BENV2423LOWE

DESIGN AND REAL TIME INTERACTIVITY – A POROSITY STUDIO

TRACE + REPRESENTATION

RESEARCH QUESTIONS

CAN POROSITY BE REPRESENTED IN REAL TIME? WHAT SHOULD THAT REPRESENTATION LOOK LIKE? CAN THE COMBINATION OF COMPUTER GAMING TECHNOLOGY AND ENVIRONMENTAL SENSORS AUTOMATE THE REPRESENTATION OF POROSITY?

COMPUTER GAMING TECHNOLOGY AND POROSITY

Using computer gaming techaology and enviroamental sensors to represent Porosity.

Russell Lowe, Senior Lecture in Architecture ,
University of New South Wales, Faculty of the Built Environment
russell.lowe@unsw.edu.au
www.russelllowe.com

Richard Goodwin, Professor of Fine Art,
University of New South Wales, College of Fine Art
richard@richard-goodwin.com
www.richard-goodwin.com

ABSTRACT: In 1996 artist-architect Richard Goodwin coined the term "Porosity". Porosity describes the publicly accessible spaces within privately owned parts of the city. Any mixed use building is necessarily Porous; for example, clients must be able to visit their dentist's surgery on the 14th floor, their lawyer on the 5th floor, or a restaurant on the roof. A buildings Porosity is a measure of the quantity and quality of pathways to a given destination (Goodwin 2006).

More recently, the growing list of urban mapping projects suggests that there is an urgent need for a deeper understanding of the dynamic relationship between public access and the occupiable spaces of the city (see Reades et al 2007, for a representative range of these. C. Nold's work is worth a special mention). The Porosity of a building is an excellent example of the dynamic relationship between people and the built fabric of the city. Due to the manual data gathering techniques employed, the first incarnation of the Porosity maps were only able to create a 'snapshot' of the buildings selected. To understand how the Porosity of a specific building might change over time the mapping process would need to be automated.

The questions that initiated this research were, "could Porosity be represented in real time? What should that representation look like? And can the combination of computer gaming technology and environmental sensors automate the representation of Porosity?"

In response to these questions the authors have developed a prototype that translates the movement of a person in the real world into the virtual environment of a computer game; note the pedestrians' participation is entirely passive (i.e. they are not knowingly playing a computer game, they are simply going about their business). The movements of a Non-Player Avatar, standing in for the pedestrian, are then represented with a range of textures, geometries and behaviors. (The external sensor that is being used to demonstrate proof of concept is the Nintendo Wii Balance Board, employing a custom script to interface with the PC). The authors call these representations of movement and time 'Porosity Lenses'. Their development draws from Goodwin's Porosity Index but, significantly, construct it in real time. In one lens the movement of the avatar constructs a facsimile of a space as sensors passively capture a person's movement through the real one.

Finally the paper compares the lenses developed with recent representations of movement over time to highlight strengths and weaknesses of the approach.

KEYWORDS: Porosity, Computer Games, Sensors, Representation, Mapping.

1. INTRODUCTION

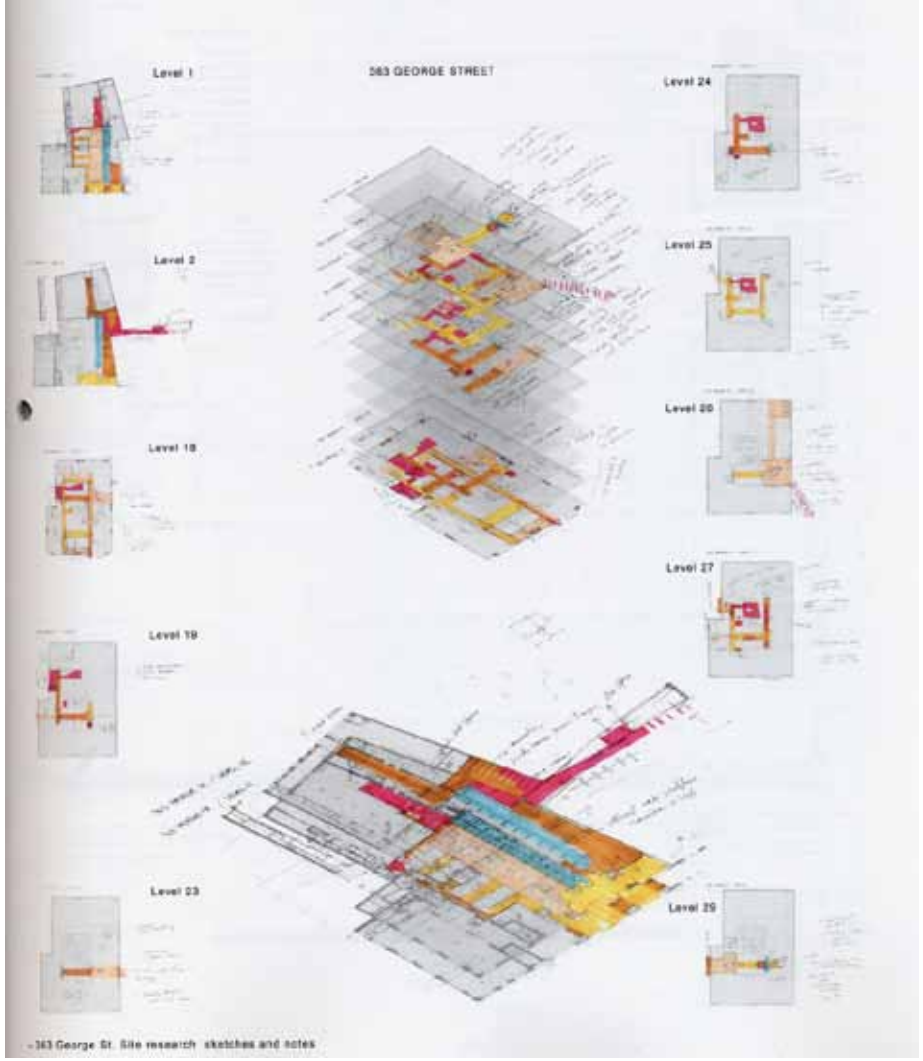
A growing list of urban mapping projects suggests there is an urgent need for a deeper understanding of the dynamic relationship between public access and the occupiable spaces of the city (see Reades et al 2007, for a representative range of these, C. Nold's work is worth a special mention). In many cases these projects represent dramatically changing patterns of use, mobility, and security. The term *"Porosity"*, coined by Richard Goodwin, describes the

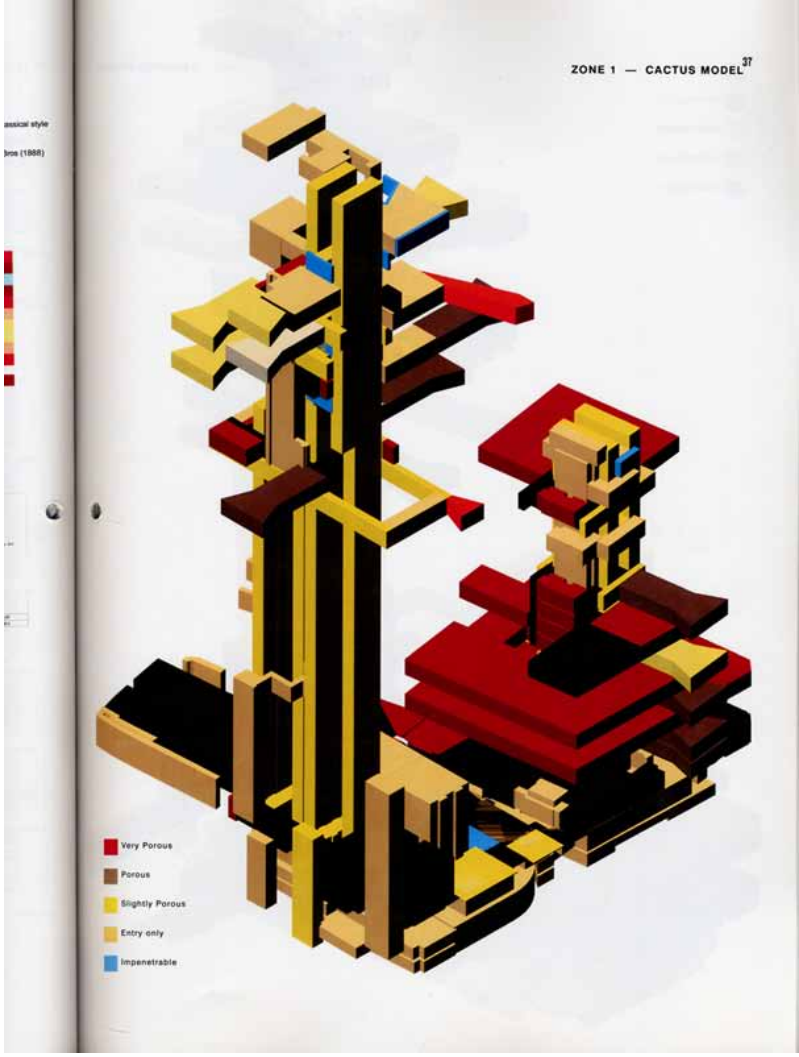
COMPUTER GAMING AND POROSITY:

9TH INTERNATIONAL CONFERENCE ON CONSTRUCTION APPLICATIONS OF VIRTUAL REALITY

1ST POROSITY STUDIO: 1996

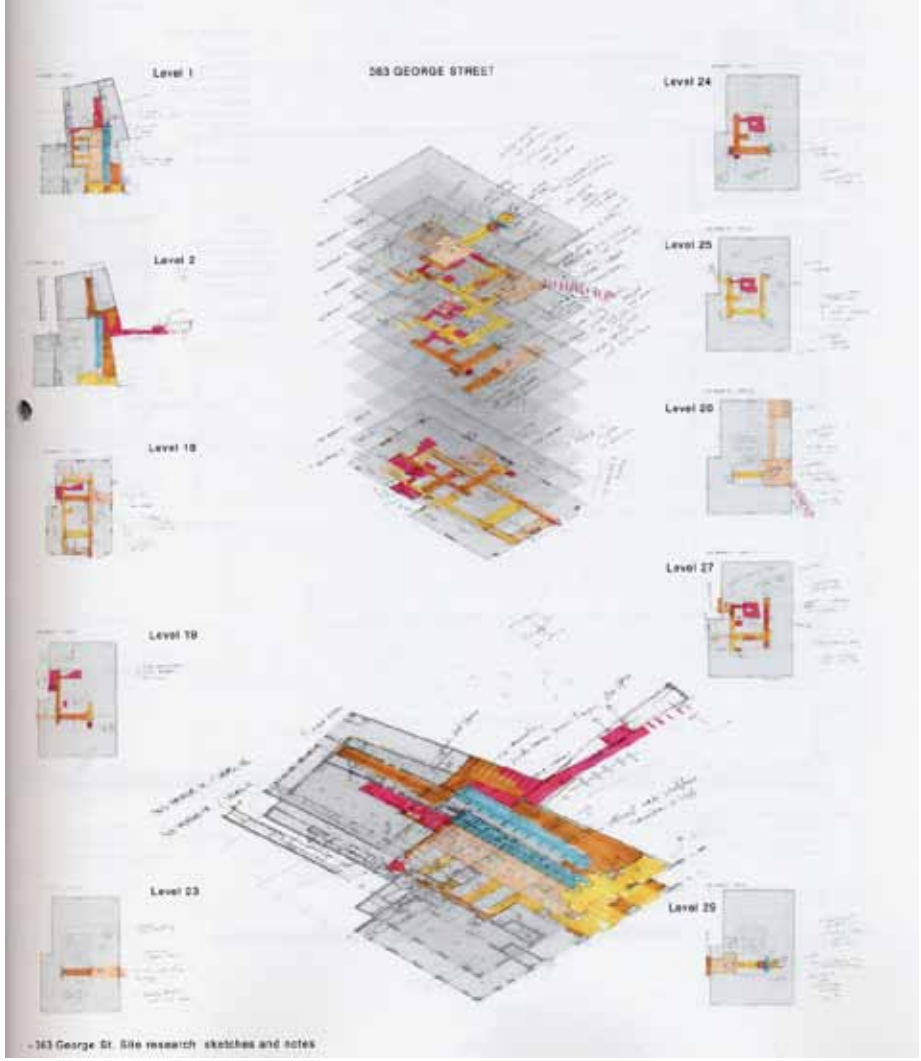
“THE PUBLIC SPACE OF THE CITY DOESN’T END AT THE BUILDING ENVELOPE; ANY MIXED USE BUILDING REQUIRES ACCESS BY THE PUBLIC AND IS NECESSARILY POROUS.

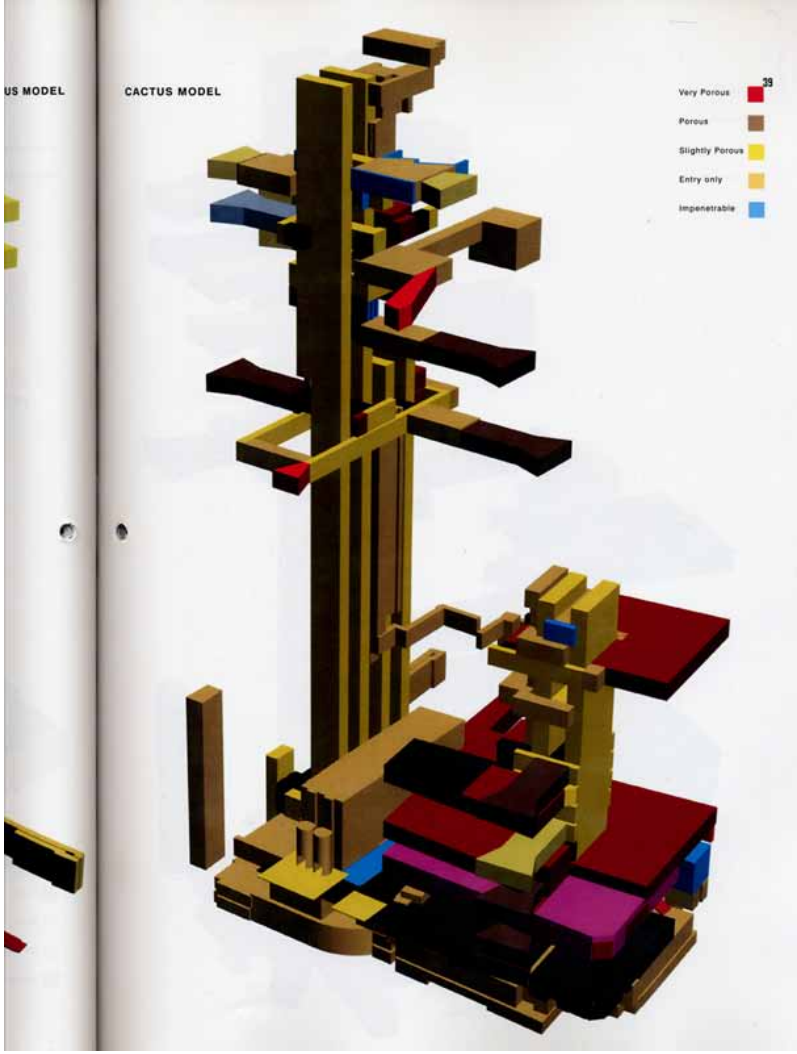




ARC DISCOVERY PROJECT 2003-2005

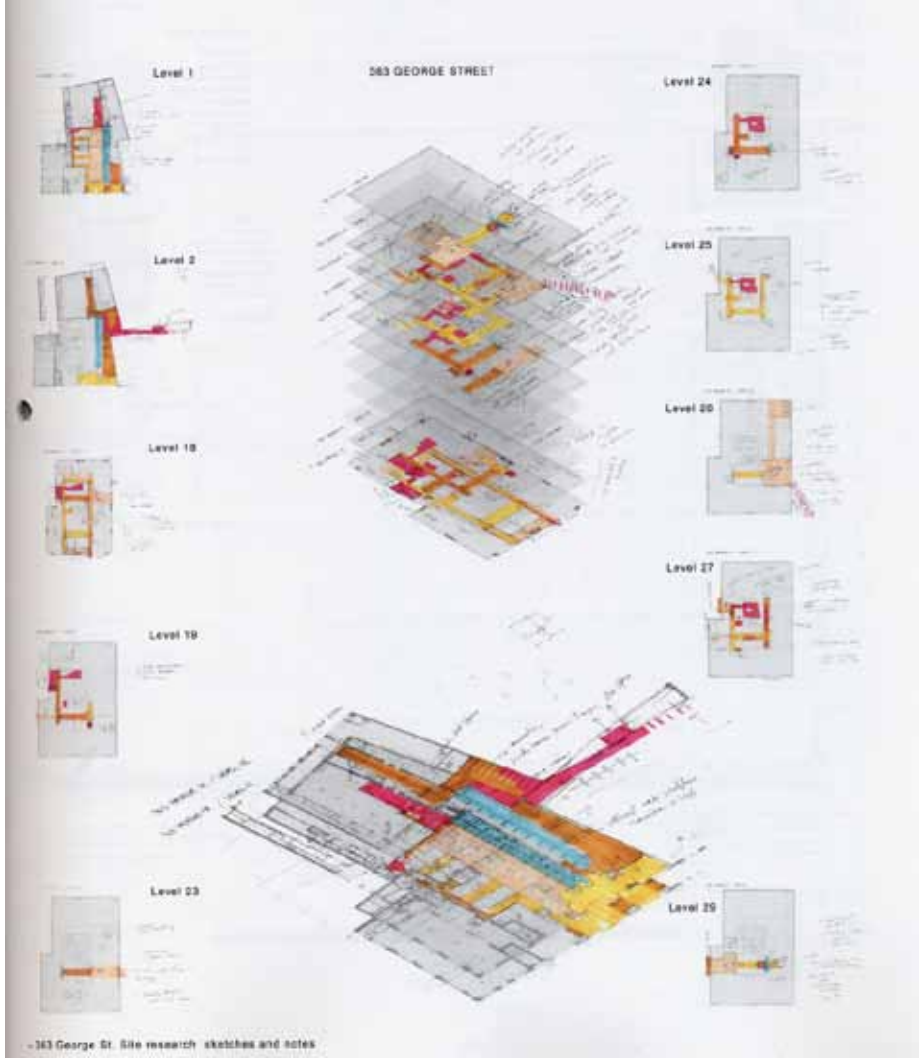
"THE PUBLIC SPACE OF THE CITY DOESN'T END AT THE BUILDING ENVELOPE; ANY MIXED USE BUILDING REQUIRES ACCESS BY THE PUBLIC AND IS NECESSARILY POROUS.





