

The Digital Historical Researcher

KÓS José Ripper

PROURB (Postgraduate Program of Urban Design) - Faculdade de Arquitetura e Urbanismo, Universidade Federal do Rio de Janeiro, Brazil

ABACUS - Department of Architecture and Building Science - University of Strathclyde, United Kingdom

<http://www.fau.ufrj.br/prourb> josekos@ufrj.br

Abstract. 3D modeling is many times applied as a tool to represent historical buildings or urban settings. Most of the time, however, its importance in the research process is minimized. Few researchers credit it as an instrument to discover and understand a historical process. The objective of this paper is to present 3D modeling as an important part of an architectural or urban historical research process. This argument is presented through 3D modeling previous experiences related to historical research, the concept of 'ur-history', conceived by Walter Benjamin during his major research project about the history of XIX Century Paris and also our research group examination of the growth of a South American city and the design development of a Modern Architecture icon in that city. In both cases historical research was based primarily in the modeling process, which synthesizes all data collected from plans, archive images and documents, books and analyses of existing artifacts.

Keywords. History; 3D modeling; research; city evolution; project analysis.

Introduction

Digital technology has been often applied to fulfill a universal wish to reconstruct demolished historical monuments throughout the world. The relative low cost, compared to the results achieved, has generated multiple enterprises spread through governmental, private and academic areas. The latter will be the focus of this study. Educational institutions have produced many historical models of buildings, urban areas and even complete cities. Many of those models were published in various academic journals. Few of those articles, however, acknowledge the role of 3D modeling to the research process as an instrument to discover and understand historical processes.

Considering, from the amount of publications on the subject, that the importance of 3D models in the historical research process is frequently minimized, the objective of the paper is to emphasize that, 3D models can be very important in the research process. Its use may change the research methodology regarding data organization, formulation and corroboration of hypotheses and representation and communication of conclusions. Furthermore, 3D models may have a significant role in historic researches, facilitating the link between past events, the present and the future.

This paper aims to present our arguments based on analogous research experiences' examinations and on observations of the modeling

process developed at the Laboratory of Urban Analysis and Digital Representation (LAURD) within the Postgraduate Program of Urban Design (PROURB) – Faculty of Architecture and Urbanism, Federal University of Rio de Janeiro, in Brazil. The researchers based at LAURD have produced various models as part of research projects on the evolution of Latin American cities, particularly Havana and Rio de Janeiro, and urban icons of Rio de Janeiro. In those projects, historical research was based primarily in the modeling process, which synthesizes all data collected from different sources.

Previous experiences on architectural or urban history, 3D models and research

3D modeling reconstruction of historical environments or important buildings from the past has been widely applied and subject of many publications. The great majority of those experiences are limited to address digital modeling as representation of past constructions. Few publications recognize 3D models as research tool or credit its importance to link past and present without seeing historical events as isolated episodes. A significant part of this paper is devoted to the examination of some of the latter publications, which share some awareness with this study, in order to support our arguments, assumptions and speculations. Although those investigations seem to be rare among publications on historic 3D models, once they concentrate on issues of architectural or urban history and research, they seem to agree in most points also sustained in this study.

Modeling an hypothetical town as a tool to teach urban form history

Thomas Seebohm and Robert-Jan van Pelt were one of the first to place a comprehensible discussion about the study of urban history related to 3D modeling (Pelt and Seebohm, 1990; Seebohm, 1992). The authors' observations were done more

than 12 years ago and are based on a previous version of a very specific piece of software, which was limited compared to the options available today. Their methodology, however, is still useful to any current project to structure a city model. Although their investigation focused particularly on the teaching of urban form history, the papers were also relevant to the contribution of the modeling process to the city history and its research. They based their argument – against the tendency of seeing historical facts as isolated fragments with no links to the present – on authors such as Benedetto Croce and Rudolf Bultmann. Thus, their students were asked to model an imaginary Greek town “from a small pre-historic settlement to the 20th century”, in parallel to historical lectures. In order to understand urban history and its presentness, the authors argued that “[t]o study the alternatives of the past means to become involved as if one were a participant, experiencing the dread and anxiety generated by an undecided future already past.” Although the experience had few practical shortcomings, it seems that modeling proved to be a powerful method to enhance the desired “sense of existential commitment to the situation studied.” (Pelt and Seebohm, 1990)

