

EPUM

Emerging Perspectives on Urban Morphology

Researching and Learning through Multiple Practices

Open Learning Resources



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EPUM

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Preface

The international project “Emerging Perspectives on Urban Morphology: Researching and Learning through multiple practices” is a transnational research project which aims at the integration of different urban form research and teaching approaches through pedagogic innovation and Information and Communication Technology (ICT). It aims to develop an innovative, open and inclusive system of teaching and training in urban form from a multidisciplinary perspective, which is capable of enabling the current and future generation of planning and design professionals to address comprehensively and effectively the variety of issues and challenges faced by contemporary cities.

Contemporary cities are characterized by a variety of forms of socio-spatial patterns and increasing social, economic, and political fragmentation strongly related to their urban form. Urban municipal authorities, policy makers, urban designers and scholars are called to respond to such challenges and a variety of approaches on understanding urban form, both theoretical and operational, has developed. However, these are characterized by specific disciplinary and geographical trends and have seen the emergence of separate schools of thought. Each approach tends to be associated with a main research centre or with certain individual researchers and, despite some exceptions, they have traditionally been applied in isolation.

The teaching of urban form analysis in higher education institutions across Europe is also addressing contemporary cities’ issues from often isolated perspectives based on the aforementioned different schools of thought, either reflecting specific national educational trends or opting for a globalized approach cutting the knots with local specificities. There is still a lack of learning spaces which foster a multidisciplinary thinking about contemporary cities’ issues and which enable the participation of all relevant stakeholders in the debate about contemporary cities’ problems and solutions.

EPUM identifies the need to establish a network linking the different approaches, developing learning platforms that foster the exchange of knowledge, providing opportunities for contact between members and encouraging the dissemination of findings. The coming together of researchers, educators and learners from different geographical areas and disciplines will provide the opportunity to establish common theoretical foundations for the growing number of urban form studies in many parts of the world. It will also provide the means to engage all stakeholders currently within introverted disciplinary, institutional and geographical boundaries, in a fruitful discussion through a collaborative open learning curriculum supported by a blended learning approach.

The project’s consortium includes the University of Cyprus (Lead), La Sapienza University Rome, University of Porto, TU Wien and Space Syntax Ltd.

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The consortium developed an array of open access learning resources providing content for the Open Learning Curriculum (O1) and the Online Training Tools (O3). Some of the resources are collated from existing sources while others are developed for the project. The resources are designed to match the needs of the curriculum and to fit into the learning structure, as well as to work as stand-alone resources for use in existing educational modules. The aim is to capitalize on expertise and subject-specific knowledge generated by all participants at different domains: urban form theoretical framework, urban form methods of analysis, public spaces, spatial configuration and social phenomena, and empirical studies. Furthermore, it is envisaged that the resources cover a wide range of formats and representations to meet educational standards and address the needs of different learning styles.

1

Introduction

Each partner leading on either an approach or a case study reviewed existing educational resources relating to their different theoretical approaches and methods of urban form analysis and the availability of data for use in the learning activities and tasks. The availability of resources relating to the relationship between the various approaches and how they may be combined for analysis was also reviewed. Once suitable materials were identified, they were collected and collated to assess what further resources were needed to address the objectives of the OLC and provide suitable content for the various sections of the EPUM online digital platform. FEUP, SKUOR, SSL and SU collected and collated materials relating to each approach and assess the gaps in resources and their formats. FEUP and UCY collated case study data needed for use in the learning tasks and for the development of further educational resources; they also scoped the availability of existing educational materials on the relationship between the different approaches and the combination of their methods.

Each organisation leading on an approach produced further educational resources based on any identified gaps and focused on developing resources which explain the history of the various strands of research, their links, the complementarity of their methods, how and why they may be or should be used in conjunction in future research. These latter resources are likely to be scant at present and they are key to the aims of this project of developing an educational module that is holistic, comprehensive of the state of the art in the field, and looking towards multidisciplinary and transnational collaboration. The final format of the learning resources is instrumental to capture, model and reuse knowledge generated by all participants at different domains: subject-specific knowledge (urban form, public space and social phenomena), a dataset of resources for empirical studies and learning design (designing, implementation and monitoring of learning sequences and processes).

2

Learning resources on different approaches and complementary resources

This section presents a number of open-access, English-language, resources (existing and new) that are fundamental to present each of the approaches promoted in the EPUM project: the historico-geographical approach, the process-typological approach, space syntax and the relational-material approach. In addition, it gathers a number of complementary resources that can be used to describe and explain the physical form of cities.

Table 1 lists 43 resources included in this section. The list is in five parts. The first part is on the historico-geographical approach. Resource 1, a short-film, and 2, a briefing paper, were produced for the EPUM project and offer a first introduction to this approach. This introduction is further developed in two interviews to the main proponents of these approaches, MRG Conzen and JWR Whitehand. A synthesis of the approach is offered by a paper (Resource 5), while the website of the Urban Morphology Research Group offers an overview of the recent advances in this approach. Resource 7 explains, in an interactive way, one of the most important concepts of this approach, the morphological region.

The second part is on the process-typological approach. As in the former case, it starts with an introduction to this approach through a short film and a briefing paper. One lecture by Giuseppe Strappa expands the theoretical and methodological dimensions of this morphological approach. Two papers (resources 11 and 12) offer a description of the origins, developments and main characteristics of this approach, highlighting the key role of Saverio Muratori and Gianfranco Caniggia.

The third part is on space syntax. As the first and second parts of this section, it includes a short-film and a briefing paper prepared under the framework of the EPUM project. It also includes a short introductory video on Space Syntax Limited. One fundamental open-access resource gathered here is the book 'Space is the machine' that is central for this configurational approach. The other three resources are: an online training platform, a website collecting information on both software and conferences, and the 'Journal of Space Syntax'.

The fourth part is on the relational-material approach. It includes a short film and a briefing paper of this approach that offers a social perspective on cities, prepared under the framework of the EPUM project. In addition, it presents two additional films and a reader.

The fifth part gathers a number of additional resources for teaching urban morphology. While these are not directly promoted in the EPUM project, they are important elements to describe and explain the physical form of cities as well as the agents and processes that change this physical form over time.

These resources are in three main groups: general, history of urban form (and of planning) and other morphological approaches.

The last part offers some insights on the combination and integration of different approaches. It is made of two videos (recorded in Nicosia and Porto) where the different partners discuss the possibilities for collaboration and of an e-book on the process and results of Porto Intensive Workshop.

