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SOVRAPPOSIZIONI. Nuove prospettive per il
territorio**

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OVERLAPPINGS. New perspectives for the
territory**

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06 Reti fisiche, infrastrutture virtuali

Discussant: Donato Di Ludovico, Piero Properzi

Il reticolo consortile di bonifica e irrigazione. Una infrastruttura fisica e virtuale

E. Alessi Celegon, P. Fanton, A. Fiume, S. Anghinelli e S. Lodrini

La prospettiva cibernetica sulla città

Claudia Chirianni

Infrastrutture verdi per la rigenerazione urbana e territoriale

La politica di mitigazione dell'effetto isola di calore urbana nella città di Boston

Silvia Cioci

La luminosità come strumento di analisi dello sviluppo territoriale

Emanuela Coppola, Ferdinando Maria Musto, Valeria Vanella

Una contraddizione solo apparente

Silvia Dalzero

Territori fragili vs Territori smart

Donato Di Ludovico e Pierluigi Properzi

I caratteri dialogici delle reti

Ettore Donadoni

Un modello trans-scalare, inter-modale e multi-funzionale per la pianificazione territoriale delle infrastrutture per la mobilità lenta.

Isidoro Fasolino e Domenico Chirico

Improving research and education in climate change management by international networking in Mediterranean areas – the AdapTM project

Paola Cannavò, Massimo Zup

I Cammini Culturali: nuovi paradigmi per un paesaggio resiliente

Nicola Martinelli, Letizia Chiapperino

Le Tecnologie dell'Informazione e della Comunicazione nella Pianificazione territoriale

Roberto Musumeci e Marichela Sepe

TUNeIT. Un ponte tra Tunisia e Sicilia

Enzo Siviero e Michele Culatti

Le toolbox GIS come strumento di analisi per lo studio delle reti stradali dei territori metropolitani

Maria Somma

Processi incrementali di produzione dello spazio pubblico nei contesti periurbani degradati. Bonifica, ricerche e progetti per l'area orientale di Napoli

Anna Terracciano

Reti e retine nell'abitare contemporaneo

Jole Tropeano

Gli aeroporti nei sistemi metropolitani. Il caso Napoli

Valeria Vanella

Dalle infrastrutture alla città: centralità e accessibilità come parametri di valutazione per lo sviluppo degli insediamenti

Antonia Arena

07 Nuove prospettive del territorio con droni, stampe 3d, giochi elettronici, robotica

Discussant: Romano Fistola, Paolo Fusero

EventMode: A new visualization tool for evaluating the experiential qualities of urban design proposals

Panagiotis Chatzitsakyris

Nuove tecnologie e futuro della città: il governo "aumentato" delle trasformazioni urbane

Romano Fistola e Andrea Rastelli

Precision Environmental Planning: strumenti e metodi innovativi per una "pianificazione ambientale di precisione"

Paolo Fusero, Piero Di Carlo, Raffaella Massacesi, Lorenzo Massimiano, Maura Mantelli, Tullia Rinaldi

Droni su Napoli: visione prospettiche di un possibile rilancio

Igor Scognamiglio

La città rivista dal cielo

Claudio Zanirato

07

Romano Fistola, Paolo Fusero

Nuove
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EventMode: A new visualization tool for evaluating the experiential qualities of urban design proposals

Panagiotis Chatzitsakyris *

Abstract

Architectural and urban designers are currently depending on a multitude of elaborate computational tools in order to explore, manipulate and visualize the geometric configuration of their projects. However, if architecture can be perceived as the manipulation of geometric form in direct relation to human activities and events that take place inside it, then it is evident that such design parameters are not sufficiently represented in the currently available modeling software. Would it be possible to introduce the human activity element in the aforementioned computational tools in a way that informs the design process and improves the final building product? Within an algorithmic landscape with expanding processing capabilities, how can this additional layer of information improve the way our cities are digitally designed, modeled and visualized? This paper attempts to answer these questions by introducing a new experimental visualization tool that enables the creation of parametric human activity envelopes within three-dimensional urban models. The novel approach is that this tool attempts to visualize, both through cinematic animations and through data diagrams, the potential experiential qualities of urban design proposals. The goal is to improve the decision-making

process of urban designers as well as their clients by enabling them to evaluate and iterate their designs based not only on urban form but also on the human spatial events that take place inside it.