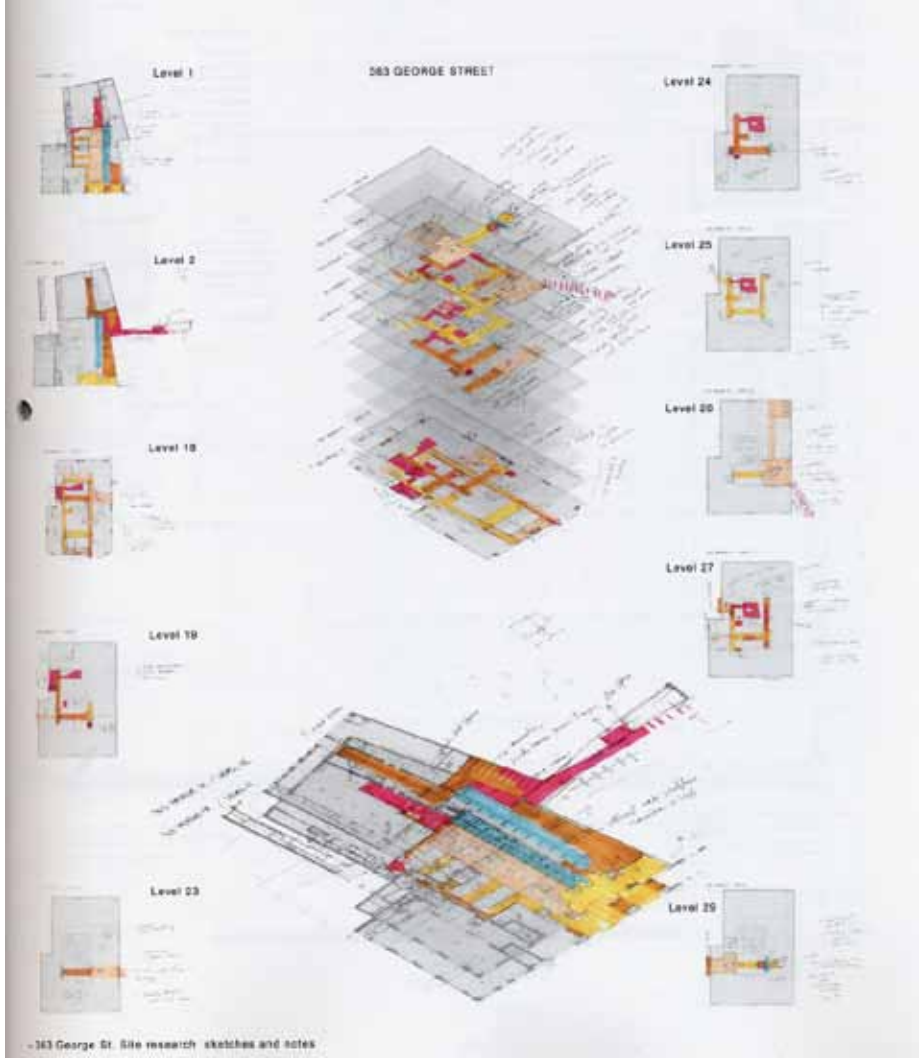
ARC DISCOVERY PROJECT 2003-2005

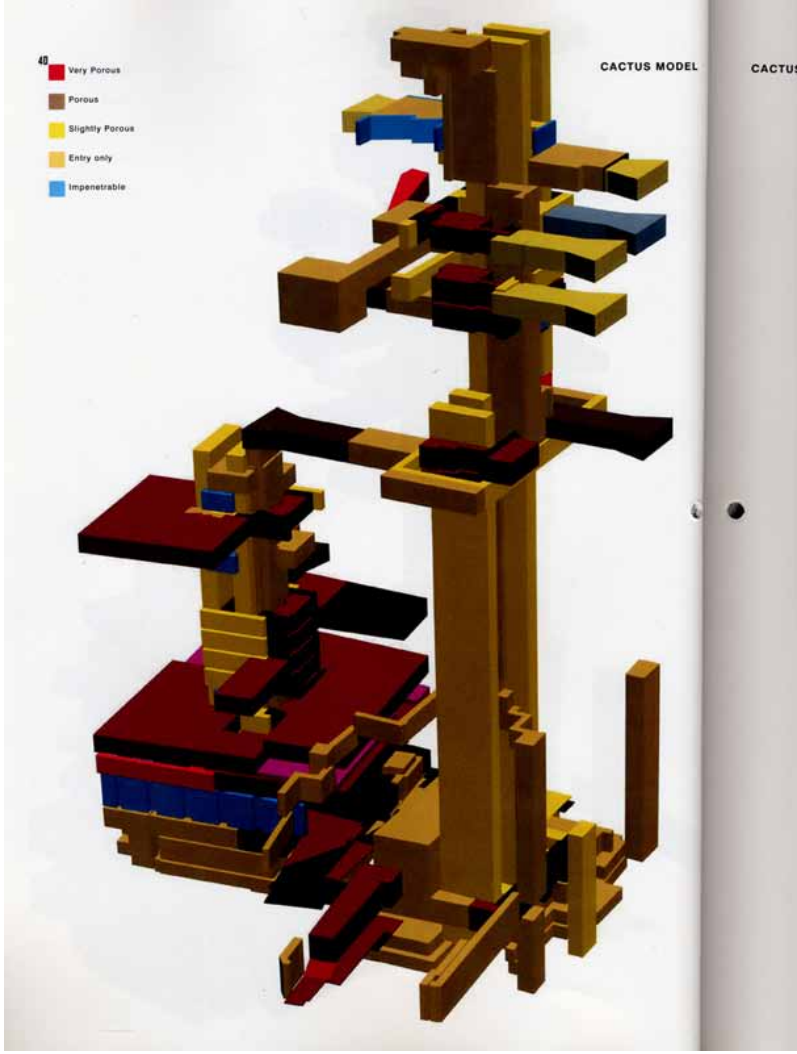
"THE PUBLIC SPACE OF THE CITY DOESN'T END AT THE BUILDING ENVELOPE; ANY MIXED USE BUILDING REQUIRES ACCESS BY THE PUBLIC AND IS NECESSARILY POROUS.



ARC DISCOVERY PROJECT 2003-2005

“THE PUBLIC SPACE OF THE CITY DOESN’T END AT THE BUILDING ENVELOPE; ANY MIXED USE BUILDING REQUIRES ACCESS BY THE PUBLIC AND IS NECESSARILY POROUS.





ARC DISCOVERY PROJECT 2003-2005

"THE PUBLIC SPACE OF THE CITY DOESN'T END AT THE BUILDING ENVELOPE; ANY MIXED USE BUILDING REQUIRES ACCESS BY THE PUBLIC AND IS NECESSARILY POROUS.

ACCESS AND EVACUATION

THE *POROUSNESS* OF A BUILDING RELATES TO THE EASE BY WHICH A BUILDING MIGHT BE ACCESSED AND EVACUATED; THE IRONY HERE IS THAT HIGH LEVELS OF POROUSNESS WOULD SEEM TO FACILITATE BOTH.

A GROWING LIST OF URBAN MAPPING ...

Reades, J, Calabrese, F, Sevtsuk, A, Ratti, C, (2007) Cellular Census: Explorations in Urban Data Collection, *IEEE Computer Society, Pervasive Computing, Vol. 6, No 3,* July-September.

... PROJECTS INDICATES A NEED FOR ...

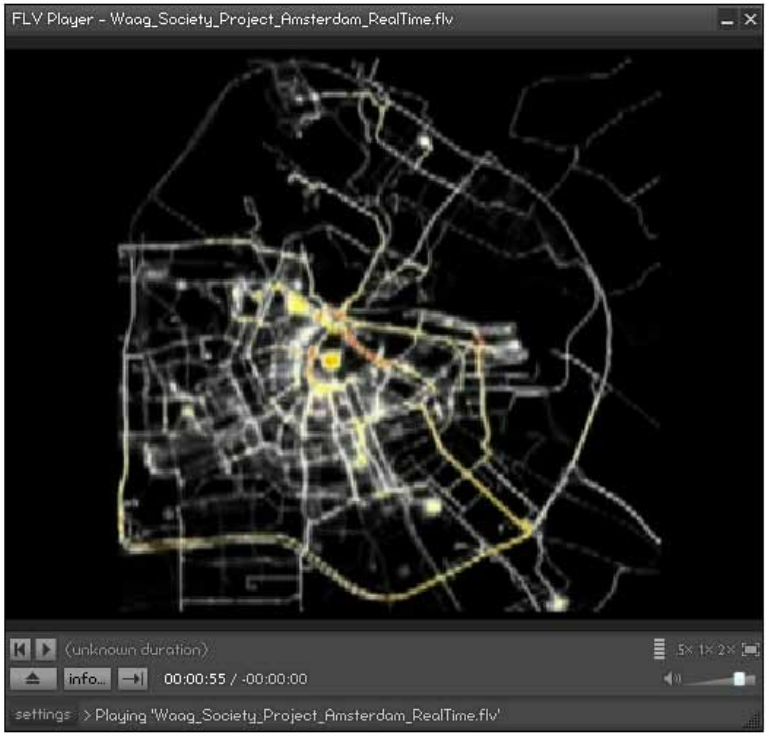
Reades, J, Calabrese, F, Sevtsuk, A, Ratti, C, (2007) Cellular Census: Explorations in Urban Data Collection, *IEEE Computer Society, Pervasive Computing, Vol. 6, No 3,* July-September.