Table 1.
List of resources

Title	Location	Type
Historico-geographical approach		
1. Historico-geographical approach	https://youtu.be/C9A23nB083g	Short film
2. Historico-geographical approach to urban morphology	http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP1_Historical-Geographical.pdf	Briefing paper
3. An interview with Professor MRG Conzen	https://youtu.be/1YqSQ8luEng	Film
4. An interview with Professor JWR Whitehand	https://youtu.be/j8ss-axGn4Y	Film
5. British urban morphology: the Conzenian tradition	http://www.urbanform.org/online_unlimited/um200102_103-109.pdf	Paper
6. Urban Morphology Research Group	https://www.birmingham.ac.uk/research/activity/urban-morphology/index.aspx	Website
7. Planning for character: an urban morphological concept in planning practice	http://www.urbanform.org/images/BarntGreen_large_map.html	Website
Process-typological approach		
8. Process-typological approach	https://youtu.be/Plb06oRlyQo	Short film
9. Typological approach to urban Morphology	http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP2_Typological.pdf	Briefing paper
10. Urban design methods: Muratori and Caniggia	https://vimeo.com/96835314	Film
11. Saverio Muratori and the Italian school of planning typology	http://www.urbanform.org/pdf/catal2002.pdf	Paper

12. From Muratori to Caniggia	http://www.urbanform.org/online_unlimited/pdf2003/200371_19-34.pdf	Paper
Space syntax		
13. The configurational approach	https://youtu.be/dFyjFZ_Xvdc	Short film
14. Space syntax approach to urban morphology	http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP3_SpaceSyntax.pdf	Briefing paper
15. Space Syntax – Company Introduction	https://www.youtube.com/watch?v=9L08-zm6BQA	Short film
16. Space is the machine	http://spaceisthemachine.com/	Link to online Book
17. Space Syntax – Online Training Platform	http://otp.spacesyntax.net	Website (meta-resource)
18. Space Syntax Network	http://www.spacesyntax.net/symposia/	Website (meta-resource)
19. The Journal of Space Syntax	http://joss.bartlett.ucl.ac.uk/journal/index.php/joss	Website (meta-resource)
Relational-material approach		
20. Relational-material approach to urban morphology	http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP4_Relational.pdf	Briefing paper
21. The relational-material approach	https://youtu.be/njLhtEdW08Q	Short film
22. The relational-material approach. Concept art video	http://epum.eu	Short film
23. Interview with Professor Charis Christodoulou	http://epum.eu	Short film
24. Urban morphology: a relational-material approach	https://skuor.tuwien.ac.at/wp-content/uploads/Skuor_EPUM_Reader_100ppi_HQ.pdf	Reader

Other resources		
25. International Seminar on Urban Form Urban Morphology	http://www.urbanform.org/	Website (meta-resource)
26. Environment and Planning B: urban analytics and city science	http://journals.sagepub.com/home/epb	Website (meta-resource)
27. UNESCO World Heritage List	https://whc.unesco.org/en/list/	Website
28. The greatest grid	http://thegreatestgrid.mcnyc.org/	Website
29. Charles Booth's London	https://booth.lse.ac.uk/	Website
30. The Pruitt-Igoe Myth	https://www.youtube.com/watch?v=xKgZM8y3hso	Film
31. The Seaside Research Portal	https://seaside.library.nd.edu/	Website
32. Citizen Jane: battle for the city	https://www.kizi.video/view.php?vid=c36060976	Film
33. What is a city?	https://youtu.be/AZM3WqDbHic	Short Film
34. What is a complex system?	https://www.youtube.com/watch?v=vp8v2Udd_PM	Short Film
35. Global cities	https://www.youtube.com/watch?v=vp8v2Udd_PM	Film
36. What is cellular automata modeling?	https://youtu.be/Eyrw0f239M4	Short Film
37. Fractals and the art of roughness	https://youtu.be/ay80M0sf6AQ	Short Film
38. Fractal cities: a geometry of form and function	http://www.fractalcities.org/	Book
39. A science of cities	http://www.complexcity.info/	Website (meta-resource)
40. Centre for Advanced Spatial Analysis	https://www.ucl.ac.uk/bartlett/casa/	Website (meta-resource)
On the combination of different approaches		
41. Nicosia Round Table	http://epum.eu	Film
42. Porto Round Table	http://epum.eu	Film
43. Collaborative Learning Workshops	http://epum.eu	E-book

2.1

Historical-geographical approach

1. **'Historico-geographical approach',
by Vitor Oliveira**
<https://youtu.be/C9A23nB083g>
Short film

This 2018 film prepared under the framework of the EPUM project offers a ten-minutes introduction to the historico-geographical approach. After defining urban morphology as a field of knowledge and its relevance for different aspects of life in cities, the film provides a brief overview on the disciplinary history of urban morphology since its origins in the end of the nineteenth century, in central Europe, in a number of works on urban geography. It then addresses the historico-geographical approach and some fundamental questions for understanding its prominent role in the debate on the physical form of cities: what are the main theories, concepts and methods of this school of thought grounded on the work of

MRG Conzen and JWR Whitehand (?); what common aspects does it share with other approaches – such as the process typological, space syntax and spatial analysis – and what is specific of it (?); how does it deal with the different elements that make up the physical form of cities (?); and, finally, is it only focused on description and explanation or does it also lead to prescription and action?

**2. 'Historico-geographical approach to urban morphology',
by Vítor Oliveira
[http://epumplatform.eu/wp-content/uploads/2019/09/
EPUM_BP1_Historical-Geographical.pdf](http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP1_Historical-Geographical.pdf)
Briefing paper**

This four-pages' briefing paper prepared under the framework of the EPUM project – authored by Vítor Oliveira – complements Resource 1 offering a first insight into the historico-geographical approach to urban morphology. The paper offers an overview of MRG Conzen's research work, particularly on the book 'Alnwick, Northumberland – a study in town-plan analysis' published in 1960. The paper highlights two key ideas in the historico-geographical approach: i) the analysis of the urban landscape can be framed by a tripartite division including the town-plan (streets, plots and the block plan of buildings), the building fabric and the land and building utilization; and ii) the process of development of an urban landscape can be structured around some key concepts, namely the fringe belt, the morphological region and the burgage cycle. Each of these concepts is explained in the briefing paper, as well as the following methods: town-plan analysis, morphological regionalization and metrological analysis. Finally, a number of fundamental texts for further reading are identified.

3. 'An interview with Professor MRG Conzen', by Terry Slater and JWR Whitehand <https://youtu.be/1YqSQ8luEng> Film

In 1986, Terry Slater and JWR Whitehand had a conversation with MRG Conzen, in which Conzen made a 'retrospective trip' on the most important aspects of his life. During this conversation, Conzen acknowledges some key influences on his work, namely: Herbert Louis' concept of fringe belt, Walter Geisler's classification of building types (direct); Albrecht Penck classes and Herbert Fleure (indirect); and his father (who as a sculptor taught MRG ways of seeing forms and shapes, colour and textures). He talks about his childhood and adolescence, and about literature. Regarding his main ideas, 'Alnwick, Northumberland: a study in town plan analysis', inaugurated a way

of looking at the urban landscape, offering a number of concepts on the process of urban development, such as the burgage cycle, the fringe belt and the morphological region. In order to strengthen urban morphology as a discipline, Conzen points out the need for international and interdisciplinary cooperation on relevant issues, thus creating a universal benchmark for comparative studies (indispensable for future development and further conceptual thinking in this field). He also reminds that for someone to become 'the ideal researcher', he/she needs to see both the individual and general.

4. 'An interview with Professor JWR Whitehand', by Vítor Oliveira <https://youtu.be/j8ss-axGn4Y> Film

In 2016, Jeremy Whitehand was interviewed by Vítor Oliveira at the University of Birmingham. The contents of this interview can be divided into three parts: influences, contributions, and a reflection on the past, present and future of urban morphology. In terms of influences, Whitehand identifies the fundamental influence of MRG Conzen, but also of RW Brooker (one schoolteacher, who made the subject geography alive to him) and two tennis partners, doing research on geography. In terms of contributions, the interview addresses: i) Whitehand's PhD dissertation on settlement patterns; ii) his research work, proposing and developing morphological theories, concepts and methods (particularly the fringe-belt concept); iii) his professional career as a teacher; iv) his books, namely 'The urban landscape' (1981), 'The changing face of cities'

(1987) and 'The making of the urban landscape' (1992); v) the formation of the International Seminar on urban Form (ISUF), as a space of debate for different morphological schools; and, finally, vi) the journal 'Urban Morphology'. To conclude, similarly to Conzen's interview, carried out by himself and Terry Slater, in 1986, Whitehand reflected on the main

challenges that urban morphology will be facing in the near future. Whitehand highlighted the need to: i) develop comparative studies (taking into consideration different cultures and bringing together different approaches) and promoting integration, ii) find interrelationships / interconnections between different methods, and iii) develop more courses on urban morphology.