Modeling a hypothetical city was an effective technique to allow the students a deep understanding of the relationship between urban form and ideology in different historic periods. According to Seebohm (1992), “[t]o gain a true understanding of urban history one has to place oneself back in historical time to consider all of the possible courses of action which were open in the light of the then current situation of the city, to act upon a possible course of action and to view the consequences in the physical form of the city.”

Our disagreement lies on Seebohm's (1992) statement that, opposed to hypothetical city models, studies on models of existing cities based on specific points in time are not able to

“actually provide a true understanding of history.” According to him “such studies only show a record of one of many possible courses of action at various moments in time. To gain a true understanding of urban history one has to place oneself back in historical time to consider all of the possible courses of action which were open in the light of the then current situation of the city, to act upon a possible course of action and to view the consequences in the physical form of the city.”

If imaginary city models are powerful tools to achieve an understanding of urban form history, their great abstraction presents limited relations to apprehend the city history. City’s physical form is a result of infinite and varied decisions. A current formal approach to shape cities has limited impact on city’s physical configuration. The city celebrates important events, which are unique and differentiate it from any other city. Those events leave marks on space and respond to its individuality through links between those past events and the present. Analyzing cities evolution through 3D city models can be a powerful mode to acquire its richness while, at the same time, “overcome [s] the limitations of historical relativism, which contends that historical fact is of value only in historical context.” (Seeböhm, 1992)

3D historical models and the changing image of the city

Patricia Alkhoven developed her research also in the early 90’s (1991; 1993). The limitations of the current software and hardware are more evident in her work than in Seeböhm and Pelt. She based it mostly on available commercial software and regular PCs. However, because of the characteristics of her investigation for a PhD thesis, her study was obviously more profound than the one developed within the two professors’ course in Waterloo, Canada.

An important contribution of her investigation is the acknowledgement of the modeling process

to research. According to Alkhoven, “[w]hile constructing the models (i.e., making a graphical simulation), one learns about the structure, distribution of elements, sizes, scale, dimensions, characteristics, and regularities, etc. The creation of the computer models is in itself a way of studying the city, since it is an active mode of research and one is more actively involved in the process of research.” (1993) Her modeling process was a method to verify, for example, drawings or maps accuracy and also to analyze the “dynamics of change and continuity in the building process.” Alkhoven also stated that “[t]he most important quality of these spatial models is that they provide direct visual feed-back to the researcher during the project. ... In other words, the computer images become a source of information themselves.” (1993)

3D city model as an urban research core

Bath (UK) 3D model has been the subject of several papers in the last years. The paper presented by Alan Day and Anthony Radford (1995) was chosen for this study because of its focus on urban history and research process. The authors stated that “[t]he computer model of Bath has always been primarily directed at being a ‘means’: a means to explore issues in urban design, in the public perception of a city, in the implications; on physical form of various strategies for making more sustainable cities, and a means for understanding more about the city’s form and history.” They describe that the model “can act as an indexing system for historical information, much in the way that maps are used in geographical information system.” Therefore, the model is used as a database where information spread in different formats is assigned to “individual properties in the city”, facilitating its access. Many unbuilt plans are also stored in the model as “alternative cities”. Like in Seeböhm and Pelt’s papers (1990 and 1992), they “acknowledge that the city we see today is only one of a numbers of possibilities and

reaffirm that the city of the future will be determined by investigating and choosing between today's alternative.” (Day and Radford, 1995)

Day and Radford's paper covers several topics related to the model's structure, process and theory. Thus, the previous statements are not very detailed and it is not clear how some of the mentioned historical information can be retrieved. On the other side, the description of such different applications for the 3D city model reveals that a comprehensible model, designed to be a “means”, can be a powerful research tool and a vehicle to several forms of analysis and representation.

