AALBORG UNIVERSITY

Building Informatics

Produkt og Procesmodeller (PPM) i byggeriet.
Product and Process models in Construction.

2. BIM tools and Parametric Modeling. Interoperability.

Cand. Scient. Bygningsinformatik.
Semester 1, 2010.

CONTENT

- Cad software history.
- ° Object based Parametric Modelling
- BIM model generating systems.

CAD Software History

CADAZZ

http://www.cadazz.com/

home
CAD software history
CAD software future
free CAD software

Ads by Google

AutoCAD 2009 kompatibel
Billig og effektiv software - ZwCAD Alle har råd til rigtig CAD 2D-3D
www.a-engineering.dk

3D Prototype
Danmarks førende virksomhed inden for fremstilling af prototyper
www.damvig.com

Solid Tech CAD ingeniører
Eksperter i SolidWorks, Inventor & ProE. Fast pris, Timepris, On Site.
www.solidtech.dk

CAD software - history of CAD CAM

1. CAD software history, 1960s

Euclid to SDRC...

CAD software, also referred to as **Computer Aided Design software** and in the past as computer aided drafting software, refers to software programs that assist engineers and designers in a wide variety of industries to design and manufacture physical products ranging from buildings, bridges, roads, aircraft, ships and cars to digital cameras, mobile phones, TVs, clothes and of course computers! CAD software is often referred to as **CAD CAM software** ('CAM' is the acronym for Computer Aided Machining).

While he could never have foreseen today's CAD software, no **CAD software history** would be complete unless it started with the mathematician Euclid of Alexandria, who, in his 350 B.C. treatise on mathematics "***The Elements***" expounded many of the postulates and axioms that are the foundations of the Euclidian geometry upon which today's CAD software systems are built.

It was more than 2,300 years after Euclid that the first true CAD software, a very innovative system (although of course primitive compared to today's CAD software) called "**Sketchpad**" was developed by Ivan Sutherland as part oh his PhD thesis at MIT in the early 1960s. Sketchpad was especially innovative CAD software because the designer interacted with the computer graphically by using a light pen to draw on the computer's monitor. It is a tribute to Ivan Sutherland's ingenuity that even in 2004, when operations which took hours on 1960s computer technology can be executed in less than a millionth of a second and touch-

pages in this section:

1. CAD software history, 1960s
2. CAD software history, 1970s
3. CAD software history, 1980-1985
4. CAD software

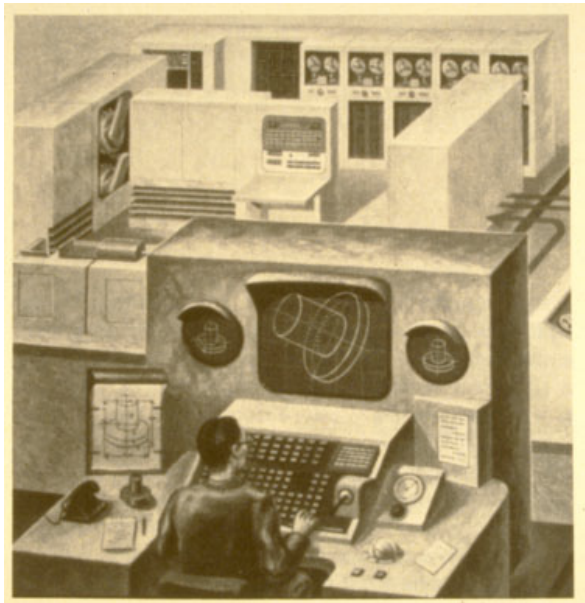


Figure 1. A CAD workstation as visualized by a *Fortune* magazine artist in 1956.

There are some CAD software history on the Web. M.Bozdoc 1955-2000 history at http://mbinfo.mbdesign.net/CAD1960.htm and http://www.cadazz.com/.

CAD Software History

- Sketchpad (1960)
- McDonnell-Douglas (CADD released in 1966),
- Lockheed (CADAM released in 1967) Avions Marcel Dassault, purchased a source-code license of CADAM from Lockheed and in 1977 and began developing a 3D CAD software program named CATIA (IBM resell 1981)
- Computervision 1969
- Bezier (at Renault) late 1960 research
- 1972 first 3D solid modelling system (Synthavision from MAGI)
- Low cost workstations. Apollo Computer started the trend in 1980, then Sun Microsystems in 1981 and Silicon Graphics in 1982. VAX minicomputers from DEC very popular.
- 1981 IBM PC. 1982 AutoCad
- 1984 Bentley was founded and released MicroStation, a PC implementation of Intergraph's IGDS CAD software.
- Parametric Technology Corporation (PTC) releases 1988 a succesful parametric 3D cad modelling system Pro/ENGINEER (on Unix)
- 1995 SolidWorks (on Windows)
- 1987 Graphisoft releases Archicad on Mac (on Windows 1993)
- April 2002 Autodesk buys Revit Technology Corporation for 133 million US dollars