5. 'British urban morphology: the Conzenian tradition', by JWR Whitehand
http://www.urbanform.org/online_unlimited/um200102_103-109.pdf
Paper

This 2001 paper, published in the journal 'Urban Morphology', complements the four resources identified above, offering a concise (seven pages) introduction to the historico-geographical approach, describing its origins, developments and main characteristics. After considering the early influences of the German geographers Otto Schlüter and Walter Geisler in the work of MRG Conzen, the paper addresses some of the concepts that the latter has formulated to describe and explain the process of urban development. These include the burgage cycle, the fringe belt (a concept that was originally proposed by Herbert Louis and later developed by MRG Conzen and, particularly by JWR Whitehand over the last five decades), the morpho-

logical frame and the morphological region. In the second part of the paper three strands of examples of current research are presented: the sub-field of micromorphology, where analysis of the spatial relationships between physical changes is carried out at the scale of the individual plot; the relationship between morphological periods and the typological process – one concept proposed by the historico-geographical and another concept formulated by the process typological approach; and, finally, the link between decision taking and urban form, illustrated with the fringe-belt concept and with the way in which numerous separate decisions combine to create regularities on the ground.

6. 'Urban Morphology Research Group'
<https://www.birmingham.ac.uk/research/activity/urban-morphology/index.aspx>
Website

The Urban Morphology Research Group (UMRG) web pages are part of the University of Birmingham website. They offer information on the Group's research, members, events and publications, as well as on the MRG Conzen Collection. There are two major subdivisions of the Group's research: the first concerns the processes shaping twentieth and twenty-first century urban landscapes; and the second concerns the planning and development of the medieval and early modern town, especially using techniques of town-plan analysis. Further insight on the group's research is given by the annual research reviews. Biography, research interests and publications of each of the different members is also

provided by the website. It also identifies the main events of the group (open to all) including discussion papers, seminars, guest lectures and excursions. Information on publications (of the group as a whole) is given in three sections: the journal *Urban Morphology*, the *Urban Morphology Research Monograph Series* and introductory bibliography. A list of sites of interest to urban morphologists is also included. Finally, the UMRG website includes information on the MRG Conzen Collection (held in Birmingham, except for records of a more personal and domestic nature that are held in Chicago) namely a number of details on the collection and a set of maps and photographs.

7. 'Planning for character: an urban morphological concept in planning practice',
by JWR Whitehand and Susan Whitehand
http://www.urbanform.org/images/BarntGreen_large_map.html
Website

This interactive map on the 'Character Areas of Barnt Green', included in the ISUF website, offers the possibility of further understanding the concept of morphological region, proposed by the historico-geographical approach and used by JWR Whitehand and Susan Whitehand in the preparation of a plan for Barnt Green, a mature suburb near Birmingham. Through the control panel of this map, the user can decide on what to reveal in each part of Barnt Green – the main areas (morphological regions), from Hewell Road to the Peripheral Community Spaces and Utilities (order 1), and the sub-areas (orders 2 to 4). The information offered by the

satellite map can be complemented by Google Street View and by the

report 'Planning for Character' included in the website. Each of these areas (morphological regions) has a degree of unity, though most of them contain within them distinct sub-areas. The character areas have been delimited according to four principal criteria: ground plan (including site), building form, land use and vegetation. These characteristics are readily observable on the ground. The character areas are an important consideration in assessing proposals for change.

2.2

Process-typological approach

8. 'Process-typological approach,'
by Giuseppe Strappa
<https://youtu.be/PlbO6oRlyQo>
Short film

In this short film (15 minutes), prepared for the EPUM project, Giuseppe Strappa offers a first insight on the origins, developments and main characteristics of the process-typological approach. The film traces the initial developments of this school of morphological thought in the works of Camillo Boito, Gustavo Giovannoni, Saverio Muratori and Gianfranco Caniggia. It then presents a definition of urban morphology as the study of form as the visible aspect of a structure in transformation. In such a definition, form refers to a formative process which can be studied as a design tool (a fundamental aspect in this approach). The way of reading the built environment, proposed by this approach, is based on two central notions: organism (as an integrated, self-sufficient correlation of complementary elements expressing a unitary aim) and process (as a series of actions that produce transformations in the built landscape). In this consideration of the built environment as an organic process, four concepts are highlighted: routes, poles, base building and special building. The film concludes with a number of fundamental goals of this approach: to understand the general structure of fabrics in their repetitive character; to establish hierarchies and scales; to recognise the typical and the exception; and, finally, to determine the order of things, the succession of ways of producing space, the base construction and the resulting specialisation.

**9. 'Typological approach to urban morphology'
by Giuseppe Strappa and Anna Rita Amato
[http://epumplatform.eu/wp-content/
uploads/2019/09/EPUM_BP2_Typological.pdf](http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP2_Typological.pdf)
Briefing paper**

This four-pages' briefing paper prepared under the framework of the EPUM project, complementary to Resource 8 (authored by Giuseppe Strappa and Anna Rita Amato), offers an insight into the process- typological approach to urban morphology. It starts by defining 'form' as the visible aspect of a structure and by highlighting the strong relationship between 'reading' (or interpretation) and 'design' of the built environment, while acknowledging the importance of history in the reading process. The paper then offers an overview of the Roman School of Architecture: starting from its origins in the 1920s (with the monument-restoration teaching), moving on to its main developments

(highlighting not only the individual contributions of Saverio Muratori and Gianfranco Caniggia but also of the schools of Florence, Genoa and Bari) and fundamental characteristics, and concluding with a reflection on its international impact. It identifies a number of key concepts in this approach: routes (including matrix routes, building routes, connecting routes and restructuring routes), nodes and poles, buildings (both base and special buildings) and urban fabric. Finally, the paper distinguishes two fundamental ways of analysing cities: the study of the urban system including the routes, the polarities system and the urban fabric; and the study of the visible part of building and architecture.

**10. 'Urban Design Methods:
Muratori and Caniggia',
by Giuseppe Strappa
<https://vimeo.com/96835314>
Film**

This is a lecture by Giuseppe Strappa in 2014, at the University of Miami, before the 22nd ISUF Conference that took place in 2015 in Rome. This lecture deals with a method of reading and designing the urban landscape that was developed in Rome, and it is divided into two parts. The first presents some

key historical ideas (and their authors) underlying this method. The second part demonstrates how this method works by presenting some specific projects. In relation to the first, Strappa highlights that, as a whole, Giovannoni's intuitions, Muratori's territorial visions and Caniggia's reading of

the organic transformation of urban fabric, enable architects to read the 'message' transmitted by both basic and special buildings and, in this way, to understand not only the built environment as it stands today, but also how it should be in the future. The method starts by analysing the territory, moving then to the study of the ground floor of buildings, then to identification of the buildings types, to the understanding of the different phases and processes of transformation of buildings, and, finally, to the effective design and construction of a new building fitting into the extant urban landscape.