Introduction

Supported by widespread technological progress, computational design and analysis tools have been gradually becoming commonplace among architectural and urban design practitioners. These tools have managed to analyze and visualize algorithmic interpretations of important urban design parameters in an efficient and productive manner. As a result, extremely accurate digital geometric models are being utilized as the centerpieces of every stage of urban design development.

Nevertheless, as a human cognitive process that targets the improvement of physical space, urban design is inherently dependent on how the users of the space are moving, interacting and perceiving the designed space. This human presence and interaction is usually absent within the 3D modeling software, where the actual design decisions usually take place. The goal of the proposed tool is to take advantage of the increased computational resources that are currently

available and to offer an enhanced and flexible 3D representation of human activity data that could be integrated into popular modeling software. By adding another layer of information into the digital 3D environment, the assumption is that the designer's point of view will be augmented and that novel ways of visualizing and understanding the urban fabric will emerge.

Computational precedents

The first instance of computational analysis tools that were loosely related with human activity can be traced to practical implementations of the theoretical ideas of Christopher Alexander and Bill Hillier. Alexander's efforts had limited success due to insufficient technical resources while Bill Hillier's team was more successful in creating computer applications (Axman, Spatialist) based on the space syntax theory. These tools have been quite popular among urban planners and designers as they provide data analysis and simulation of road or path networks. More recently, various other applications (Legion SpaceWorks) promise reliable simulation of human movements in urban contexts or in emergency evacuation scenarios. All these software, albeit incredibly useful while evaluating urban design proposals, are focusing on pedestrian traffic and are tre-

ating the urban users as human agents that move from point A to point B. What is missing from such evaluations is the experiential quality of designed spaces: how the users of the space are moving, interacting and perceiving the designed space.

The new tool

In order to visualize the experiential aspect of urban spaces the proposed tool relies on another visual language that is suitable for representing human activities in space: the cinematic language. This language, largely built for narrative films with characters in space, controls attributes such as framing, camera movement, sound effects as well as film editing, and has been developed by various film-makers throughout the past century. The goal of the new tool is to take advantage of the increased computational resources that are currently available and to introduce cinematic visual principles in order to offer novel, human-centered visualizations of urban design proposals.

Modeling

This paper introduces a new type of digital tool that augments the existing three-dimensional digital modeling software by implementing a mechanism for visualizing the human activity and events that might take

place inside the designed spaces. To facilitate its process, the software introduces a new parametric component that can be described as a transparent, volumetric human activity envelope. This component is called Event Platform (Figure 1) and its goal is to define urban areas where people engage in certain static activities (playgrounds, exterior cafe seating, bus stops, etc.). The urban designer can position these platforms within the digital urban model and control them through a diverse set of parameters (size, type of events, number of avatars, mobility of avatars between platforms, etc.). By utilizing established techniques from other digital fields (character animation), the proposed tool enables the designer to create simple avatar sequences with minimal hassle through the assistance of pre-established motion capture libraries. At the same time, the Event Platforms are not isolated entities but are able to be parametrically connected with each other and with the actual geometric elements of the 3D model. By assigning connections between certain platforms, the designer can establish how the human users can move between the platforms. Therefore, the passageways from each space to the neighboring ones can be positioned in a parametric manner. At the same time, the architect can adjust the intended opacity of individual borders of each