GREATER UNDERSTANDING

Reades, J, Calabrese, F, Sevtsuk, A, Ratti, C, (2007) Cellular Census: Explorations in Urban Data Collection, *IEEE Computer Society, Pervasive Computing, Vol. 6, No 3,* July-September.

WHY USE COMPUTER GAMING TECH?

Rather than being fully spatial many urban mapping projects still represent the city in two dimensions.



AMSTERDAM REAL TIME

WHY USE COMPUTER GAMING TECH?

Rather than being fully spatial many urban mapping projects still represent the city in two dimensions. See Envisioning Information (Edward R. Tuft), the subject of next weeks lecture.

www.biomapping.net

WHY USE COMPUTER GAMING TECH?

Rather than being fully spatial many urban mapping projects still represent the city in two dimensions.

www.alisonmealey.com

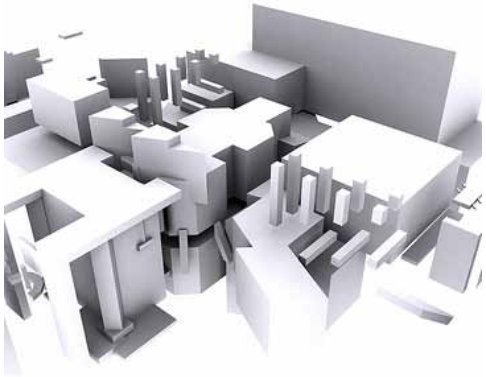
WHY USE COMPUTER GAMING TECH?

Rather than being fully spatial many urban mapping projects still represent the city in two dimensions.

www.alisonmealey.com

WHY USE COMPUTER GAMING TECH?

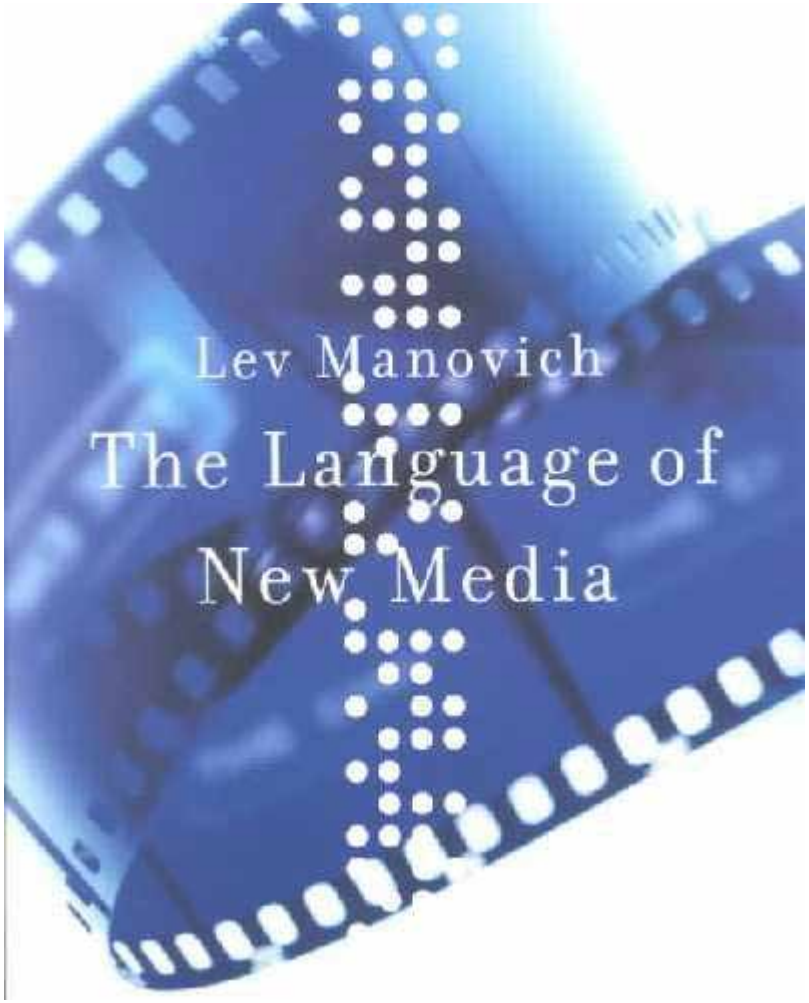
Rather than being fully spatial many urban mapping projects still represent the city in two dimensions.



www.alisonmealey.com

WHY USE COMPUTER GAMING TECH?

Rather than being fully spatial many urban mapping projects still represent the city in two dimensions.



WHY USE COMPUTER GAMING TECH?

LEV MANOVICH, THE LANGUAGE OF NEW MEDIA: “the 3-D virtual space combined with a camera model is the accepted way to visualize all information”

MEASURING HUMAN BEHAVIOUR USING A HEAD-CAVE

CHENGYU SUN
Tongji University, PR. China

and

BAUKE DE VRIES, JAN DIJKSTRA
Eindhoven University of Technology, The Netherlands

Abstract. In this research funded by NSFC (50408038), an agent-based simulation model is developed for the human evacuation behaviour determined by a list of so-called architectural clues in the environment. A research method is introduced with an application for one of these clue types called Doorway. A six-variable model and a related set of virtual scenes were constructed and implemented in a Head-CAVE system, in which 102 subjects were tested as in an evacuation game. With the binary logit regression analysis a utility function is estimated indicating how these variables affect human choice on any pair of doorways in a scene. Evidence was found that the distance from the decision point to the doorway is not always the most important factor as it is assumed in the other evacuation models.

1. Introduction

As many mega cities in China, Shanghai is entering a period of booming underground space development, Figure 1, in the next 20 years. As the government planned, the subway system will increase from 82 km to more than 400 km by the year 2010, and the daily passengers will increase from 1.3 million to 6 million. With the big step of the underground space development, the security problem on how the public space evacuates people in an emergency is coming to the surface.

Building performance research with regard to hazard situations resulted in simulation models of human movements. These models are based on social force methods (e.g. Helbing et al. 2000) and cellular automata methods (e.g. Nishinari et al. 2004).

A Dong, A Vande Moere & JS Gero (eds), CAADFutures'07, 501-511.

WHY USE COMPUTER GAMING TECH?

SUN et al (2007) IMPORTANCE OF POINT OF VIEW (POV).

WHY USE COMPUTER GAMING TECH?

SUN et al (2007) IMPORTANCE OF POV: Their research utilized an environment that was “designed to be something like a first person shooting game, such as DOOM.”

WHY USE COMPUTER GAMING TECH?

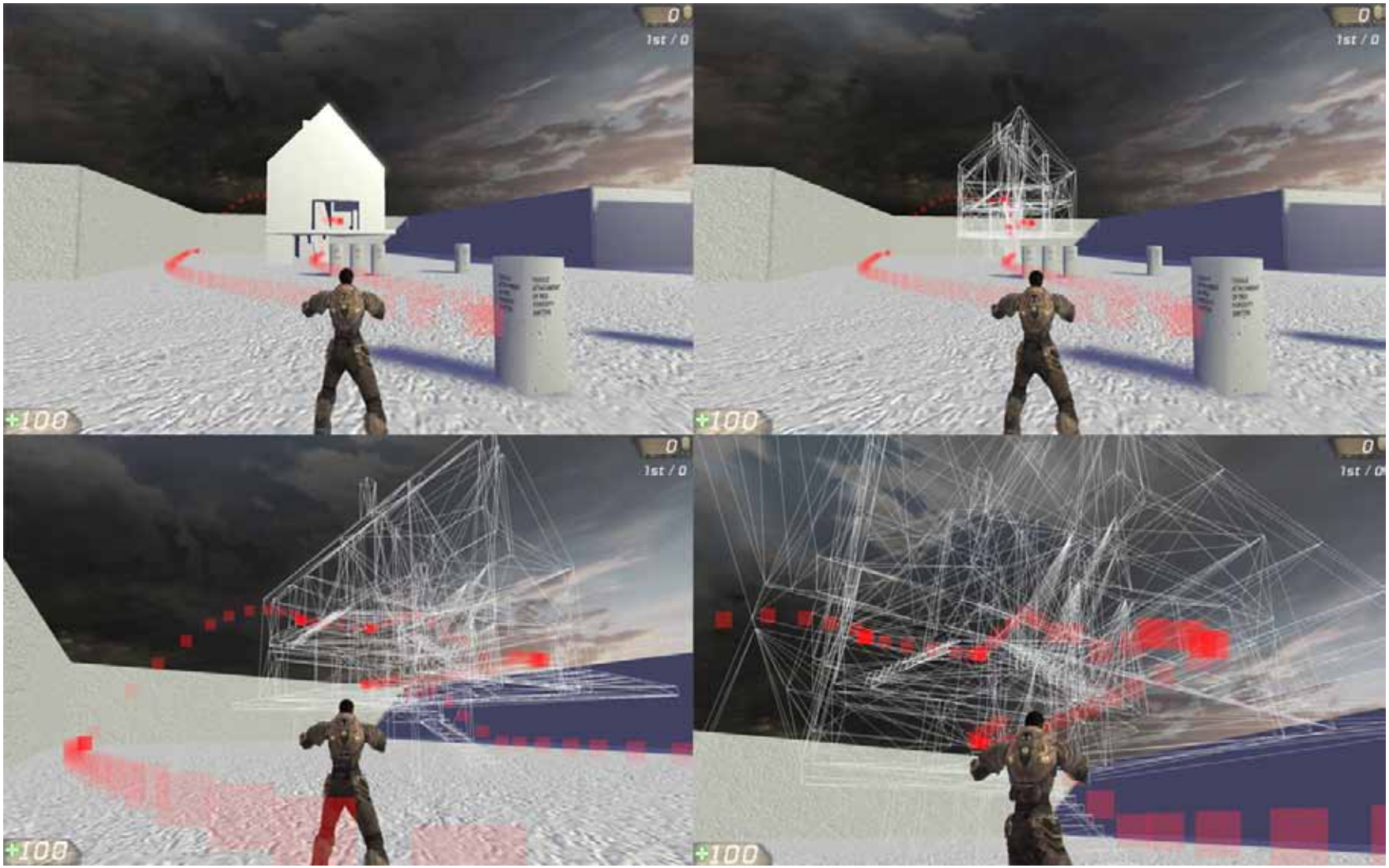
MICROSOFT RESEARCH, 2005, “COMPUTER GAMING TECHNOLOGY PUSHES THE TECHNOLOGY ENVELOPE”

WHY USE COMPUTER GAMING TECH?