**11. 'Saverio Muratori and the Italian school of planning typology',
by Giancarlo Cataldi, Gian Luigi Maffei and Paolo Vaccaro
<http://www.urbanform.org/pdf/catal2002.pdf>
Paper**

In this ten-pages' paper published in 2002, in the journal 'Urban Morphology', Giancarlo Cataldi, Gian Luigi Maffei and Paolo Vaccaro focus on the process-typological approach to urban morphology. It starts with a focus on Saverio Muratori, describing the Roman school (since his days as a student, in the 1920s, until the beginning of the 1970) and highlighting Muratori's interest in history as a means of recovering a sense of continuity in architectural practice and his later work towards the design of a critical framework which could explain the creation and transformation of urban form over centuries. The paper also addresses the fundamental concepts of type,

fabric, organism and operative history. The paper then moves to a description of the formation, development and dispersal of Muratori's team of assistants including the Bollati brothers, Caniggia, Figus, Giannini, Greco, Maretto and Marinucci. In describing this complex process, it highlights the role of Gianfranco Caniggia and his effort to simplify Muratori's theoretical system highlighting its more directly operative aspects. Finally, the paper focuses on the recent developments of this school of thought, particularly on the research group based in Florence, including his coordination of the *Centro Internazionale per lo Studio dei Processi Urbani e Territoriali*.

12. 'From Muratori to Caniggia: the origins and development of the Italian school of design typology', by Giancarlo Cataldi
http://www.urbanform.org/online_unlimited/pdf2003/200371_19-34.pdf
Paper

Giancarlo Cataldi, a former student of Saverio Muratori in Valle Giulia, introduces, in this 2003 article, the cultural background, the influences and the issues that shaped Muratori's architectural way of thinking. He explains the origins (Muratori and his influences) and developments of the main ideas of the process-typological approach (mainly through the work of Gianfranco Caniggia) and compares the work of Muratori and Caniggia. With regard to origins, Cataldi explains Muratori's theoretical work, that deductively aimed at conceiving a philosophical system capable of interpreting the history of civilization. This theoretical work is grounded on six unsolved design problems that Muratori, during the course

of his life, wanted to solve (each of these constituting a different section of the paper): i) the architectural issue of technique and language; ii) the philosophical issue of typological features; iii) the constructional issue of the built environment; iv) the urban issue of the development of towns; v) the geographical issue of the human environment; and, finally, vi) the historical issue of the development of civilization. After Muratori theoretical foundation, Caniggia contribution was crucial for the development, the progress and the diffusion of the process-typological approach, because he, among others, prove, in simple, general and accessible terms the applicability of Muratori design thought.

2.3

Space syntax

- 13. 'The configurational approach',
by Kayvan Karimi
https://youtu.be/dFyjFZ_Xvdc
Short film**

In this short video (eleven minutes), Kayvan Karimi offers a first insight into space syntax. The video is in two parts. The first part starts with a reflection on the relationship between architecture and urbanism, to frame the emergence and development of the space-people paradigm. The video discusses how this paradigm can offer a new perspective on the issue of scale and how it relates analysis and design (evidence-based design). The second part of the video focuses on a case study developed by a group of students – the Imperial College London and South Kensington, London. It starts with an analysis of the urban area in terms of land use, pedestrian flows and spatial network, and of Imperial College London in terms of external permeability, internal pedestrian flows, level differences and internal accessibility.

Then, it describes the emergence of design ideas and proposals, and how each one of these is evaluated with the tools offered by the configurational approach.

**14. 'Space syntax approach to urban morphology',
by Kayvan Karimi
[http://epumplatform.eu/wp-content/uploads/2019/09/
EPUM_BP3_SpaceSyntax.pdf](http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP3_SpaceSyntax.pdf)
Briefing paper**

This five-pages briefing paper, prepared under the framework of the EPUM project, written by Kayvan Karimi, complements Resource 14. The paper highlights that space syntax focuses on the properties of the spaces between streets blocks rather than on the form of these blocks. It presents two fundamental propositions of space syntax: space is not a background to human activity, but is intrinsic to it; and space is first and foremost configurational (what happens in any individual space is fundamentally influenced by the relationships between that space and the network of spaces to which it is connected). The paper moves to a discussion of some

components which are used in all space syntax applications: representations of spatial elements (through their geometric forms); analysis of relationships between spatial elements (resulting from their configuration); spatial models to describe, explain and forecast different phenomena; and, finally, theories on the relations between spatial and social patterns. Finally, the briefing paper presents a number of methods – from the axial map and the segment map, to convex maps, visibility graphs, isovists and agent analysis – and software – including Depthmap and the Space Syntax Toolkit for QGIS.

15. 'Space Syntax – Company Introduction'
<https://www.youtube.com/watch?v=9L08zm6BQA>
Short film

In this seven-minutes video, Tim Stonor, the Managing Director, and Anna Rose, the Director of Space Syntax Limited, summarize their approach: what it is, what it does, where, how they work and who do they work for, and when it can be applied. The short video also includes the view of different agents that have worked with space syntax. The video highlights the fact that the Space Syntax approach is a co- creation of the UCL research group and Spatial Syntax Limited (a spin out company). On the one hand, the company has access to the latest research from the university, and

on the other, the research group has access to the projects and data from practice. The Space Syntax approach observes and analyses, mathematically, the existing environment, offering accurate information and data, which is summarized in coloured spatial models. These spatial models inform and demonstrate the qualities of settlements, towns and cities, in order to advice, on where spatial accessibility can be strengthened: where the problems lie, and what the best solutions are (in terms of the design of streets and public spaces).

**16. 'Space is the machine',
by Bill Hillier
<http://spaceisthemachine.com/>
Link to online Book**

'The Social Logic of Space', written in 1984 by Bill Hillier and Julienne Hanson set out a new theory of space as an aspect of social life. Since then the theory has developed into computer software and, among others, into an expanding range of applications in architectural and urban design. Considering these developments, in 1996, Hillier publishes 'Space is the Machine', outlining a configurational theory of architecture and urbanism. The book is divided into four parts. The first, 'Theoretical Preliminaries', deals with the most basic of all questions which architectural theory tries to answer: what is architecture, and what are theories, that they can be needed in architecture? The second part, 'Non-discursive Regularities', sets out a number of studies in which regularities in the relation

between spatial configuration and the observed functioning of built environments have been established using 'non-discursive techniques' of analysis to control the architectural variables. The third, 'The Laws of the Field', uses these noted regularities to reconsider the most fundamental question of all in architectural theory: how is the vast field of possible spatial complexes constrained to create those that are actually found as buildings? Finally, the last part, 'Theoretical Syntheses', begins to draw together some of the questions raised in Part I, the regularities shown in Part II and the laws proposed in Part III, to suggest how the two central problems in architectural theory, the form-function problem and the form-meaning problem, can be reconceptualised.

