

Keynote presentation

CAAD Complements: Art and Science, Real and Virtual.

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This is a personal reflection on the nature of CAAD, current trends and thoughts on where we appear to be heading with this (literally) most intangible of disciplines.

Keyword: *eCAADe*

From where

Back in the last century, 1986 to be precise, I attended my first eCAADe Conference in Rome. From both a personal and an educational point of view, presenting a paper at that conference (Brown, 1986) remains as a valued memory to me. The cocktail made from a significant European city with a particular architecture and culture mixed with groups of enthusiastic educators and researchers with interests along a range of strands in the CAAD field, was for me, very potent.

I am not sure how Professor Carrara and his team in Rome decided on an order of presentation but as a raw academic I was first on stage. And what an impressive stage it was. The room (as all the rooms around where we were in the La Sapienza University) was painted with original Roman artwork. Technicians were nailing an array of cables to these walls with a kind of casual air that would have amazed archaeologists from every other country represented at the conference.

So, in that environment, and with an expectant audience, I opened with a talk about our work with the 3D modeler CATIA. Liverpool University had links with the aerospace industry so had invested heavily in a small suite of machines to run CATIA for engineering modeling. I had managed to get us time on the CATIA system to do architectural modeling: so a group of three graduate students worked with me to model buildings on the University campus. That modeling took in the School of Architecture (figure 1) and neighbouring buildings.

I guess that Frank Gehry or one of his close colleagues must have been sitting in the audience since the Gehry practice adopted CATIA as their

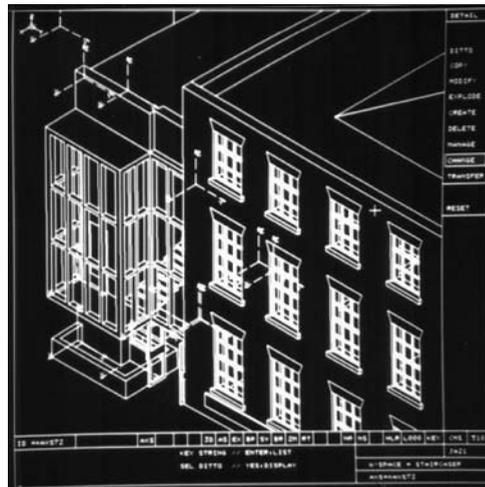


Figure 1. CATIA model of the Liverpool School of Architecture (as modeled in 1986).

modeler for the complex 3D forms that the practice is so well known for. I am willing to admit that there may be other explanations as to how Gehry's practice came to be a CATIA user, but this is the one that I prefer. Whatever, that tenuous link brings me to a first point.

One of the phenomena that is prevalent at the moment is the increasing appearance of the doubly curved (or similarly complex) element and surface in architectural CAAD models (such as those in figures 3,4 and 5). The forms are very seductive and one of my concerns is that students of architecture get drawn in by that seduction and lose sight of the technological constraints that should be balanced with the exploration of form. In discovering this new art form they forget the science; and lose track of the fact that architecture is richer if it addresses both art and science with equal respect.

In this respect the 'Fred and Ginger' building (figure 2) by Gehry (the National Netherlands Administrative Building, Prague, 1992-1996 by Frank O. Gehry, Vlado Milunic) is often quoted in a worrying way. It is sometimes used as an example that is seen to legitimize the use of computers to create complex doubly curved forms simply because it exists and because computer modeling played an important role in its creation.

Art and Science

What is reassuring that the interaction between certain designers who are dealing with complex forms is responsive to practical issues and to tech-

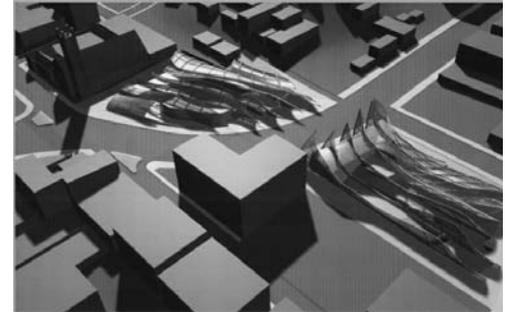
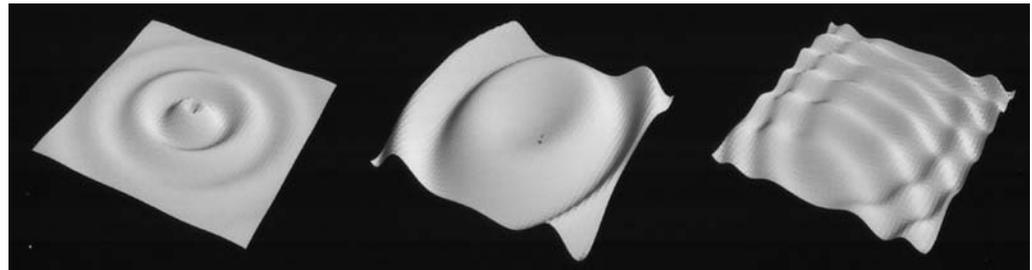