Modeling methodology as formal critic of Terragni's projects

The investigation carried out by Antonino Saggio (1993) followed by Mirko Galli and Claudia Mühlhoff (2000) about Giuseppe Terragni's projects is the only one in this group which relates to architectural artifacts rather than urban environments. The authors elaborate hierarchically structured 3D models in order to allow many possibilities to analyze buildings and communicate the authors' hypotheses. This methodology has much in common with the city models and demonstrates that architectural projects' 3D models can also be organized in such a way that facilitates discovers, analysis, tests, representations and communications. Saggio (1993) states that “[t]he critical ideas about how the project is interpreted are contained in the way the model is built. Therefore, critical understanding of the project and hierarchical construction coincide.” Thus, the researcher has an active role while defining modeling methodology as part of the modeled project critic. According to Galli and Mühlhoff (2000) “structural patterns do exist that can establish complex relationships between data, identical to those established by the researcher between the different parts of a project during analysis, by identifying and grouping together certain ele-

ments (even if they are very different from one another) by function, material and compositive meaning. A model constructed in this way will not only provide a 3D representation of the work, but the structure of relationships between the data will contain a critical knowledge of the role, meaning and functions of its elements.”

Sense of 'place' through linking past events and geographical location

The CD-ROM *Glasgow2000: the history of the city* (ABACUS, 2001) doesn't present many images from 3D models and 3D models were not applied as a research tool for the CD development. Although digital models are seldom presented in the CD-ROM, they were actually used as a base for artists to traditionally render different periods of the city based on digital terrain renderings while in “the most recent period of the city's development, actual aerial photographs were 'draped' over the computer generated topography.” (Maver, Ennis and Jarvis, 2001) The reason 3D models were not used to render images for the final product was the project's limited time and budget. This fact demonstrates that, even if the research group had a quite complete 3D model of the existing city configuration, the transformation of that model into historical ones of previous periods would be a laborious task.

The ABACUS research group has many projects related to their 3D city model, one of the first to be elaborated at such a scale. Although the 3D model was just a support to generate city's historical representations, this project suggests significant use for it. If we consider previous projects from ABACUS such as *The Glasgow Directory* (<http://iris.abacus.strath.ac.uk/glasgow/>: May 2002), which links different sort of data to a *vrrml* city model, then, the same could be done with *Glasgow2000*'s historical data. Therefore, a more flexible digital model – compared to the still watercolor images – could be applied to also achieve the authors' desired “sense of place”.

Besides the speculations about 3D models, it's important to acknowledge the most important issue of this CD-ROM to our paper: their aim, through the CD, to "give a sense of 'place' and to link all of the information to geographical locations." (Maver, Ennis and Jarvis, 2001). The authors make use of a great number of historical documents from several file types connected to city locations. Traditionally, those files, like sound or video clips, photographs and text are accessible in limited number and connected to some texts on specific topics. Seeing, hearing or reading many of them, in a chosen order and linked to known areas of the cities is a powerful move. One has a comprehensible feeling of the city's environment through those pieces of information and the comparison of the present city's urban spaces.

The "total historic event": Walter Benjamin's "ur-history"

In the 13 years that preceded his death in 1940, Walter Benjamin dedicated most of his time to a major research project concerned to XIX century Paris' history. It seems that he never finished his work and his notes constituted an important historical document. Although Benjamin never wrote about 3D models and his work is not actually an urban or architectural history, his investigation has many relevant aspects to this study. Benjamin started his research from an architectural typology, which had its origin, apogee and decay in the XIX century. Through this typology, the commercial arcades which crossed traditional city blocks as subversive devices, he traced a cultural history of the city. His investigation had a political and pedagogical intention. His objective was to dig, from a myriad of sources, a history which was not written by the 'winners'. Paris' arcade was his instrument to unveil this hidden history of the city. His notes were composed of fragments, organized in an ingenious structure

which some authors speculate as an "intuition of today's computer technologies." (Bolle, 1998)