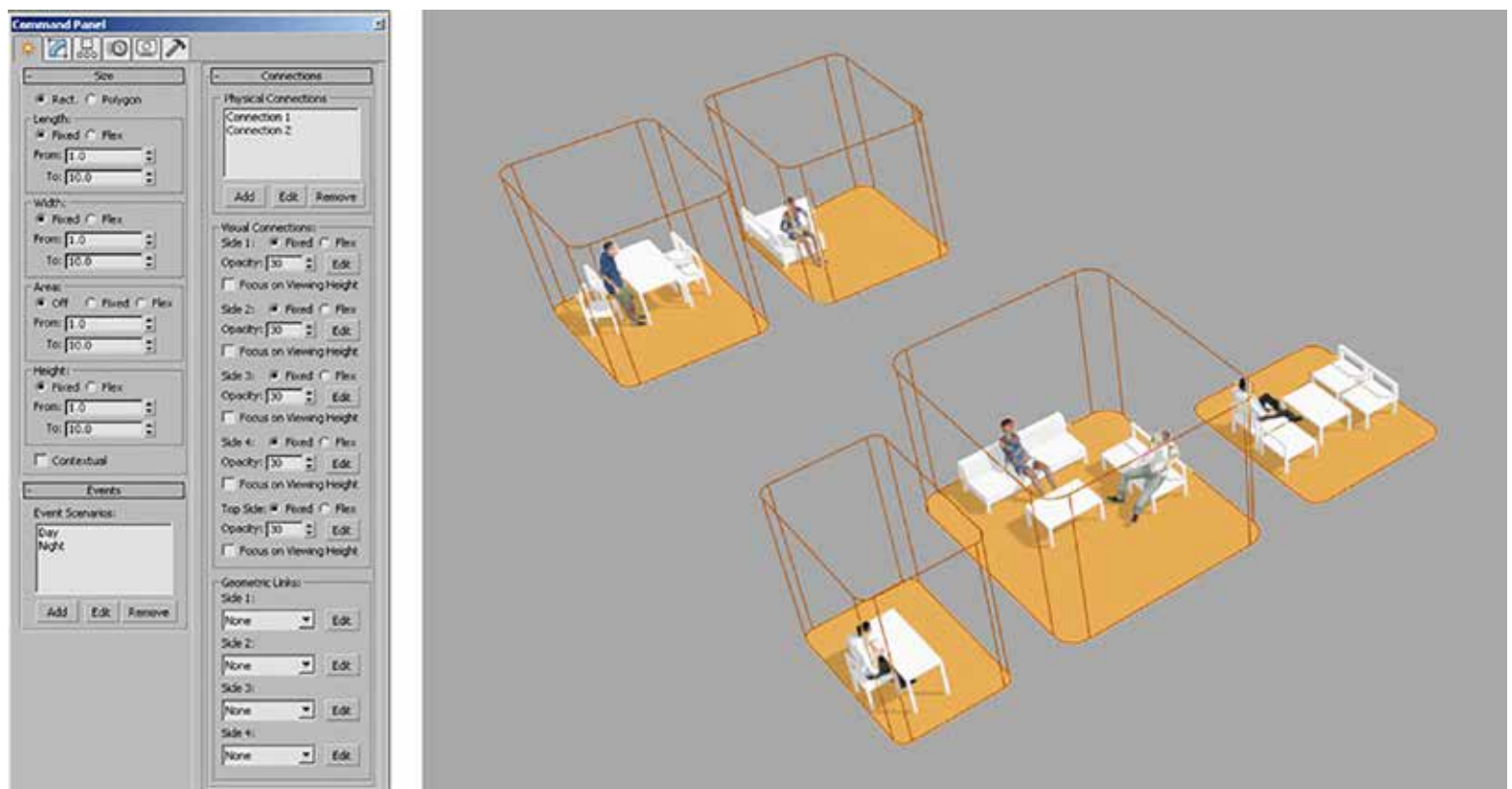


Figure 1— Part of the user interface of the plugin within 3DS Max (left) and Event Platforms after the creation of the various events (right).



Figure 2— Animation matrix showing 9 cameras following the avatars in the urban fabric.

platform to control the optical relationships among the different Event Platforms as well as their visual connections with the environmental context.

Visualization

In order to adequately encapsulate the complexity of events and human activities in space, the proposed tool utilizes the positioning of the avatars of the Event Platforms and creates various digital cameras around them by adhering to established cinematic conventions. After creating a large number of cameras, a representative sample of the best shots is algorithmically compiled into an animation matrix that shows up to 25 different frames. This human activity animation matrix constitutes a new visualization mechanism that offers a fresh representational perspective during the design process (Figure 2).

In addition to the animation feedback, the tool is capable of analyzing the frames of all the point-of-view cameras and extracting useful data out of them. Apart from the visual imagery that they provide, the viewpoints of the avatars can provide additional information that could be translated into useful diagrams. The digital tool can currently mo-

nitor data about the typology of the urban context (what type of buildings are visible to every avatar), other avatars (how many of the other avatars are visible to each avatar) and average spaciousness (the average distance of the first obstacle in front of every avatar).