Figure 2. 'Fred and Ginger':
Frank Gehry

Figure 3. 'videofield, Inst.
For Video art, Hollywood'
by Wang (Liu, 2001¹)

Figure 4. 'Aegis Hypo-
Surface' by dECOi
Architects (Liu, 2001¹)



nological performance; to the science counterpart. Examples include the work of dECOi architects (figure 4) working with Mark Burry, who is well known for his modeling work on Sagrada Familia in Barcelona.

It was enlightening, at the recent CAADRIA Conference to see the complex and sophisticated forms being generated by Hani Rashid and Lise Anne Couture in their architecture (Rashid and Couture, 2002), and to note their response to questions. Although their architecture takes advantage of CAAD tools to generate non-linear forms they confirmed, quite clearly, that these forms were generated within a prescribed technical framework. Sloes and curves were not simply fanciful. They were generated within prescribed boundaries and with set preconditions.

There are a number of researchers who have been active in promoting the interaction of design and technology (or art and science) in CAAD research. One particular example is Tom Maver who has maintained a clear stance on this (Maver 1988, 1997, 1999) and has actively supported the symbiotic relationship between creativity and technological performance in (Computer Aided) architectural design. I retain a particular personal interest in the work of architects and engineers such as Peter Rice, Prouvé, Tony Hunt, Frei Otto and Felix Candella (to name a few) who bring art and science together so effectively. In particular Rice and Hunt have used computational techniques to augment architectural intention in a way that is laudible, for instance, with Hunt at Waterloo Station in London, and Rice at La Defense (Nuages) in Paris. For Les Nuages Rice was able to maximize structural performance, minimize costs using techniques such as parametric variation, and thereby accomplish the architect's (Spreckelsen) intent efficiently and effectively.

So, I think that the lesson is to remain reflective and to avoid being seduced by 3D modelers are now capable of. We need to see the computer as an increasingly capable interactive counterpart to the design process. In other words, it is still a 'tool for design', just a better one than it used to be; and one with potential that continues to develop. In an educational and a research context we need to be cre-

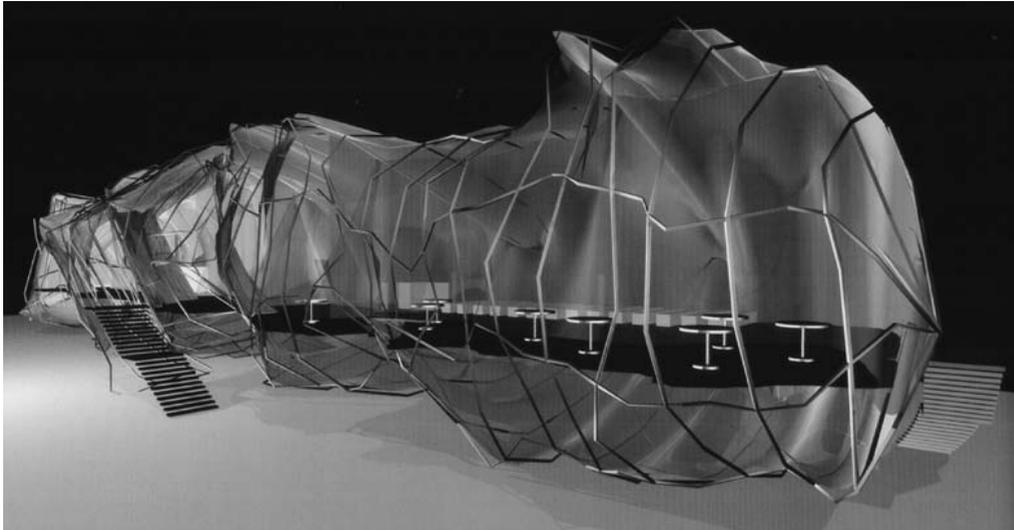


Figure 5. 'Digital Trilogy' by Eloueini and Parmentier (Liu, 2001¹)

ative and innovative wherever possible, but to be mindful of the pitfalls in an educational context.