Benjamin attempted to reveal the city's 'ur-history'. He borrowed this term from Goethe, who used, in his scientific research, the term: 'ur-phenomenon', "the essential pattern or process of a thing. Ur- bears the connotation of primordial, basic, elemental, archetypal; the ur-phenomenon may be thought of as the 'deep-down phenomenon,' the essential core of a thing that makes it what it is and what it becomes." (Seamon, 1998) Benjamin's 'ur-history' was comprehended through several 'images'. For Buck-Morss (1991), "[w]hichever form they took, such images were the concrete, 'small, particular moments' in which the 'total historical event' was to be discovered, the 'perceptible ur-phenomenon' in which the origins of the present could be found." Through collected object's images, organized by means of montage, he wished to "telescope the past through the present." (Benjamin, 1999; Buck-Morss, 1991)

The flâneur, the stroller on Parisian streets, was a critical figure in Benjamin's musings. He was "the 'ur-form' of the modern intellectual. The flâneur's object of inquiry is modernity itself. Unlike the academic who reflects in his room, he walks the street and 'studies' the crowd." (Buck-Morss, 1991)

Urban and architectural history and the research process

The historical research process consists of collecting a multitude of fragments from different sources. The researcher task is the recognition of the data relevance and its interpretation related to other studied pieces. The analysis of urban or architectural history is often related to images based on visual sources as well as textual, aural and other sources. From those sources, architectural and urban historians often attempt to imagine a setting, which no longer exists. Although

sometimes those buildings or urban spaces where not eliminated or didn't change much over the time, the historians duty is much more complex than just registering its physical configuration. The cultural, social and economical among other historical analyses as well as the study of the surroundings or other contemporaneous settings – all related to the present – are critical to the investigation. According to Alkhoven (1991), “[a]rchitectural historians who study *real* architecture, work with imperfect, heterogeneous and often incomplete material when studying the transformation of a city. By studying very precisely the subtle transformation over time it is possible to trace the agents and forces that have produced the image of the city.” (1991)

Usually, researchers responsible for collecting or analyzing an urban historical setting are not the same as those responsible for the 3D model construction. The recognition of the modeling process importance to the historical analysis and research depends often on the interaction between those two groups. Patricia Alkhoven developed a research project, which successively connects the 3D urban model of Heusden, to the analytical and research process (1991; 1993). One of the reasons for her success lies in the fact that she seemed to be responsible for every phase of the project.

3D models are constructed from the collected fragments in the research process. This investigation supports the argument that 3D models should be regarded as a research physical database rather than a representation of an already concluded study (Day and Radford, 1995). Each modeled object should be a piece of historical data linked to different information sources, such as drawings, photographs and texts. Thus, the model should be the research core which synthesizes the collected information as form. The model's detail level is less important than the possibility to represent in 3D each investigated object

as a component of the overall study and to give form to the research material. It evidences the links between each piece and the physical context and also among every piece in the investigation.

Architectural models can display links among the several parts of a historical research (Saggio, 1993; Galli and Mühlhoff, 2000). This process, however, is much more obvious in urban models. A city is produced throughout a long period of time by a myriad of fragments. Most physical fragments are autonomous objects linked to many others. Those fragments are usually related to constructed objects, which are erected in different times with particular characteristics. Cities are delineated by the creation and transformation of those objects. Therefore, their research is critical to the city history. As many of those objects, created in various periods, remain in the present, they are both testimonies of a past and a piece of the current urban configuration. The study of historical components of a city is often a study of existing fragments in the urban fabric. Present and past dwell within the urban fabric and city's inhabitants share their lives with historical settings.

Historical urban digital models are frequently produced backwards (Alkhoven, 1991; Day and Radford, 1995). The current information is always more accurate, easier to verify and has often partial information available in digital form. Thus the current state is applied as a starting point to elaborate previous periods. The information from those periods is interpreted in order to fit on the established standard based on the present configuration. The researcher shape previous periods assembling information from different sources and formats, replacing current elements with their predecessors. Starting the model from the present configuration is often a practical decision. However, the process of interpreting past events according to the present embody a critical issue

(Benjamin, 1999; Buck-Morss, 1991). The past is not studied as a separate episode as opposed to its relation to the present and to humanity as a whole (Croce, 1941 as quoted in Pelt and Seebom, 1990). This relationship is enhanced by the modeling process, which evidences spatial links between past and present. Therefore, the model as a research instrument, rescues the past from the foundations of the present and, at the same time, the present from the fragments of the past. The digital model grounds the investigation to a constant move, departing from the present, towards the past, always considering future implications.

