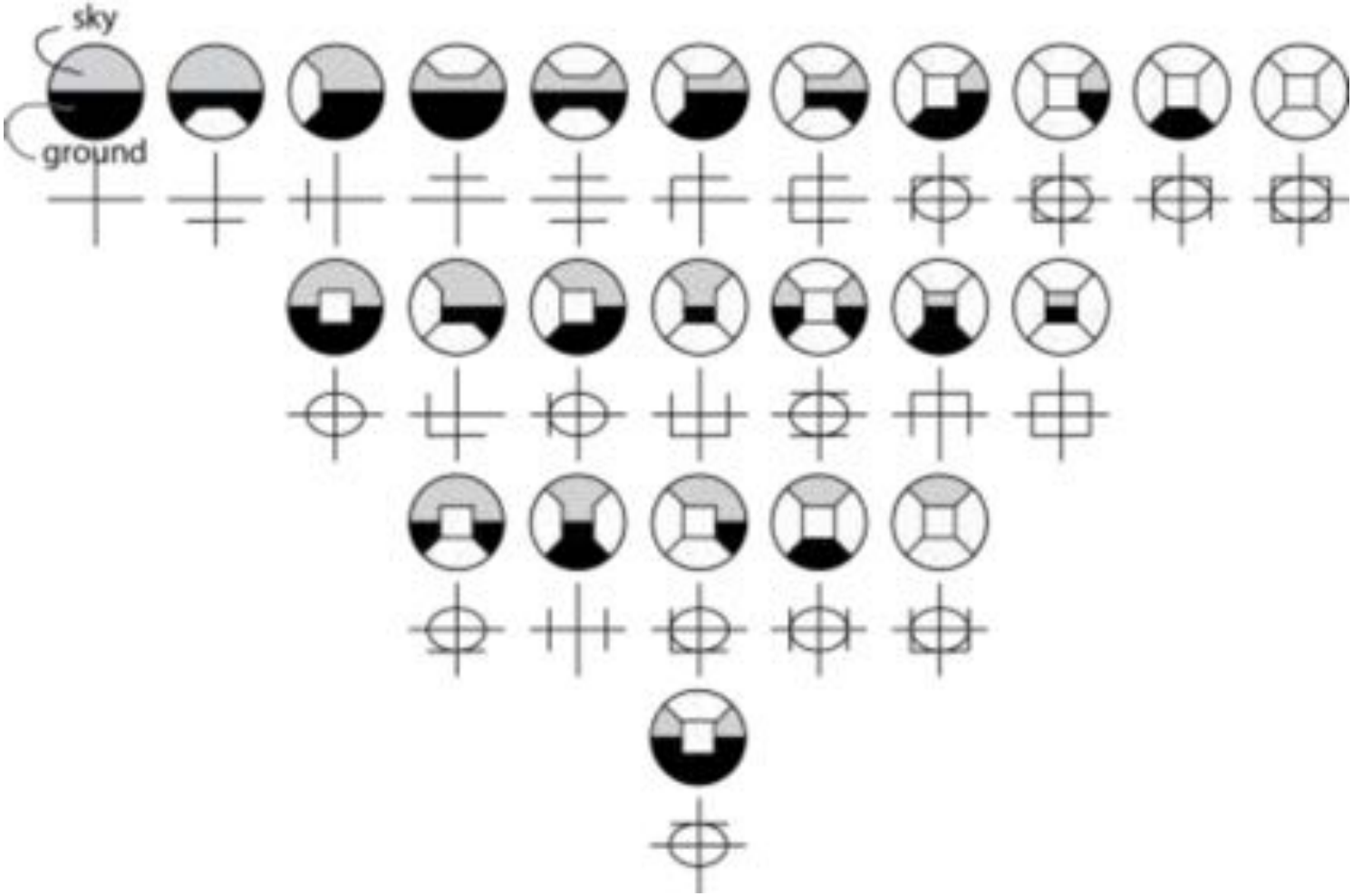
# Représentation (intelligible) d'isovists 3D