Ten years ago I was at a Cambridge University seminar (that produced a book edited by Francois Penz) where we concluded with an interesting session on where we might be with CAAD in the future. Paul Richens (1992) put his neck on the block and has a prediction for 2002 that it is interesting to read, but too long to paraphrase here. No one predicted the Internet I have to say. But Bill Mitchell (1992) tried looking in his low-resolution crystal ball and saw a mixture of good and bad for the future of CAAD. On the good side he rightly foresaw 'the disparity between the rapidly evolving technical capabilities of CAD systems and the more slowly

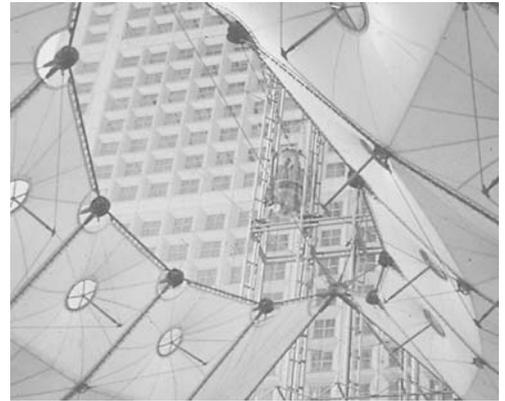


Figure 6. *Les Nuages at La Defense in Paris: Peter Rice and others using computational techniques to marry architectural intent, technology and form.*

changing cultural frameworks that we use to comprehend and apply these capabilities'. On the negative side he thought, amongst other things, that '...teachers of design who do not see any reason to doubt that the way they were taught is the way that their students should be taught'.

My experience is that he is not far wrong on that one. Perhaps it was a reasonably straightforward one to predict, but it is pleasing to see that there researchers in CAAD (such as Vasquez de Velasco and others) who are pushing at the conventions in a creative and productive way. We need more of this and organizations like eCAADe can foster such activity.

Will History repeat itself?

Since the 1960s the focus of research in Computer Aided Architectural Design has, broadly speaking, oscillated between two major themes. These two themes can be characterised as, first, regarding the computer as an *Intelligent System*, and second regarding the computer as a *Design Tool*. The focus on computers as intelligent agents in the design process was strong in the 60s and 80s. The focus on the computer as a design tool was strong in the 70s and 90s. For those looking at the computer as an Intelligent system, the concept is the computability of design, whereas for those looking at the computer as a Design Tool, it is the pragmatic view of the usability of the computer that drives the investigations.

Interest in the computer as an Intelligent System has led to work on knowledge based systems, Expert Systems and Case based Reasoning. The counterpoint, regarding the computer as a design tool has led to examination of the potential of drafting, modelling, animation, distributed communication systems and multi-media applications. If history repeats itself we are due to come out of a period where the computer as Design Tool dominates our interest into a period where attention on the potential for the computer to provide an Intelligent System to support design will gain more attention. It will be interesting to see if the pendulum does swing the way of Intelligent systems in the first five to seven years of the century.

The argument presented above is perhaps contentious. Is it that design tools are now being augmented with intelligent capability? Are the distributed information systems offered via the Internet starting to marry the two themes (intelligence and tools) together?

End Point

I stated at the outset of this piece that in 1986 I found attending an eCAADe Conference to be a potent and formative activity. I still do. Obviously this could be seen as patting oneself (or ourselves) on the back, but I genuinely believe that our activities, solely and collaboratively, do make a difference. Equally I believe that organizations like eCAADe (and its counterparts around the world) that cross political, social and cultural boundaries enhance the worth and productiveness of such activity. This is surely something to nurture.

Through our research, through our national and international collaborations and through applying our research in an educational context, members of our organizations have the opportunity to continue to influence and shape the future of architectural design in a positive way. We must maintain an optimistic presence in what can often be a pessimistic world. We will be more effective in doing that through an interconnected and well-informed set of frameworks. One of those frameworks if offered by eCAADe, and that is why I made it the single keyword of this contribution to the ongoing debate.

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Acknowledgements

1. These images are taken from Liu, Yu-Tung: 2001, Defining Digital Architecture, Birkhauser. Thanks to the editor and publisher.
2. Some of these references were downloaded from the CUMINCAD database (www.ecaade.org). Thanks to Bob Martens and Ziga Turk.