17. 'Space Syntax – Online Training Platform' **<http://otp.spacesyntax.net>** **Website (meta-resource)**

The Space Syntax Online Training Platform is a key resource to understand this configurational approach and to use spatial syntax software, as it contains self-learning tools for both theoretical and practical usage. The Training Platform has been co-created by the Space Syntax Laboratory, at UCL, and Space Syntax Limited. The two organisations have worked together on the academic development and commercial application of space syntax for over 25 years. The Training Platform is structured in five sections: i) overview (including the fundamental propositions and components of this approach); ii) urban and building applications of space syntax (comprising representations of space, spatial form

analysis, spatial function analysis, interpretative models, and case studies – including Jeddah, Trafalgar Square and the British Museum); iii) tutorials and software for download (including DepthmapX and the QGIS Space Syntax Toolkit); iv) glossary of terms (with their respective bibliographic references); and, finally, v) contact (including also publications, symposia and bibliography). The fifth section identifies the fundamental texts of space syntax: 'The Social Logic of Space' by Hillier and Hanson, 'Space is the machine: a configurational theory of architecture' by Hillier (open access), and 'Decoding Homes and Houses' by Hanson.

18. 'Space Syntax Network'
<http://www.spacesyntax.net/symposia/>
Website (meta-resource)

This website offers a brief explanation of space syntax: describing its origins in the 1970s, in the work of Hillier, Hanson and colleagues, and its main academic developments; defining it as a science-based, human-focused approach that investigates relationships between spatial layout and a range of social, economic and environmental phenomena; listing its research areas, including archaeology, criminology, information technology, urban and human geography, anthropology and cognitive science; and addressing its practical and commercial applications, stating that space syntax provides a set of planning and design principles as well as a toolkit for the generation and evaluation of ideas. The website offers professional

practitioners and academic researchers, space syntax software, including depthmapX and the QGIS Space Syntax Toolkit. To support the use of this software, the site offers a comprehensive handbook, 'Space Syntax Methodology', authored by Kinda Al-Sayed and colleagues and an Online Training Platform (see Resource 18). Another important content of this website is the symposia list gathering information from each of the conferences that took place since the first meeting in London, in

1997. Through the websites of each of these conferences, all papers presented in twenty years of meetings, can be downloaded open access.

19. 'The Journal of Space Syntax'
<http://joss.bartlett.ucl.ac.uk/journal/index.php/joss>
Website (meta-resource)

The Journal of Space Syntax is a peer-reviewed, open-access academic journal focused on research investigating relations between society and space. It is edited by Daniel Koch (former editors are Julienne Hanson and Sophia Psarra) and published, since its first number in 2010, by University College London. While grounded in the field of space syntax, the journal considers its field of inquiry in a broad sense and invites articles of a wide range of theories, approaches

and methods addressing its broader scope. The journal encourages a variety of themes and topics ranging from architecture to geography, the smaller scale of local places or small buildings up to the larger scales of cities, regions and beyond. The website offers open access to the most recent articles and, through its archives, to all articles published by different authors, providing a search section by authors, title, full text, date or supplementary files.

2.4

Relational-material approach

- 20. 'Relational-material approach to urban morphology',
by Sabine Knierbein and Tihomir Viderman
[http://epumplatform.eu/wp-content/uploads/2019/09/
EPUM_BP4_Relational.pdf](http://epumplatform.eu/wp-content/uploads/2019/09/EPUM_BP4_Relational.pdf)
Briefing paper**

This five-pages briefing paper, prepared under the framework of the EPUM project (by Sabine Knierbein and Tihomir Viderman), presents the 'relational-material' as an approach that tries to grasp urban form as a material that is constantly changing as an outcome of mutual relations between people and places. The paper highlights five key ideas. First, urban form is a continuously emergent materiality and a material culture of social relations. Second, urban form is a process of 'spatialization', encompassing designed space, a domain of mental production of abstract space and 'materialities' of everyday life. Third, urban form is an epistemological opportunity to track down and to understand social change by addressing transformations of the built environment. Fourth, experiential learning about the city is needed to balance mainstream planning regulations and design practices. Fifth, participatory action research as a practice of shared production of knowledge involving researchers and participants in a concerted effort, should be promoted. In methodological terms, the relational-material approach offers a mainly qualitative analysis of public space, addressing urban form as a material evidence of dynamic urbanization processes (as a formant of the social history of capitalism). It is centred on qualitative socio-empirical case study research, combined with quantitative data on the socio-spatial context of the case study.

**21. 'The relational-material approach',
by Sabine Knierbein
<https://youtu.be/njLhtEdW08Q>
Short film**

In this short video (fourteen minutes) prepared for the EPUM project, Sabine Knierbein offers a first insight into an emerging perspective on urban morphology, named relational-material approach. The video starts with a presentation of the Interdisciplinary Centre for Urban Culture and Public Space (TU Wien), where this approach is being developed, proposing then a linkage between studies on built space with research on lived space. The approach aims at connecting social theory, cultural theory, political theory about urbanisation and built

fabric with knowledge about the micro spaces – the spaces of everyday life – of the city. A fundamental idea of the video and of this emerging approach is to link the 'know why' (the theoretical considerations of cities as places of difference and unequal embodied experiences) and the 'know how' (the embodied approaches to engaging in local space inspired by participatory action research). The video expresses also an intention to establish the 'relational material' as a complementary approach to the established approaches in urban morphology.

**22. 'The relational-material approach. Concept art video',
by TU Wien
<http://epum.eu>
Short film**

This video in duration of 3 minutes explains how urban form is studied from the perspective of a relational-material approach. Through an explorative recording of urban spaces in Vienna it engages with urban form beyond rational objectivity of visual analysis to include action-oriented and praxis-based dimensions of everyday life. 'At no point can there be a final shape of the city', the video cites Ali Madanipour, suggesting that urban form is constantly produced and reproduced and that we can only take visual snapshots of this socio-historic process. A built urban form materializes not only by design and construction in various degrees of (de)regulation and (in)formality, but also through the settling of plural dimensions of mundane ev-

eryday life, political struggle, as well as social, political and economic practices. A relational-material approach aims at introducing into research on urban morphology ethics that is mindful of such lived experiences, and engages with urban form as a political arena and lived social space, which can be explained by its social, cultural and political context as well as by dynamic and diverse relations between human and non-human bodies and objects, both at a given moment of time and in the course of history. The approach draws from theories on action-based relational space to reaffirm spatial practice as point of departure and the purpose of research and design endeavours in urban form.

**23. 'Interview with Professor Charis Christodoulou',
by TU Wien
<http://epum.eu>
Short Film**

The interview discusses an epistemology of a relational-material approach with Charis Christodoulou, who shares her own experience and systematization of thought regarding urban form. The study of urban form is contextualized in regard to broader theoretical debates on the city as a social process of the production of space. Charis Christodoulou suggests a socio-historical analysis of urban form which puts focus on everyday life as a path towards a new phenomenology of doing research which would be sensitive towards to different realities and capable of building bridges between them. Such an endeavour would allow for a synthesis of complex relations between built space and social, cultural and political processes of its production. If we agree that urban form is also lived social space, the methodology for researching its genealogy needs

to engage across disciplines and cultures to establish productive linkages between analytical approaches of design and planning and qualitative research practices of geography and social sciences. Charis Christodoulou discusses methods for engaging with social processes of the production of urban form. She suggests the focus on mundane built structures where everyday life unfolds, as well as directing the research beyond visual analysis of material dimensions of space to include into consideration social dimensions of everyday routines, struggles, planning practices and design intentions. The insights into (meaningful) practices of everyday life and bodily experiences allow for an understanding of unbalanced patterns of built urban form in relation to social context and transformations.