IN APRIL 2009 VIRTUAL HEROES WAS ‘ACQUIRED’ BY APPLIED RESEARCH ASSOCIATES.

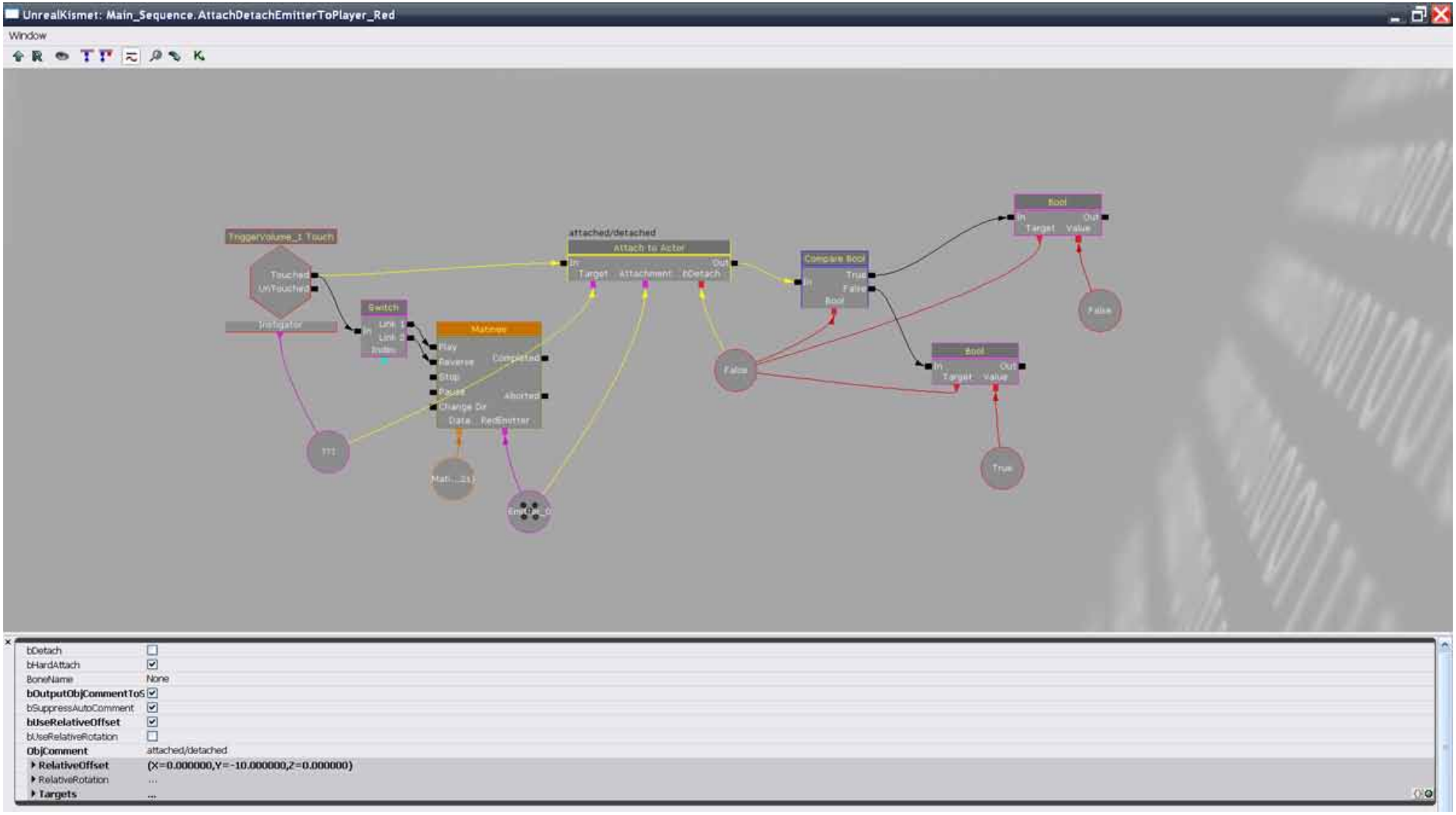
PROTOTYPING

ADDING PERSISTENT TRACES OF MOVEMENT TO THE “SET OF ARCHITECTURAL CLUES IN SIGHT”.



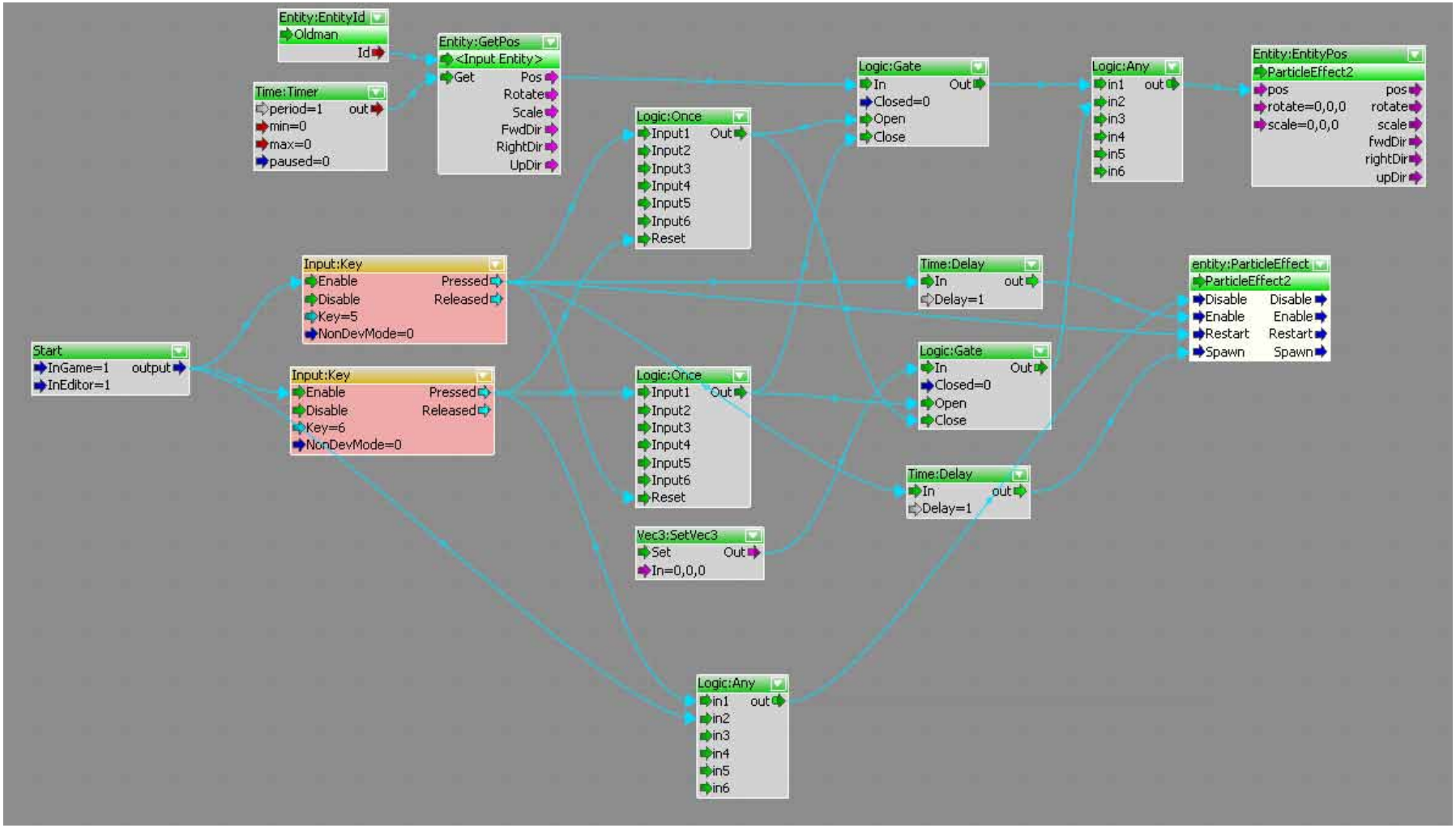
HANSEL AND GRETAL

ADDING PERSISTENT TRACES OF MOVEMENT TO THE “SET OF ARCHITECTURAL CLUES IN SIGHT”.