The acknowledgement of this link between past, present and future is also important for the model as a research representation. Places, which are the settings for our lives, are able to accomplish this powerful link between different periods and the present. As past events are spatially organized throughout the city model, connections between those events and the present are strengthened by the recognition of city spaces represented on the model. Inhabitants of the city comprehend better the complexity of urban historical experience associated with familiar places. The observation of 3D historical city models becomes a pedagogical action. One, who consciously experiences historical sites, also experiences the presentness of historical events.

The research developed at the Federal University of Rio de Janeiro

The research group based on the Laboratory of Urban Analysis and Digital Representation of the Graduate Program of Urban Design (PROURB-FAU-UFRJ) has been working with models of the Latin American cities of Havana and Rio de Janeiro and some of the latter's important buildings. The modeling process is the core of our investigations and most hypotheses are elaborated while the models are constructed. As most

research subjects become very complex, models turn out to be powerful tools to represent and organize data, elaborate and verify hypotheses and communicate research analysis.

Our first models of Havana and Rio de Janeiro (Kós et al., 2000) were developed to allow a thorough analysis of the forces that influenced their urban configuration in the colonial period. Other projects were related to the investigation of individual buildings or projects. In our current research, we chose to shift the study procedure. We decided to analyze specific buildings in order to comprehend the city. Those buildings are examined as a synthesis of countless forces which affected a specific period and place. Through the location of those forces, 3D modeling assumes a critical position in the research process. The process of deconstructing and reconstructing models is analogous to the “theoretical” research and becomes the field where the latter is shaped, tested and represented (Saggio, 1993).

The building for the Ministry of Education is the first studied project as an autonomous CD-ROM (Figure 1) and also as part of the larger city project with other icons of the XX century. Around 20 models were elaborated for different proposals or phases of the project. An overview of the peri-

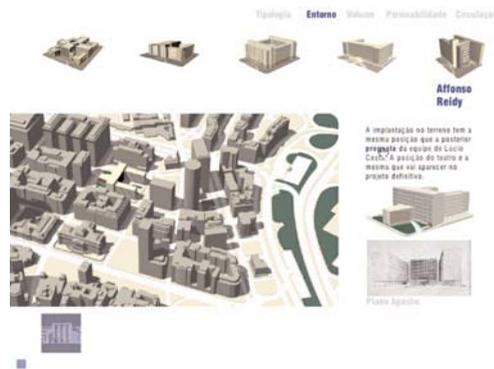


Figure 1. Ministry of Education Building CD-ROM.

Figure 2. Interface for Rio de Janeiro historic database.



od through cultural, political and social examination is also provided. The objective of this project is to supply information to understand the environment of the time in order to understand the motives and impacts of the decisions taken by those responsible for the project. The project's analysis is the motto to comprehend an important period of the city and to reveal some of the hidden facts of the city history, which are not explicitly stated in most studies historic studies.

We are also starting a project which aims to collect and retrieve all sort of information related to the city, connected to spatial locations through the 3D model (Figure 2). In this project, one can choose a specific period view from the 3D model and access the information that will be associated with that period and place. Therefore, one will retrieve pieces such as images, newspaper articles, drawings, statements or commentaries of that period and area of the city. The 3D model will facilitate the link between the known current area of the city to that same area in the past and place will be the main connection element past and present. Instead of retrieving just an isolated piece of historic information, the 'reader' will be placed in a position to actually make the link between past, present and future.

Final remarks

As urban and architectural historians become more proficient with 3D modeling, we will verify a shift in the use of 3D models in historical research. This shift will not only modify research organization but may have significant impact on

its results. Our assumptions are that modeling will facilitate a deeper understanding of urban and architectural history. 'Ur-history' is acquired through the immerse process of modeling a historic environment structure. On the other side, the 'reader', who retrieves information wandering through 3D models, is Benjamin's flâneur digital version.