**24. 'Urban morphology: a relational-material approach',
by TU Wien
https://skuor.tuwien.ac.at/wp-content/uploads/Skuor_EPUM_Reader_100ppi_HQ.pdf
Reader**

With this Reader the 'Interdisciplinary Centre for Urban Culture and Public Space', has sought to summarize the results of explorative research on urban form which engaged in a dual mission: an empirical inquiry into entanglements between built urban form and experiences in everyday life; and a reflection on the research and design practice as a means for curbing or fostering people's social, cultural and political agency to transform urban form. This collaboratively edited collection is of an open and inclusive character, with the ambition to conceive of urban form studies from the perspective of public space research which includes aspects of 'emergence' of new urban forms. This evolving theorization is coined as relational-material approach. The reader's plural formats mirror the fact that in the perspective of public space research the study of

urban form is about the systematic inclusion of difference. A relational-material approach introduces into research on urban form ethics that is mindful of lived, cultural, as well as social and material differences in urban space, and thus includes recent insights from feminist and post-colonial theories of urbanization. Various formats, including essays, storylines, visualisations, as well as documentation of research projects, depict diverse and engaging exploration paths address the complexity of a meaningful engagement in a plural dynamics and many contingencies of lived social space. They approach urban form as a relational-material process unfolding between physical urban forms and an embodiment of a plurality of particular memories, cultures and experiences, which may be institutionalized, contested, discriminated against, marginalized or rather invisible.

2.5

Other resources

2.5.1

General

25. 'International Seminar on Urban Form' and 'Urban Morphology' <http://www.urbanform.org/> Website (meta-resource)

The website of the 'International Seminar on Urban Form' (ISUF) offers an insight on the activity of this organization for researchers (including the historico-geographical, the process-typological approaches and space syntax) and practitioners inaugurated in 1994. The website is in five fundamental parts. After presenting the organization and staff, 'About ISUF' gathers papers on the history of the study of urban form in different countries (the collection 'the study of urban form in...') and on the history of different schools of morphological thought, and offers an insight into four ISUF projects. The 'Conferences' section presents information on the conferences that ISUF has organized since the first meetings in Lausanne in the mid-1990s, including for most cases a link to the specific conference website and a conference report published in 'Urban Morphology'. The 'Bibliography' compiled by Peter Larkham lists a comprehensive number of titles organized in fourteen sections, from general works to specific morphological schools. The 'Glossary' compiled by Peter Larkham and Andrew Jones offers basic definitions of technical terms common principally in historico-geographical studies. Finally, the fifth section is devoted to the journal 'Urban Morphology' published biannually since 1997, edited by Jeremy Whitehand. The website offers online access to all papers published in the journal between 1997 and 2007 and presents the structure of the journal (editorial, articles, viewpoints, reports, book reviews, book notes, notes and notices).

26. 'Environment and Planning B: urban analytics and city science'
<http://journals.sagepub.com/home/epb>
Website (meta-resource)

This is the website of 'Environment and Planning B: Urban Analytics and City Science' (formerly sub-titled as 'Planning and Design'), an international and multidisciplinary journal focused on the application of quantitative, computational, design and visual methods to the spatial structure of cities and regions.

The journal is edited by Michael Batty (Lionel March was the founding editor of EPB, six years after the establishment of 'Environment and Planning', and acted as editor of that new series

B until the early 1980s). The website gathers all issues published since 1974 offering open access to some of these. The journal includes many papers on space syntax and 'spatial analysis', but also some papers on the historico-geographical approach. The homepage of the website offers easy and quick searching. First, it lists the latest articles published online for this journal; second, it lists the articles most read in the last year; and, third, lists the most cited articles in the last year.

2.5.2

History of cities

27. 'UNESCO World Heritage List' **<https://whc.unesco.org/en/list/>** **Website**

The 'World Heritage List' is one of the seven sections of the 'United Nations Educational, Scientific and Cultural Organization' / UNESCO website, including: i) 'News and Events'; ii) 'The List'; iii) 'About World Heritage', providing information and documentation about the World Heritage Convention, and access to regional actions; iv) 'Activities', gathering information, recommendations and activities for each of the specific plans related to World Heritage; v) 'Publications', gathering publications such as The World Heritage Journal, the World Heritage Paper Series and Manuals; vi) 'Partnerships', providing information on partnerships and how to be part of it; and finally, vii) 'Resources' containing all documents, forms and tools necessary for the implementation of the World Heritage Convention. The second section of the website, on the World Heritage List offers a first insight into the architectural and urban history of more than 1000 sites – including cultural sites, natural sites and mixed sites – spread around the world, from Afghanistan to Zimbabwe. For each of these sites, the website offers a description (in different languages), a set of maps, a number of documents and a set of indicators on the classification of the property, a photographic gallery, and data on assistance for the conservation of the property.

28. 'The greatest grid' **<http://thegreatestgrid.mcny.org/>** **Website**

The website 'The greatest grid', created by the Museum of the City of New York, offers information on one of the fundamental documents of planning history worldwide, the 1811 plan for Manhattan. The website is in seven parts and includes interactive maps (the 1811 plan, John Randel's composite map and map gallery) and a number of learning resources. The first part of the website describes how New York grew organically, with no overarching order, before the existence of the grid. The 1811 plan prepared by The Commissioners and John Randel is presented in the second part: the proposed street system and plot system and the guidelines for the building system. The third part addresses the process of building the grid (with a focus on the first 60 years after the design

of the plan), from surveying the city to opening streets up to 155th Street and selling the plots. The fourth part continues to focus on the nineteenth century development: from the 1860s, when development was approaching 155th Street, requiring a new plan for the north end of the island, to the end of the 19th century, when the grid was fully laid out and filled in. The twentieth century is the focus of the fifth part, from the construction of skyscrapers to the laid down of plazas and of superblocks (erasing part of the grid). The sixth part describes how the grid affects almost all aspects of urban life, from utilities to transportation networks, and to social patterns.

Finally, the last part presents a number of grids in other cities.

29. 'Charles Booth's London' <https://booth.lse.ac.uk/> Website

This website is devoted to Charles Booth and the 'Inquiry into Life and Labour in London'. It comprises over 450 volumes of interviews, questionnaires, observations and statistical information, documenting the social and economic life of London and showing how Booth developed new methodologies and techniques in the development of social research techniques. The archive is in three main series: i) poverty, containing detailed information about living conditions and levels of poverty among the families; ii) industry, detailing patterns of work, wage levels and conditions of employment; and iii) religious influences, documenting social and moral forces acting on the lives of the people. Profoundly concerned with contemporary social problems, Booth recognized and demonstrated,

through his notebooks and maps, the limitations of philanthropy and conditional charity in addressing the poverty which scarred British society. The website allows access to Booth's map (enabling, also, access to notebook entry for each location) and comparison with the current map of London. It also provides, answers to questions such as who was Charles Booth (from his youth, through his political and social interests, and to his later years); what was the question (the research assistants, data and methodology); what were the maps of poverty (poverty classification is explained); and what were the topics covered by Booth's descriptions of street life (drinking and drugs, migrant communities, and prostitution).

**30. 'The Pruitt-Igoe Myth',
by Chad Freidrichs
<https://www.youtube.com/watch?v=xKgZM8y3hso>
Film**

This documentary presents the history of Pruitt-Igoe, gathering a number of retrospective interviews and archival footage of local news. To inform and enhance the debate on public housing and government welfare programs, the documentary illustrates the main reasons for the failure of this modernist estate.