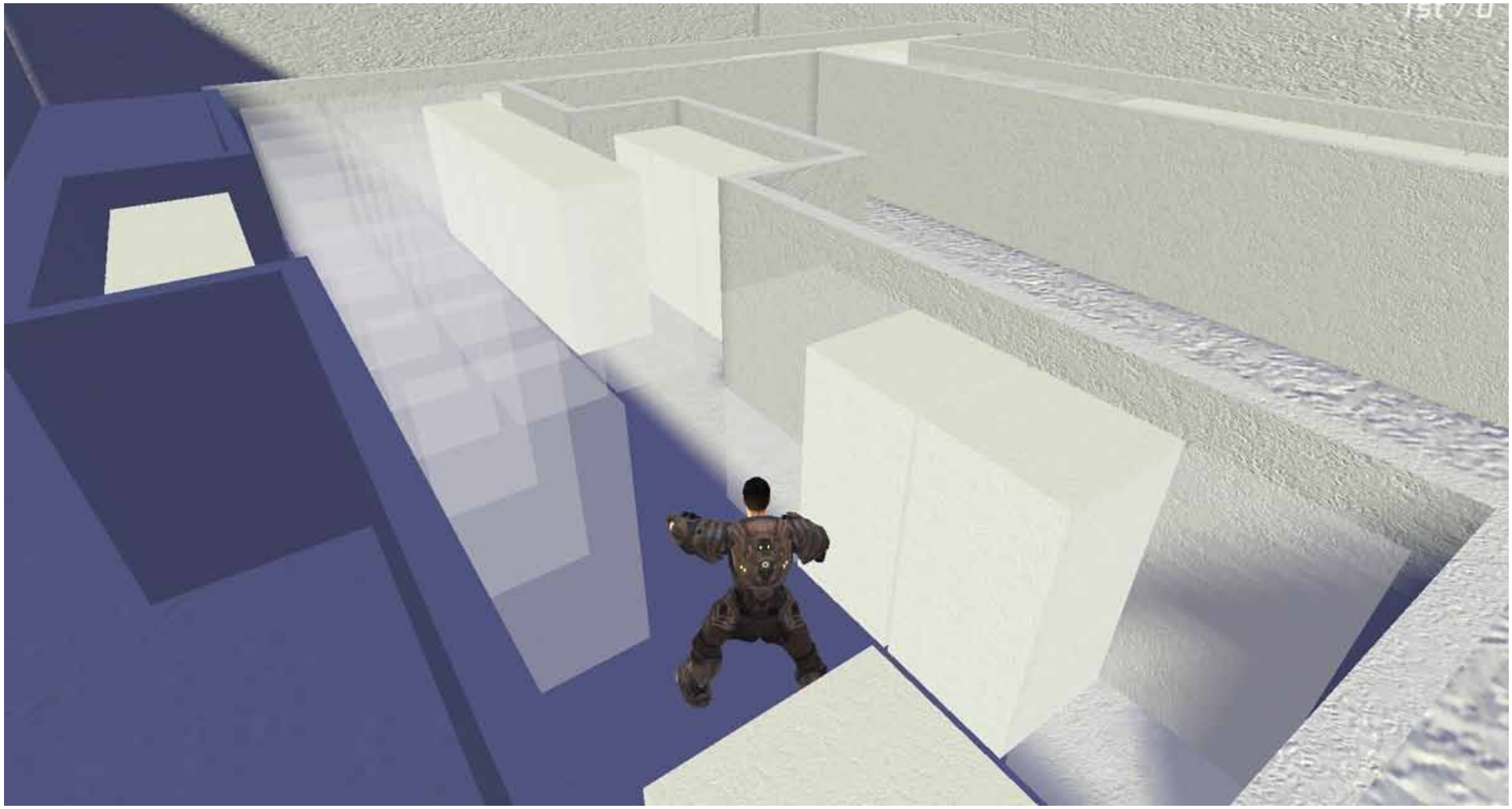
UNREAL KISMET: ATTACH EMITTER

VISUAL SCRIPTING LIKE THE FLOWGRAPH IN CRYSIS AND CRYSIS WARS.



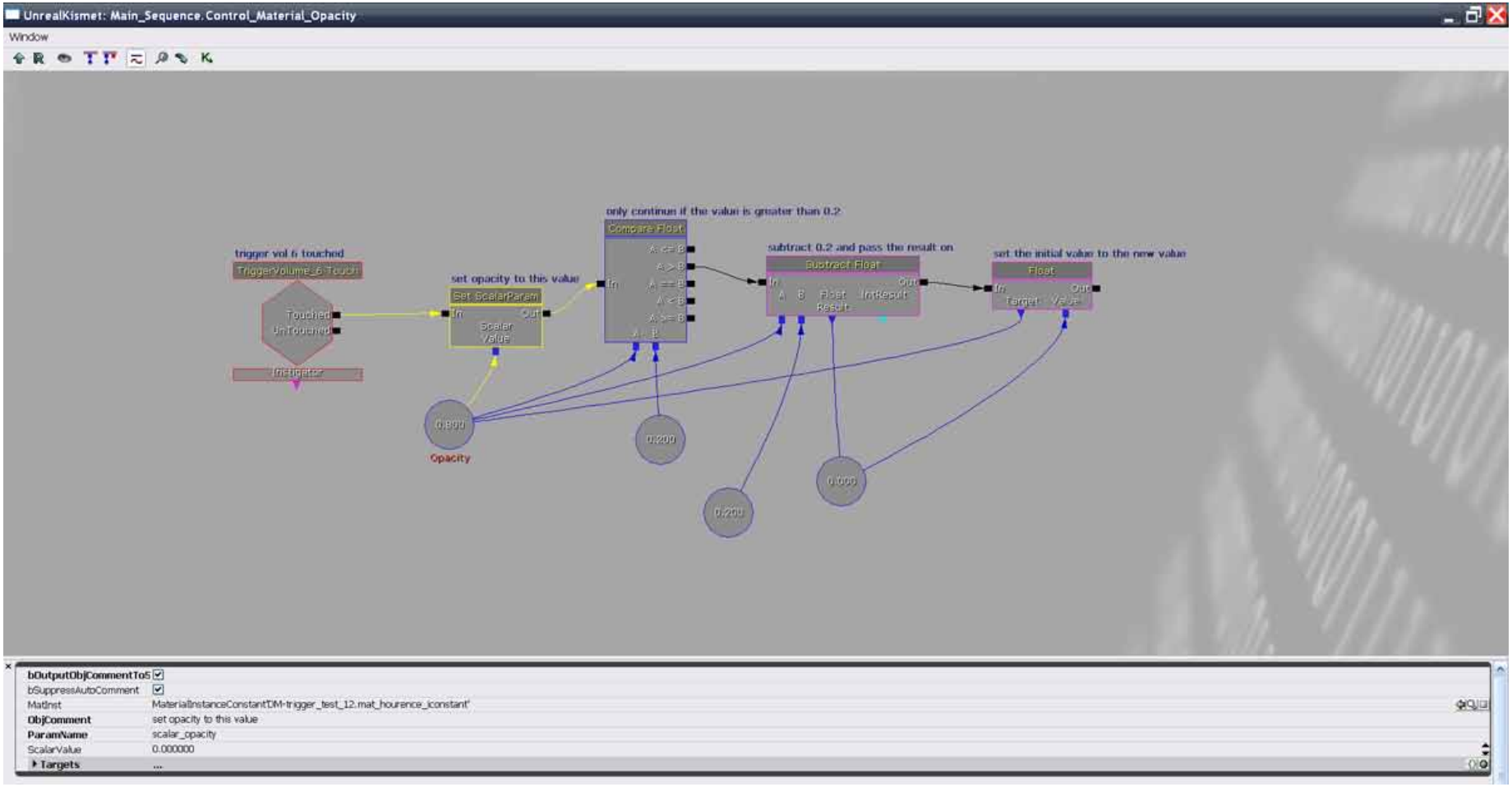
FLOWGRAPH: ATTACH EMITTER

VISUAL SCRIPTING FOR CRYSIS AND CRYSIS WARS.