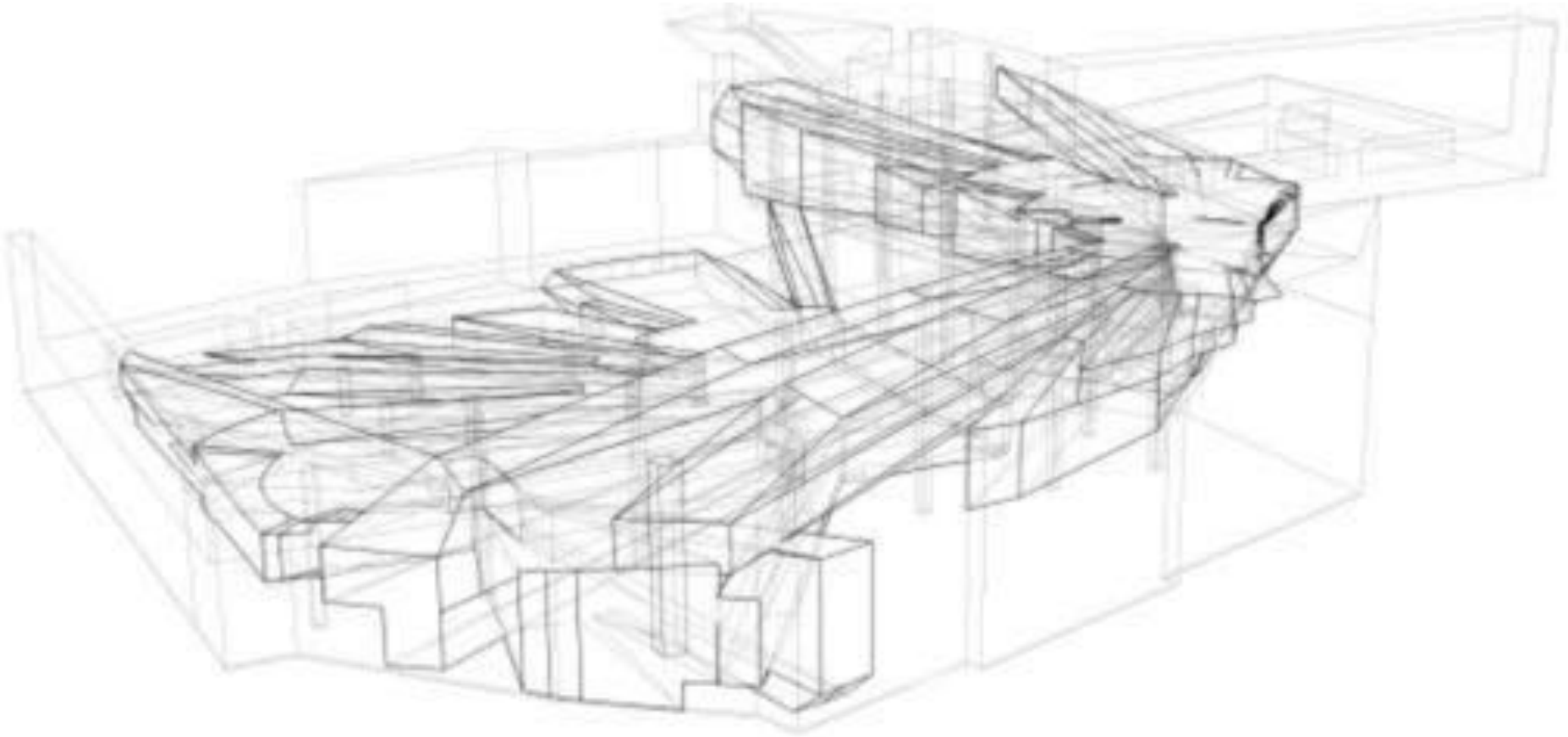
# Représentation d'isovists 3D

- *Around 1996, whilst working [. . . ] with Alan Penn, he made a thought-provoking observation, which has stayed with me over the subsequent years ; he claimed that the initial generation or production of fully three-dimensional isovists (as opposed to the typical 2D planographic representations) was relatively easy to do ; the hard part was how to represent the resultant data in any clear and meaningful way* [Dalton and Dalton, 2015]
  - Thiel's notations for Space-Establishing Elements, 1997
  - Dalton's scripted IsoCam (in Pangea), 1996
  - Teller's spherical metric, 2003
  - Fisher-Gewirtzman and Wagner's Spatial Openness Index, 2003
  - Derix et al.'s polyhedral volumes/data fields, 2007
  - Morello and Ratti's 3D isovist and 'isovistmatrix', 2009
  - Varoudis and Psarra's 3D VGA, 2014
  - Dalton and Dalton's contour isovist, tri-planar isovist, circomvoluted isovist, 2015