This reasons include: i) the Modernist layout, including blocks of flats surrounded by open space, which represented a break with the traditional city building; ii) the loss of people and jobs, and the deterioration of the centre (the economy flourishes but out

of city); iii) the government control; iv) the lack of financing for maintenance and operation; v) the planned segregation, as public housing was used as an instrument of racial segregation and as a justification for the cleaning of the poor and working class neighbourhood, and finally, vi) the violence, crime, closing and others. Consequently, the 11-storey buildings experience was a failure, leading to its demolition. Adding a human face to a subject that has become so 'inhuman', this documentary reveals the myth behind Pruitt-Igoe.

2.5.3

Other approaches

31. 'The Seaside Research Portal' **<https://seaside.library.nd.edu/>** **Website**

This website is on Seaside, United States, a small coastal community that has been planned by Andres Duany, Elizabeth Plater-Zyberk and Leon Krier, under the framework of the New Urbanism. The website is three parts: 'About Seaside', 'Planning Seaside' and 'Building Seaside'. The first part contains historical information about the creation of the town (after Robert Davis was gifted an 80-acre plot in Florida Panhandle) along with essays from the founders and interviews with some of the fundamental agents in Seaside's creation and development. The second part presents information about the Plan and the Code. An interactive map offers an overview on the design of the plan, going through its different alternatives prepared from the end of the 1970s to the mid-1980s, until the final version of the plan and the consolidation of the town. The Code, framing the transformation of the urban landscape, is also presented. It is very simple in its form (one single sheet) but aims at creating a rich and complex environment. The Code divides the city into eight different urban tissues, regulating the design and transformation of yard, porch, balcony, outbuilding, parking and height. The third part of the website addresses the buildings, and the architects, of Seaside.

**32. 'Citizen Jane: battle for the city',
by Matt Tyrnauer
<https://www.kizi.video/view.php?vid=c36060976>
Film**

This documentary, draws on a number of interviews with various agents (including Jane Jacobs and Robert Moses), excerpts from books, newspapers and magazines, to illustrate the battle for New York City, between Jacobs, the author of 'The death and life of great American cities' and Moses, a promoter of modernist infrastructures and super blocks. On one side of the battle was Moses, an enthusiast for massive highways, wiped away slum tenements wholesale and replaced them with grim, soulless and cheaply made projects. On the other side was Jacobs, who insisted that the city is a place for the people; and that

is why you cannot simply serve them but to express who they are. Jacobs' thoughts are explained throughout the documentary: i) the city is an ecosystem, a community of diverse people, mutually supporting each other; ii) mixed-use urban development should be promoted, (different uses in cities are not a form of chaos, on the contrary, they represent a complex and highly developed form of order; iii) bottom-up community planning should be promoted, as cities have the capability of providing something for everybody, only because, and only when, they are created by everybody.

**33. 'What is a city?',
by Geoffrey West and Luis Bettencourt
<https://youtu.be/AZM3WqDbHic>
Short Film**

In this short film (four minutes), physicists Geoffrey West and Luis Bettencourt, look at existing data on cities around the world and try to understand how they are and how they work. The film argues that cities can be compared to every complex system and to some non-complex systems. Cities are like machines (that can be optimized), ecosystems, huge magnets for socioeconomic activity, or special kinds of social reactors. The film states that there are some universal properties that can describe every

city. Cities obey some fairly simple and universal parameters. They change in a predictable way. For example, after a city doubles its size, it also experiences an increase of until 50 per cent in a set of different things such as wage, patents, AIDS cases, crime or hospitals. The film also highlights the fact that, despite some tragic exceptions, cities never die, their resilience is extraordinary, and the solution to the existing problems are within them (cities are the only solution to the problems of cities).

**34. 'What is a complex system?',
by Complexity Labs**

**https://www.youtube.com/watch?v=vp8v2Udd_PM
Short film**

This short film (ten minutes) presents a working definition of what is a complex system (for which there is no formal definition). It starts by defining 'system' as a set of ordered or unordered parts called elements, and a set of connections between these parts called relations. The film then moves to defining 'complex system' as a product of four primary parameters: numeracy, non-linearity, connectivity, autonomy and adaptation. The four primary parameters are then explained: i) the only property in all definitions of complex systems is that they consist of many parts – this is the

primary source of complexity; ii) it is also acknowledged that non-additive interactions and feedback loops over time can give exponential relations between the input and output of a system and lead to phase transitions; iii) many definitions of complex systems involve high dense or high levels of interconnectivity between components (the network concept); and, finally, iv) in a complex system, elements have a degree of autonomy and also a degree of adaptation (concept of evolution) – the greater the autonomy and capacity for adaptation that elements have, the more complex is the system.

**35. 'Global cities',
by Complexity Labs
<https://youtu.be/V-4oMnmU47Q>
Film**

This five-parts, documentary explores the changes on urban landscape, and the development of urban networks as an emerging geography of connectivity in an age of globalization. The first part of the film, 'Historical context', reviews thousand years of urban development, from the first urban environments to the complex urban network today, arguing that our engineering environment has a direct relationship with our knowledge of the natural environment around us. The second part, 'Globalization', states the existence of a new geography based on functional connectivity (economy of services and informational technology) instead of physical borders; this leading to the explanation and conceptualization of the concept of Global Cities. 'Territo-

ry and Governance' proposes the existence of a new form of governance. This new type of geography, geometry and governance transforms the environment, thus giving rise to a new era, the Age of the Anthropocene. In the fourth part, 'Loading Environment', the concepts of Mega City, City Region and Sustainability are discussed, to understand the influence of human activity on climate and on the urban environment. To conclude, 'Economic Development' discusses the idea that global cities are physically super connected in this network and, also super disconnected (social exclusion and inequalities within cities because of the rapid and unplanned urban growth), leading to the argument of the inexistence of the 'local'.

**36. 'What is cellular automata modeling?',
by Andreas Flache
<https://youtu.be/EyrwOf239M4>
Short film**

In this short film (eight minutes) Andreas Flache introduces one of the different forms of spatial analysis, Cellular Automata (CA). The film starts with a description of the two basic principles of CA. The first is the spatial structure. Considering that a social self-organization in a complex social system arises from interactions of individuals with each other, CA provides a precise meaning of what is meant by this interaction. The second principle

is local interaction. It means that individuals can only interact with others at close range, and thus, the way the neighbourhood is modelled can be used to express how local or global the interaction is. The film continues, explaining how the interaction can be modelled. In CA, each cell has a state and that state can change over time. How the state of a cell changes depends both on the cell state and on the neighbourhood cells state.

**37. 'Fractals and the art of roughness',
by Benoit Mandelbrot
<https://youtu.be/ay80M0sf6A0>
Short film**

In this short film (seventeen minutes) prepared for a Technology, Entertainment and Design / TED conference, Benoit Mandelbrot presents the fractal geometry of roughness. In 1979, Mandelbrot discovered the so-called 'Mandelbrot set', which shows how visual complexity can be created from simple rules (that would be repeated without end). He constructed a geometry of things that apparently do not have a geometry and found that the rules of this new geometry are quite simple. With this presentation, and

with the use of some real and artificial examples, Mandelbrot tries to demonstrate what he means by roughness (by contrast to regularity), its importance and how this can be used as a practical measure (developing a proposal made in 1919 by Hausdorff). The example of cauliflower, with its convoluted and peculiar shape, illustrates that the idea of something that is both complicated and simple. Fake fractal clouds are also complicated, instable and variable but have a simple rule behind it.