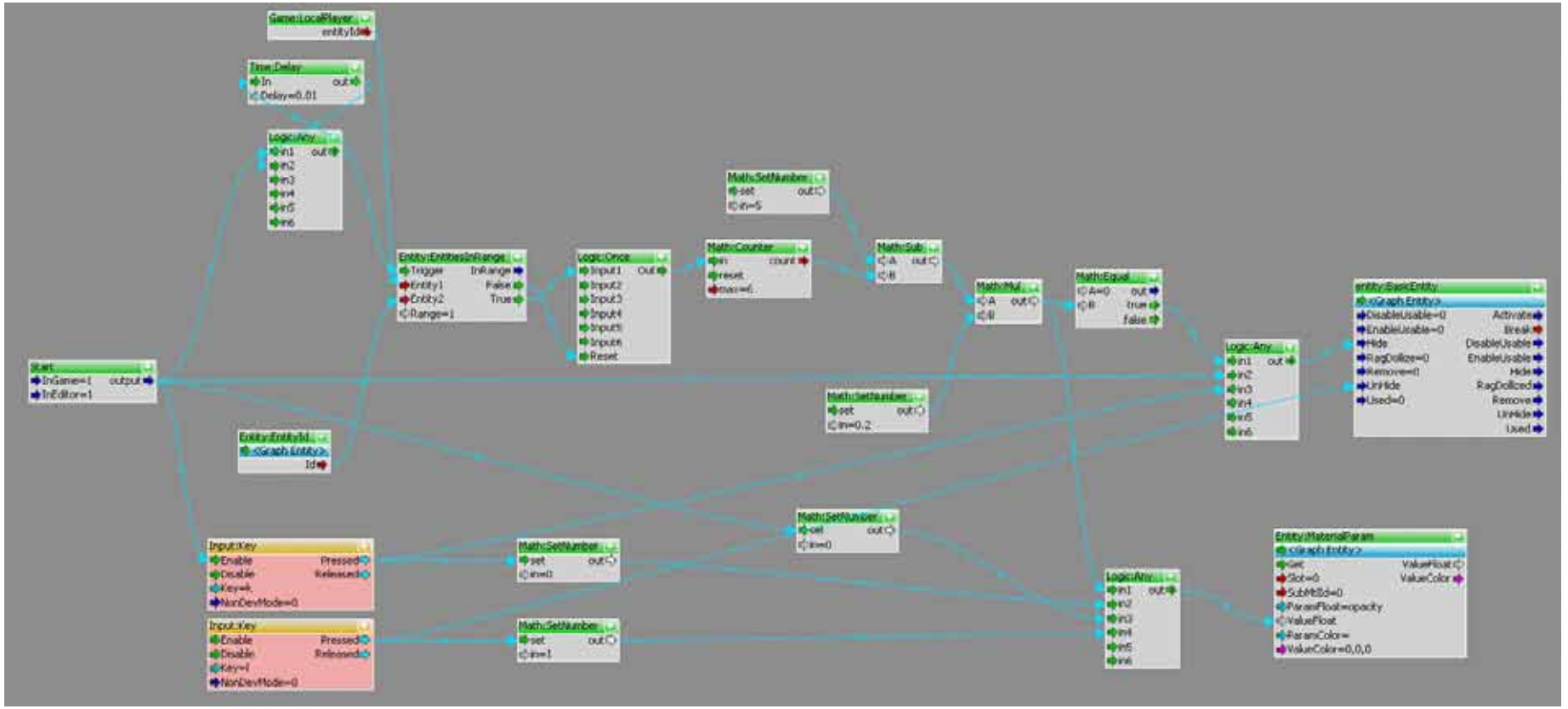
CARVING OUT SPACE

ADDING PERSISTENT TRACES OF MOVEMENT TO THE “SET OF ARCHITECTURAL CLUES IN SIGHT”.



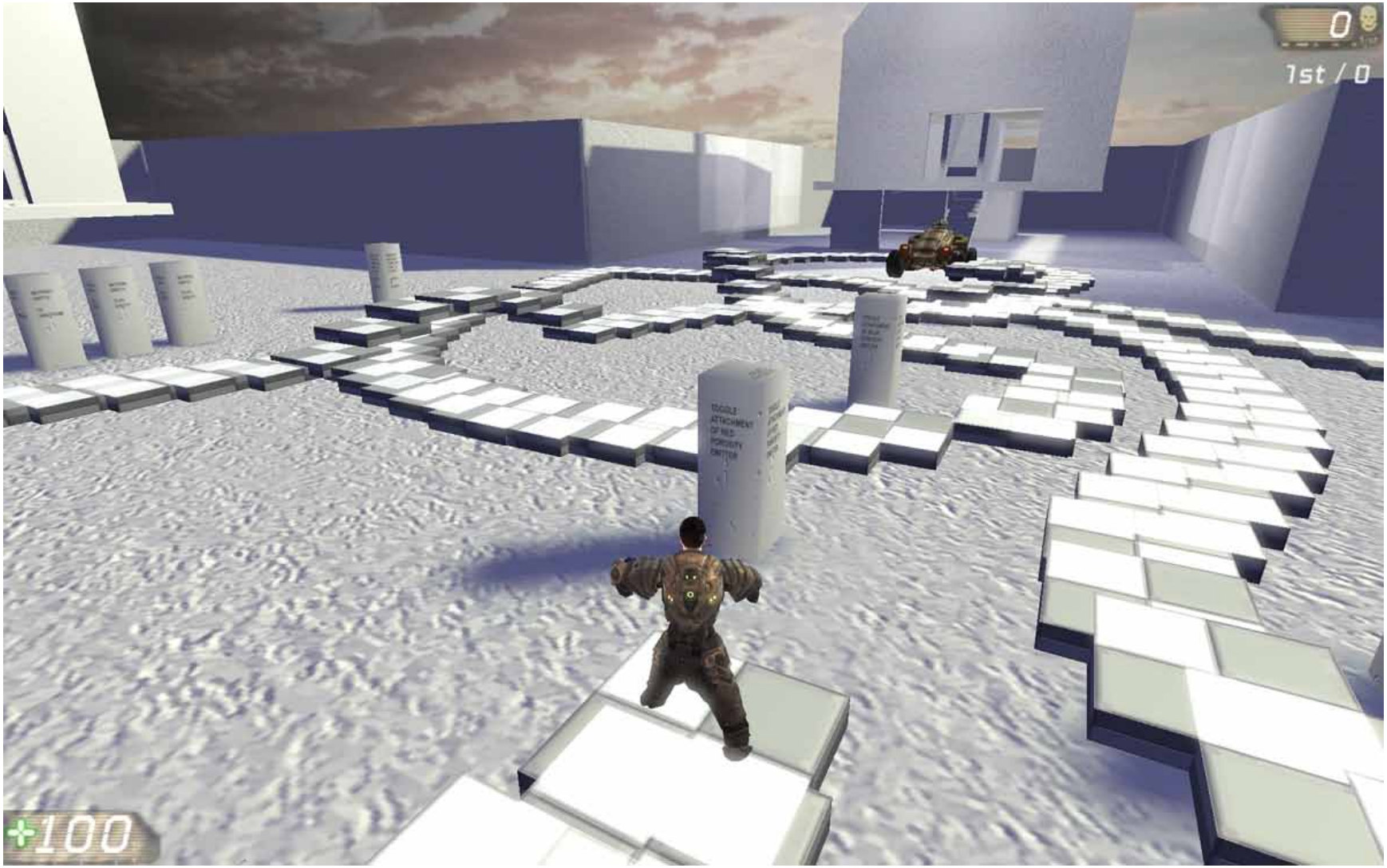
UNREAL KISMET: MATERIAL OPACITY

VISUAL SCRIPTING LIKE THE FLOWGRAPH IN CRYSIS AND CRYSIS WARS.



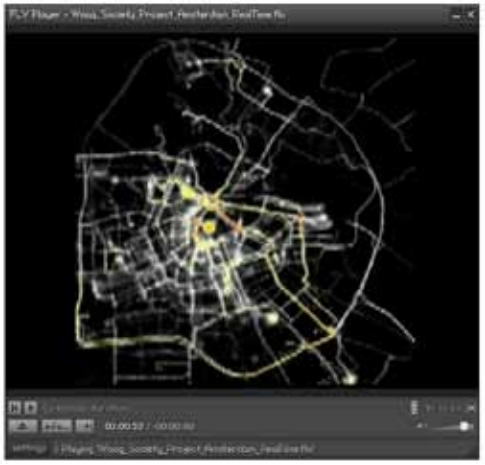
FLOWGRAPH: MATERIAL OPACITY

VISUAL SCRIPTING FOR CRYSIS AND CRYSIS WARS.



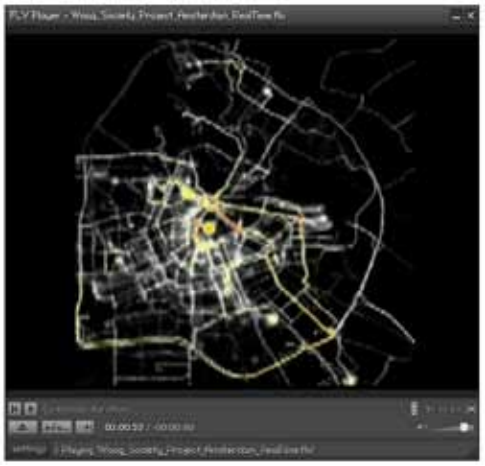
MAPPING + CREATING THE WORLD

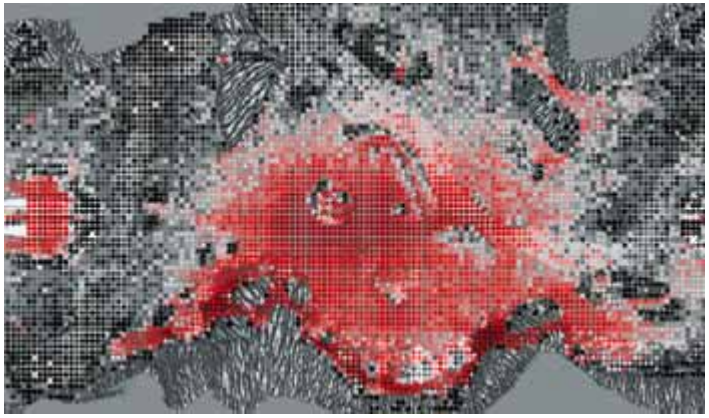
SIMULTANEOUSLY.