Experimentation and evaluation

In order to illustrate the use and benefit of this proposed software, a prototype 3DS Max plug-in has been implemented and has been put into use through an experimental urban design project.

In this explorative project, an urban plaza was populated with Event Platforms which were further enhanced by the insertion of animated avatars that represent human activities. Consequently, these platforms were parametrically connected with each other based on their desired relationships and manually placed within the plaza in order to achieve a first initial configuration. The tool was then utilized in order to automatically generate animation matrixes and data diagrams which depicted optimization strategies. This feedback loop was repeated until the resulting model was deemed satisfactory.

Conclusion

The design experimentation has demonstrated that the proposed plugin could have a quite positive impact during the urban design decision-making process. By operating both at the more abstract scale of functional areas and at the more experiential scale of moving avatars, the Event Platforms manage to integrate human activity data into the 3D geometric model. This additional information layer can prove beneficial both for modeling and for visualizing urban design projects.

As a modeling aid, the plug-in is able to quickly generate different Event Platform configurations. Most importantly, the software encourages the designer to establish bidirectional connections between the Event Platforms and the parameters of the physical elements. This results in an enhanced digital urban fabric model that enables a much more comprehensive understanding of its spatial relationships while constantly maintaining interactive flexibility.

At the visualization level, the avatar-based cinematic animation matrix and the data diagrams demonstrate novel representational features that are missing from existing visualization techniques. The experiential quality

of the multiple cinematic camera views as well as the quantitative data diagrams of the avatars' positioning and point-of-view are not only contributing to the augmented understanding of the human-enhanced model but are also suitable for the effortless generation of presentation material for each project. Therefore, although this tool is originally intended to be used during design development, an urban designer may opt to use it strictly as a visualization tool after the design is concluded.

The future development of the tool targets two areas of improvement. A certain potential point of emphasis is the integration of VR export capabilities for the human activity animation matrix. Moreover, the data categories that are depicted in the diagrams can be expanded to include more complex information about the human activities that take place within the platforms.

Notes

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Nuove tecnologie e futuro della città: il governo "aumentato" delle trasformazioni urbane

Romano Fistola* e Andrea Rastelli**

Qualunque cosa la mente umana si trovi a dover comprendere, l'ordine ne è una indispensabile condizione. Disposizioni quali la planimetria di una città o di un edificio, un insieme di utensili, un'esposizione di mercanzia, la manifestazione verbale di fatti o di idee, ovvero quali un dipinto o un brano musicale, sono disposizioni dette tutte ordinate quando sia possibile a chi le osservi o le ascolti coglierne la struttura generale ed anche il diramarsi di essa da una certa articolazione di dettaglio" (Rudolf Arnheim, Entropia ed arte).

Città e tecnologia

Il ruolo delle nuove tecnologie nel campo dello studio dei fenomeni urbani e delle tecniche di governo della città è ormai riconosciuto anche in ambiti e gruppi di studiosi tradizionalmente tecno-resistenti che hanno tuttavia percepito l'influenza dell'innovazione tecnologica (IT), non solo all'interno delle definizioni tecniche del governo del territorio, ma soprattutto nella modificazione dei comportamenti degli agenti urbani. Quello che fino a qualche tempo fa appariva come un esclusivo dominio della "componente" tecnico-scientifica degli urbanisti, appare oggi un campo condiviso nel quale si vanno sviluppando interessanti approfondimenti metodologici ed operativi (Moccia, 2008). In generale è forse possibile affermare che il riconoscimento della potenzialità delle tecnologie innovative e la loro adozione nella predisposizione della pre-visione della città e del territorio è da ricondursi alla necessità di mettere a punto un "progetto di futuro" (Secchi, 2000) che necessitava di ambienti: computazionali, rappresentativi e valutativi che solo le nuove tecnologie consentivano di realizzare. Si possono in tal senso distinguere due elementi che hanno determinato tale processo: da un lato lo sviluppo della cartografia numerica che ha prodotto nuovi ambienti di sviluppo della conoscenza territoriale (Fistola, 2009) quali i sistemi informativi geografici (GIS), dall'altro la diffusione