The Early Concepts of CAAD

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ABSTRACT

It is a short 5 decades since the earliest concepts that laid the foundations for the current multimillion CAAD industry. This contribution recounts the early concepts and suggests that they are as relevant today as they were then–transforming the way we design, manage, re–create and use our built environment.

Keywords:
Design methods, virtual prototype, cost/performance, appraisal.

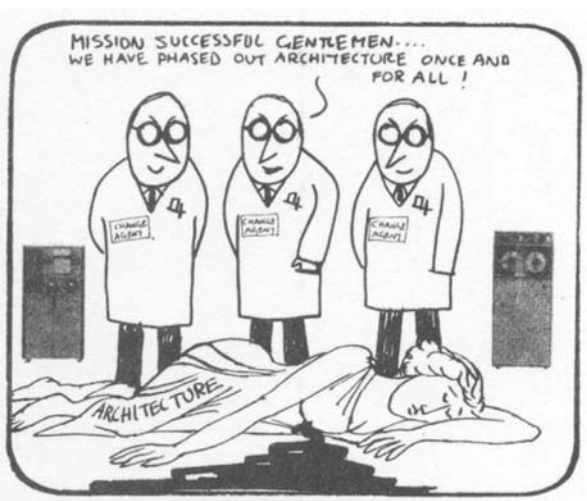
INTRODUCTION

In October 2015, the ACADIA conference was held in Cincinnati, Ohio. Some one hundred plus mostly young people heavily committed to CAAD, attended. Prof Robert Ash presided over a panel discussion 'Pioneers of Design Computation'. It featured Don Greenburg – arguably the father of computer graphics, Chuck East– man – arguably the father of BIM; and the current author – Tom Maver, who in the 1960's told the story of the early days, based on the research group ABACUS – the Architecture and Building Aids Computer Unit, Strathclyde – set up around 1969 in the Department of Architecture and Building Science at the University of Strathclyde in Glasgow. The story of the current state of the art is based the R+D of ABACUS and on the highly successful international company – Integrated Environmental Solutions (IES) – a spin–out consultancy from the original research group ABACUS and now employing in excess of 170 professionals in offices on four continents. ABACUS struggled to develop primitive computer software to predict how design decisions – the geometry and construction of the buildings – might impact on their capital cost, their recurring costs, their energy performance (heat, light sound), their efficiency in pedestrian movement, their evacuation in emergency and in every other aspect of their cost and performance.

The Early Days

Inspired by the emergence of the Design Research Society in the UK and the Design Methods Group in the USA, the research group, ABACUS (Directed by the author) in the Department of Architecture at the University of Strathclyde created the notion of the 'virtual prototype' (as opposed to a physical prototype) in which a representation of the building, at a conceptual stage in the design process, was modelled in the computer and was subjected to analysis of its functional and aesthetic characteristics. The difficulties lay in the primitive power and absence of input/output devices of the early mainframe computers〈Figure 1〉.

Not surprisingly, the early crude attempts provoked an aggressive reaction from the architectural profession. Thankfully, a few pioneers persevered and slow, but steady progress was made. In ABACUS, some of the milestones were:



<Figure 1>

The first primitive software to predict the cost/performance consequences of design decisions [Maver,1972].

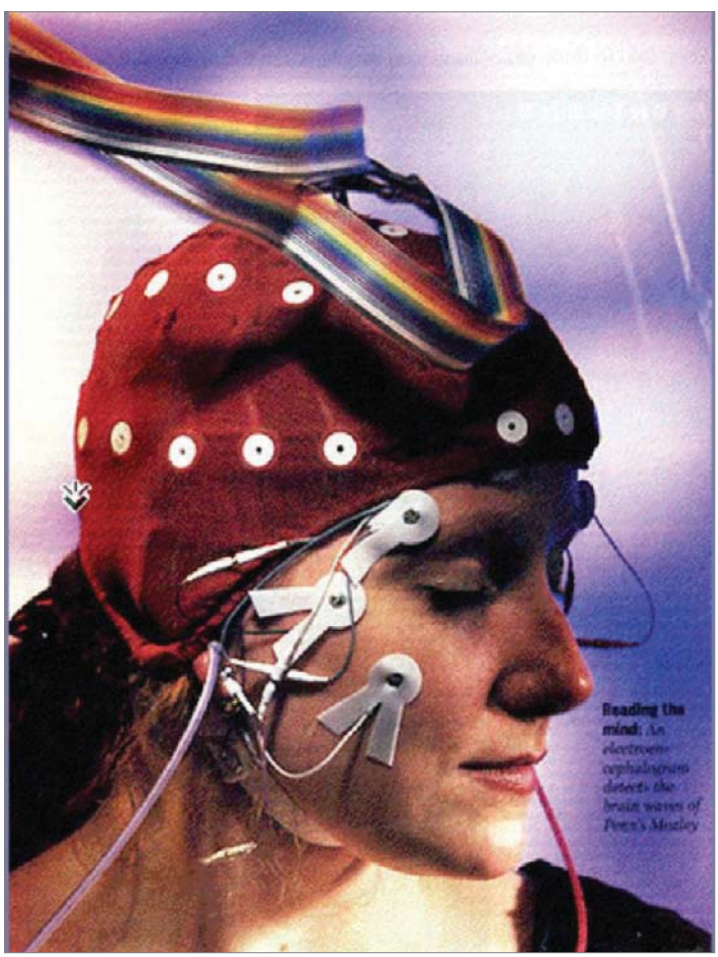
Encoding of the laws of perspective geometry to allow representation of 3D wire-line views of buildings

Introduction of colour graphics to allow the first colour images of buildings

Visual Impact Analysis of constructions in the urban and rural landscape [Maver, 1986].

The advancement in scale from the representation of individual buildings to entire cityscapes [Maver, 1987].

Animation: the change from stop-frame film-based technologies, set up to run all night, to real time dynamic interaction [Maver 1997]



<Figure 2>

The huge increase in the sophistication of the modelling of the dynamic thermo-fluid behaviour of buildings as they respond hourly and annually to weather and climate [Clarke & Maver, 1991].

The application of multimedia software to explain our cultural patrimony [Maver & Petric, 1995].

The evolution of virtual reality and virtual worlds [Conti at all, 2001].

The advent of 'rapid prototyping' and its link to CAD [Petric & Maver, 2003]

Current State of the Art

The current state of the art of computer aided architectural design (CAAD) has been summarised in the document authored by Maver and DiMascio. The areas of application, some well-established and some still emerging, are: Information management and collaborative design

Simulation of environmental performance

Parametric geometries

Space syntax

Generative design

Precedence, prototypes and shape grammars

Digital fabrication, rapid prototyping and laser scanning

User participation in design

Multimedia in heritage and patrimony〈Figure 2〉

Thankfully, a number of international Conferences and Journals (including BIM) covering these and related topics, have come into existence to ensure that our students and young researchers can

build on work already done. One that is worthy highlighting is CumInCAD (http://cumincad.scix.net) an index of around 13,000 abstracts and full papers.

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