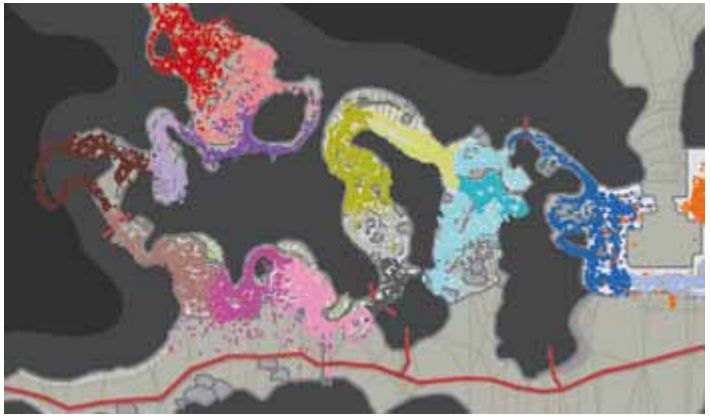


REPRESENTATION

WHAT SHOULD THE POROSITY LENSES LOOK LIKE?







REPRESENTATION

WHAT SHOULD THE POROSITY LENSES LOOK LIKE? BUNGIE STUDIOS AND MICROSOFT.

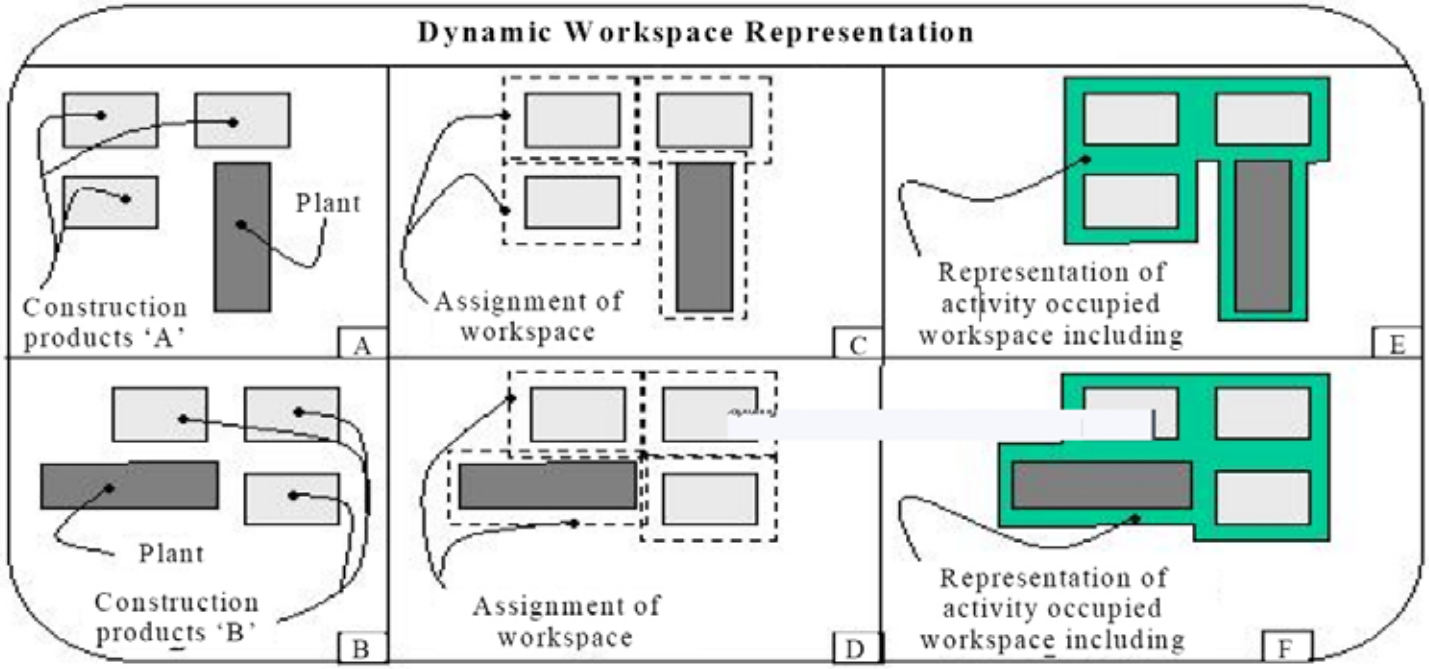


Figure 8. Representation of dynamic workspace configuration utilising the 3D *AE* concep

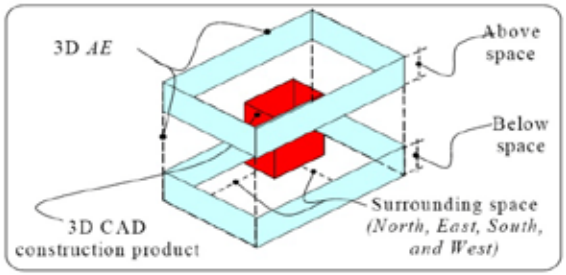


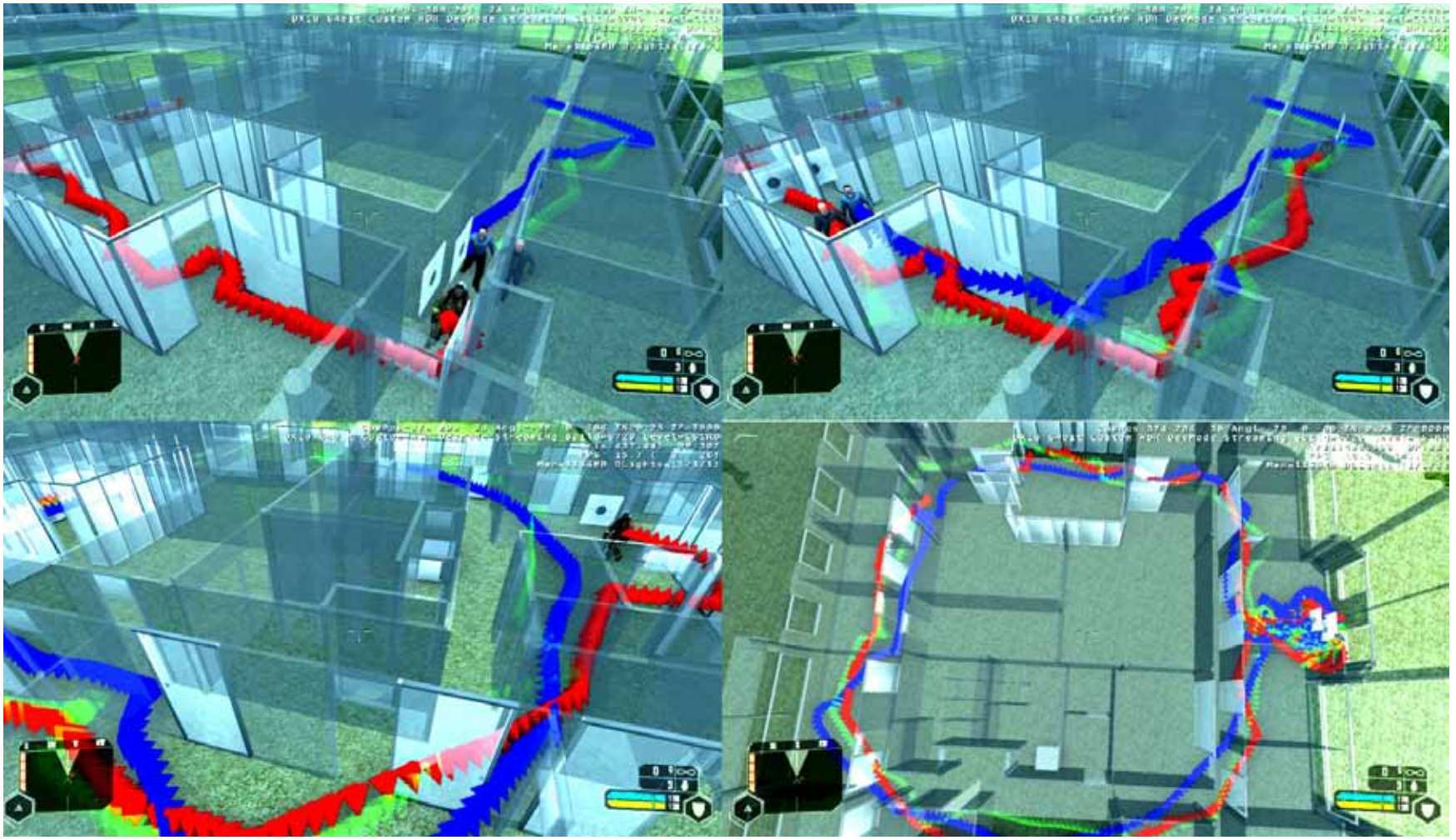
Figure 7. The three workspaces properties associated with the 3D *AE* around a construction product.

REPRESENTATION

WHAT SHOULD THE POROSITY LENSES LOOK LIKE? MALLASI (2004)

AUTOMATING DATA COLLECTION

WITH HELP FROM JACOB SCHWARTS AND NEDIM JACKMAN.



AUTOMATING DATA COLLECTION

WITH HELP FROM THE CSIRO.

CONCLUSION

COULD POROSITY BE REPRESENTED IN REAL TIME? YES.

CONCLUSION

WHAT SHOULD THAT REPRESENTATION LOOK LIKE? PROBABLY A HYBRID OF ADDITIVE AND SUBTRACTIVE METHODS.

CONCLUSION

CAN THE COMBINATION OF COMPUTER GAMING TECHNOLOGY AND ENVIRONMENTAL SENSORS AUTOMATE THE REPRESENTATION OF POROSITY? YES.

DEMO: FLOWGRAPH

QUESTIONS?