# Thiel's notations for Space-Establishing Elements, 1997



# Derix et al.'s polyhedral volumes/data fields, 2007

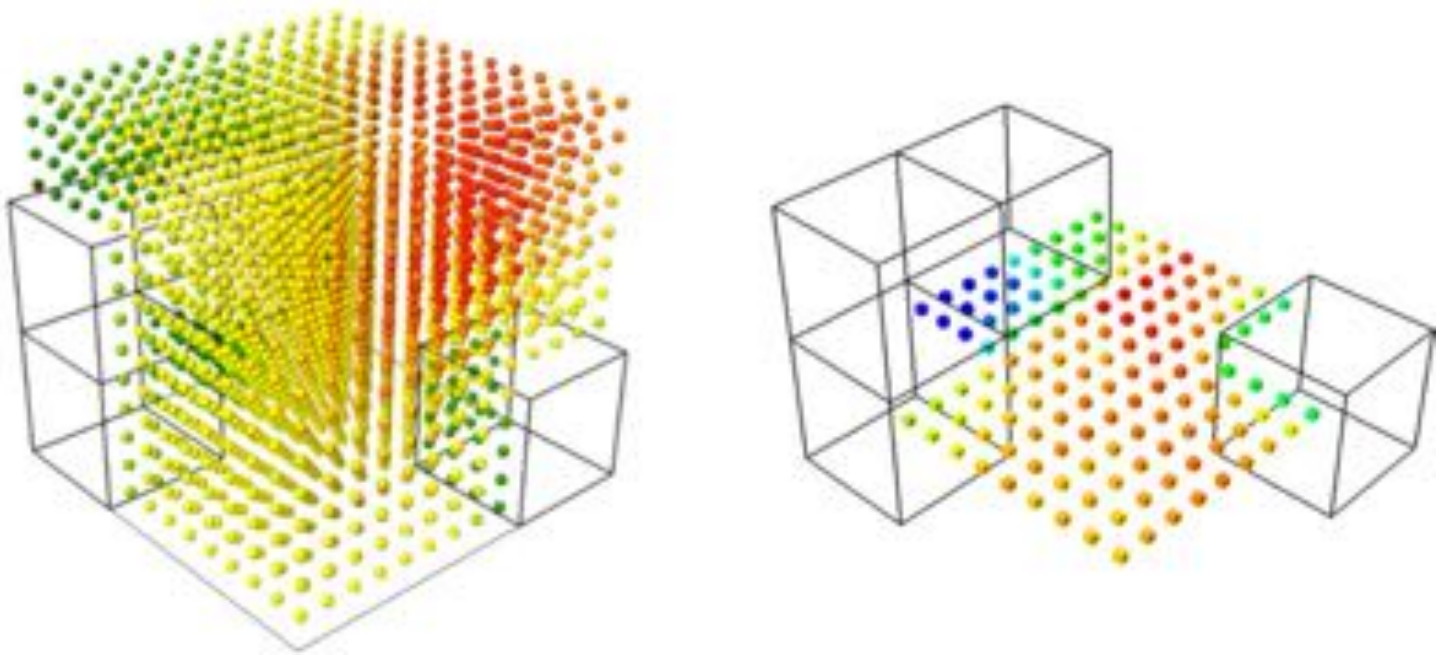


# Varoudis & Psarra's 3D VGA [Varoudis and Psarra, 2014]

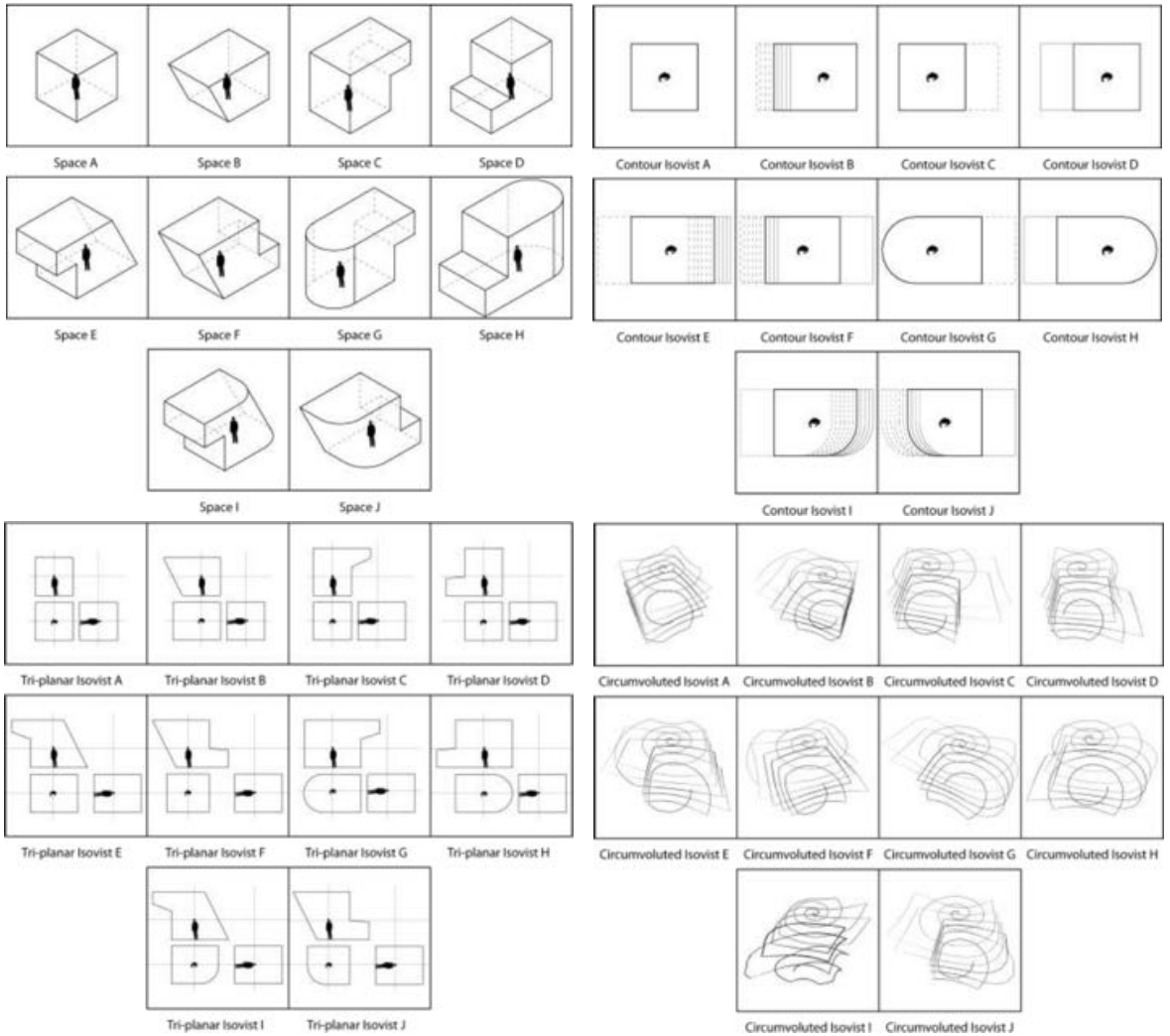