**38. 'Fractal cities: a geometry of form and function',
by Michael Batty and Paul Longley
<http://www.fractalcities.org/>
Book**

Fractal geometry, proposed by Benoit Mandelbrot, enables the understanding of order and regularity in what, at first sight, appears irregular and disordered. In this sense, all cities show some irregularity in most of their parts and are thus ideal candidates for the application of fractal geometry. This book presents an initial attempt to apply fractal geometry to cities, sketching out how fractal geometry might be applied to cities, first in terms of visualizing urban form through computer models and computer graphics, and then through the measurement of patterns in real cities and their dynamic simulation. The first chapter, 'The shape of cities: geometry, morphology, complexity and form', starts by reviewing what is known about the shape of cities and about urban form.

The next three chapters, from 'Size and shape, scale and dimension' to 'Laboratories for visualizing urban form', lay the foundations for a fractal theory of cities. The next two, 'Urban boundaries and edges' and 'The morphology of urban land use' consider specific methods of measurement and estimation. Considering the theory described in the previous parts, chapters 7 to 10, 'Urban growth and form' to 'Extending the geometry to systems of fractal cities', begin the construction of fully-fledged dynamic models of the city and systems of cities using fractal geometry. The last chapter summarizes the theory, and suggests directions in which the application of fractal geometry to cities as well as the theory of the fractal city might develop.

**39. 'A science of cities',
by Michael Batty
<http://www.complexcity.info/>
Website (meta-resource)**

In the website/blog 'A Science of Cities', Michael Batty develops a number of concepts, explains spatial analysis models, and presents some fundamental books ('Urban modelling: algorithms, calibrations, predictions' and 'Fractal cities: a geometry of form and function' are open access), papers (published between 2001 and 2011), editorials (published in 'Environment and Planning B' since 2002), presentations (recent presentations in pdf format), and working papers supporting this 'science'. In terms of concepts, offers definitions of complexity, fractals and networks, and recommends additional open access readings on these. Complex systems are those that have the potential to reconfigure themselves

in ways that may be surprising. A fractal is an object whose properties remain invariant with changes in scale. Networks are the containers through which flows (of material goods, information, and so on) take place and their physical configuration represents ways in which such exchange is organized to fill the space taken up by those engaged in such exchange. In terms of models, the website introduces the LUTI models, the Cellular Automata, the Agent-Based Models and other variants. Through movies, detailed software description and simple demos (demonstrate ideas about how cities grow, restructure and change using hypothetical example), the spatial analysis models are explained.

40. 'Centre for Advanced Spatial Analysis' <https://www.ucl.ac.uk/bartlett/casa/> Website (meta-resource)

This is the website of the Centre for Advanced Spatial Analysis (CASA), a centre that was established in 1995 at the Bartlett, University College London (UCL). CASA is an interdisciplinary research institute; among its staff are physicists, planners, geographers, data scientists, architects, mathematicians and computer scientists, all working on the same projects. The goal of this mix is to be at the forefront of what is one of the grand challenges of twenty-first century science: to build a science of cities from a multidisciplinary base, drawing on cutting edge methods, and ideas in modelling, complexity, visualization and computation. It also aims at advancing the state of the art through

research complemented by graduate study, undergraduate teaching, consultancy and distance learning. CASA research interests include a common domain knowledge in cities, smart cities, internet of things and connected environments, urban planning, data visualization, migration, urban and regional modelling, GIS, fractal analysis and network science. The website offers an insight into CASA and also the possibility to download different kinds of software accompanied by an explanation of what they are, their use, their results. It also enables the possibility to receive information about the latest news, events, publications and videos of CASA.

2.6

On the combination of different approaches

41. Nicosia Round Table, by EPUM <http://epum.eu> Film

This is a film of the first Round Table of the EPUM project, that took place in Nicosia, Cyprus, in May 2017, with Giuseppe Strappa (process-typological approach), Kayvan Karimi (space syntax), Sabine Knierbein (relational-material approach) and Vitor Oliveira (historico-geographical approach), in a session moderated by Andreas Papallas and Ilaria Geddes. The Round Table was integrated in the first conference of the Cyprus Network of Urban Morphology (CyNUM). The Round Table addresses fundamental questions of the current debate in urban morphology such as: i) the potential complementarity between each approach and others; ii) the most effective ways to promote such complementarity; iii) the way in which, each participant (as a teacher and as a proponent of, at least, one of these approaches) organizes the main morphological theories, concepts and methods for educational purposes; and, finally, iv) the willingness of each participant to promote exposure of his/hers students to other approaches.

42. Porto Round Table, by EPUM <http://epum.eu> Film

This is a film on the second Round Table of the EPUM project, taking place in the last day of the 2- weeks' Porto Intensive Workshop, in that Portuguese city in September 2018. The Round Table had the participation of Giuseppe Strappa (process-typological approach), Abhimanyu Acharya (space syntax), Tihomir Viderman (relational-material approach) and Vitor Oliveira (historico-geographical approach), in a session moderated by Chrystala Psathiti. This second Round Table goes one step further, in relation

to the first one, by benefiting from a first application, in a workshop environment, of the main ideas proposed by the different partners of the EPUM project. The debate focuses on key issues such as: i. the potential of each approach on the analysis of a specific city (in this case, Porto) and society; ii. the potential for combination of different approaches; and, finally; iii) the relation between analysis and design, bearing in mind the progress of the project in the Nicosia Intensive Workshop.

43. Collaborative Learning Workshops, by Vítor Oliveira and Silvia Spolaor <http://epum.eu> E-Book

This e-book organized by Vítor Oliveira and Silvia Spolaor describes the goals, process and results of the Porto Intensive Workshop, taking place in Porto between 3 and 13 September 2018, gathering the participation of tutors and students from the five partners of the EPUM project. After a brief introduction, the book is in two parts. The first part is based on the work developed in the first part of the workshop and it is organized in five chapters. Each chapter is prepared by one of the five partners – students and tutors – and describes the appli-

cation of its approach to the historical centre of Porto, addressing the rapid transformation of its physical forms and the social impacts of this process. The second part draws on the second week of the event and it is structured into four chapters. Each chapter is a solid attempt to build bridges between analytical theories, concepts and methods proposed by different morphological approaches. Each chapter launches the basis for further exploration in the Nicosia Intensive Workshop.

3

Conclusion

In the above sections, a number of open-access, English-language resources on the physical form of cities has been presented. Some of these are existing resources, others have been prepared under the framework of the 'Emerging Perspectives on Urban Morphology' project. The resources are in a variety of formats including books, papers (containing journal papers and briefing papers), films (comprising both short and long films) and websites. Each of these resources constitutes a valuable tool to teach one of the approaches promoted in this project: the historico-geographical, the process-typological, space syntax and the material-relational approach. The order of appearance of each resource in each part of Section 3 reflects an increasing level of complexity from introductory to more comprehensive resources or to resources that are focused on a particular theory, concept or method. The list also includes resources that do not fit under the umbrella of these approaches but that are important tools to teach urban morphology, and goes one step further by offering some guidance on the combination and integration of different approaches.

The list of 43 resources and the description of each one of these will be uploaded in the EPUM website and should constitute a key element in the preparation of lessons on the physical form of cities, and on the agents and processes shaping this form over time. The use of these resources in classes should be framed by a culture of evaluation. The resource is used, assessed and, if needed, improved. Under this culture of evaluation, the list as a whole should also be assessed and changed in the future.



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