Although modeling is an abstract representation, a simplification of the real studied object, it allows a spatial assemblage of innumerable pieces of information resembling the physical configuration of the object. The possibility to include such quantity of information in one individual source actually permits acknowledgement of the richness of cities or buildings within complexity of data organization. Built environments are more than just boundaries where life takes place. They actually mirror human existence. To really grasp their richness one needs to thoroughly comprehend their creation process' complexity. Then, one will have a deeper understanding of her (is) own place in the world and will be better qualified to ponder future decisions.

Acknowledgements

This work was supported by a PhD scholarship from the Brazilian Ministry of Education – CAPES at Strathclyde University and a research grant from Brazilian Ministry of Science and Technology – CNPq at Universidade Federal do Rio de Janeiro. We acknowledge with thanks the discussions with Tom Maver, Roberto Segre, José Barki and Jelena Petric, which helped to shape the

thoughts for this paper, and all researchers of the Laboratory of Urban Analysis and Digital Representation – PROURB, who took part in this investigation.

References

- ABACUS: 2001. *Glasgow2000: The Story of the City*, Scrán, Glasgow.
- Alkhoven, P.: 1991, *The Reconstruction of the Past: The Application of New Techniques for Visualization and Research in Architectural History* in G. Schmitt (ed), *Computer Aided Architectural Design Futures: Education, Research, Applications [CAAD Futures '91 Conference Proceedings]*, Zürich, pp. 549-566.
- Alkhoven, P.: 1993, *The Changing Image of the City*, Den Haag, Canaletto. (this publication is also available at <http://www.library.uu.nl/digiarchief/dip/diss/01754573/hfdheus.htm>: May 2002)
- Benjamin, W.: 1999, *The Arcades Project*, The Belknap Press of Harvard University Press, Cambridge.
- Bolle, W.: 1998, *A Metrópole como médium-de-reflexão, Semeiar 3*, Rio de Janeiro.
- Buck-Morss, S.: 1991, *The Dialectics of Seeing: Walter Benjamin and the Arcades Project*, MIT Press, Boston.
- Day, A. and Radford, A.: 1995, *Imaging Change: The Computer City Model as a Laboratory for Urban Design Research* in M. Tan and R. Teh (eds), *The Global Design Studio [CAAD Futures '95 Conference Proceedings]*, Singapore, pp. 495-506.
- Galli, M. and Mühlhoff, C.: 2000, *Virtual Terragni: CAAD in Historical and Critical Research*, Birkhäuser, Basel.
- Kós, J., Barbosa, A., Krykhtine, C., Silva, E. and Paraizo, R.: 2000, *The city that doesn't exist: multimedia reconstruction of Latin American cities*, *IEEE Multimedia*, 7 (2), pp. 12-16. (a similar interactive version of this paper is available at <http://www.fau.ufrj.br/prourb/cidades/vsmm99/>: May 2002)
- Pelt, R. and Seeböhm, T.: 1990, *Of Computer Memory and Human Remembrance: History of Urban Form Through Three-Dimensional Computer Modeling* in P. Jordan (ed), *From Research to Practice [ACADIA Conference Proceedings]*, Big Sky, pp. 45-59.
- Saggio, A.: 1993, *Hypertext, Solid Modeling, and Hierarchical Structures in Formal Architectural Analysis* in U. Flemming and S. Wyk (eds), *CAAD Futures '93 [Conference Proceedings]*, Pittsburgh, pp. 289-309.
- Seamon, D.: 1998, *Goethe, nature and phenomenology: an introduction* in D. Seamon and A. Zajonc (eds), *Goethe's Way of Science: A Phenomenology of Nature*, State University of New York Press, Albany, pp. 1-14.
- Seeböhm, T.: 1992, *Discursing on Urban History Through Structured Typologies* in K. Kensek and D. Noble (eds), *Mission – Method – Madness [ACADIA Conference Proceedings]*, pp. 157-175