**Figure 2:**

***(a) VGA with 3D 'all-to-all' relations*** - visual integration.

***(b) 3D VGA for comparison.***



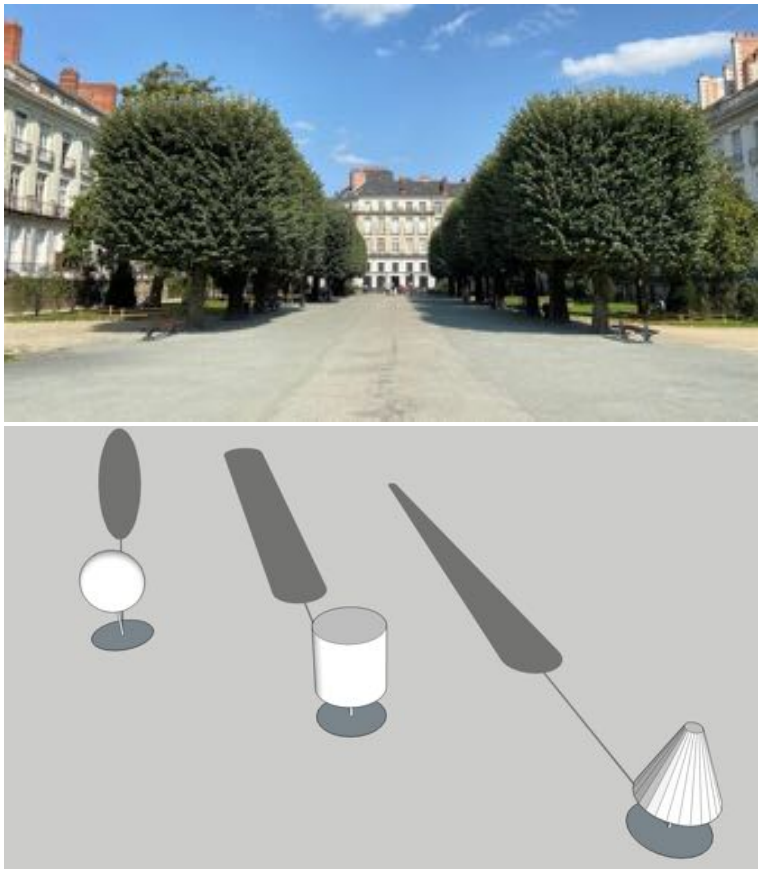
# Dalton and Dalton's contour isovist, tri-planar isovist, circomvoluted isovist [Dalton and Dalton, 2015]



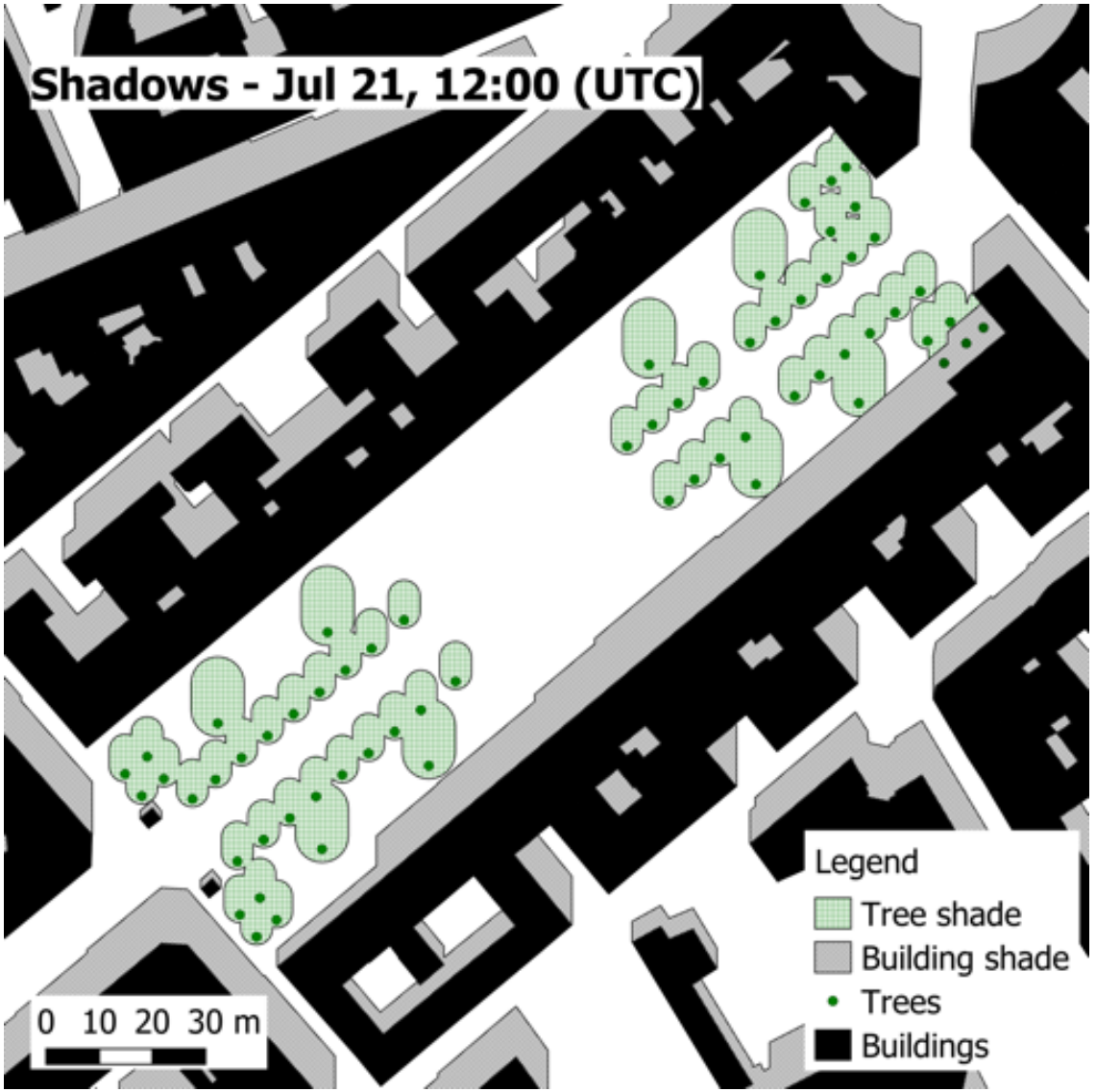
# Capter le monde réel

- *The real world is noisy, messy and imperfect. Our CAD models (from which we produce isovist analyses) are reifications of the real world : abstracted, generalized and perfected* [Dalton et al., 2015]
- *Isovist computation of outdoor environment with semi-dense line SLAM and monocular camera* (Le Jan et al., SAGEO 2021)

# Micro-/pico-climat urbain



Extrait de (Leduc et al., SAGEO 2021)



# *t4gpd*

- https://github.com/crenau/t4gpd
- https://t4gpd-docs.readthedocs.io

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