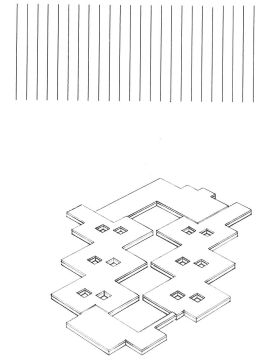
CAD Software History, BDS

BDS by Applied Research of Cambridge

BDS is an integrated set of computer programs which records, organises, analyses and reproduces the information associated with and generated during the design of a building.

BDS helps designers produce better buildings

BDS provides fast, detailed feedback on the performance, cost and appearance of any projected building. Alternative designs can readily be refined, revised or completely re-shaped and each new version rapidly evaluated to facilitate choice of the best scheme.

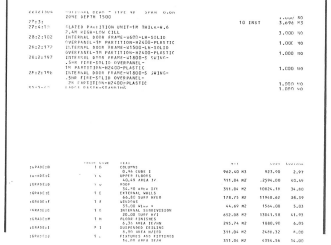


BDS saves time and advances start on site

The routine and time-consuming procedures attached to design - drawing, scheduling, calculations, etc. - can be completed automatically by BDS as the design proceeds. Thus production documentation of the final design is generated very quickly.

BDS provides better costings

From sketch design onwards, BDS measures the building automatically, giving more reliable estimates of capital commitment and costs in use.



BDS makes coordination of the design process easy

Drawings, schedules and information produced by BDS automatically incorporate all design decisions made to date by all members of the design team. BDS also checks for incompatible decisions, in particular spatial clashing of elements. The resulting consistency of documentation can prevent expensive mistakes.

BDS produces highest quality drawings

Drawings produced by BDS include plans, elevations, sections and other arrangement drawings with any selection of elements. Annotation includes automatic dimensioning.

BDS gives fast access to relevant building information

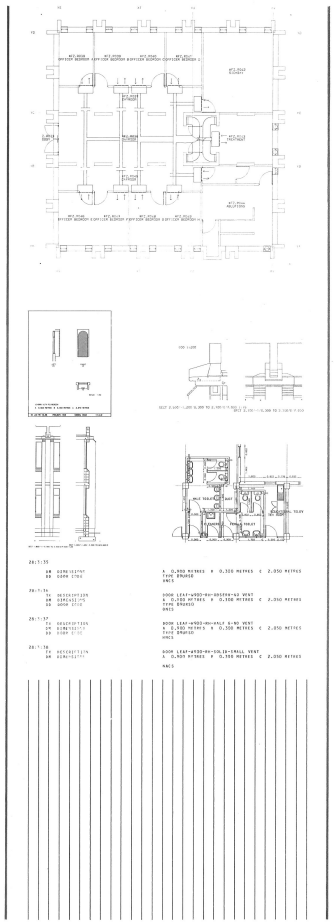
BDS has the capacity to store large amounts of data covering locatable building elements and other components, room equipment, costs, performance specifications, etc., for use when it does an evaluation and for quick retrieval by the design team.

BDS is extensible and can be tailored to your needs

BDS has been designed with enhancement in mind. It provides a firm basis for the development of new analytical tools and the automation of specific design detailing tasks. In addition it can handle a building project of any size and can be extended to hold almost unlimited amounts of building information.

BDS means:

Greater productivity for the designer
Better estimates all round
More reliable instructions to the contractors
A better building for the client



Building Design System (BDS), Appied Reserch of Cambridge. (1978-). ARC formed 1970

CAD Sweden 1982

4. NULÄGET

4.1 CAD-installationer.

Nedan är flertalet av de i dift varande CAD-installationerna upp-räknade (sammanställningen är hämtad från Konsulttidningen nr 4 1982).

Förutom de angivna installationerna skall här nämnas

Myresjö Hus AB	Medusa	Prime
ABV	Medusa	Prime
Riksbyggen	GDS	VAX
SCG	Medusa	Prime

samt följande servicebyråer som erbjuder tillgång till CAD-mjukvara (ytterliggare är att vänta)

-UMDAC, Umeå datacentral (med filial i Luleå)	CD2000	CDC
-Mora teknikcentrum	CD2000	CDC
-IUC,Industriellt utveck-lingscentrum, Skellefteå	Medusa	Prime
-LDC, Lunds Datacentral	Medusa	VAX

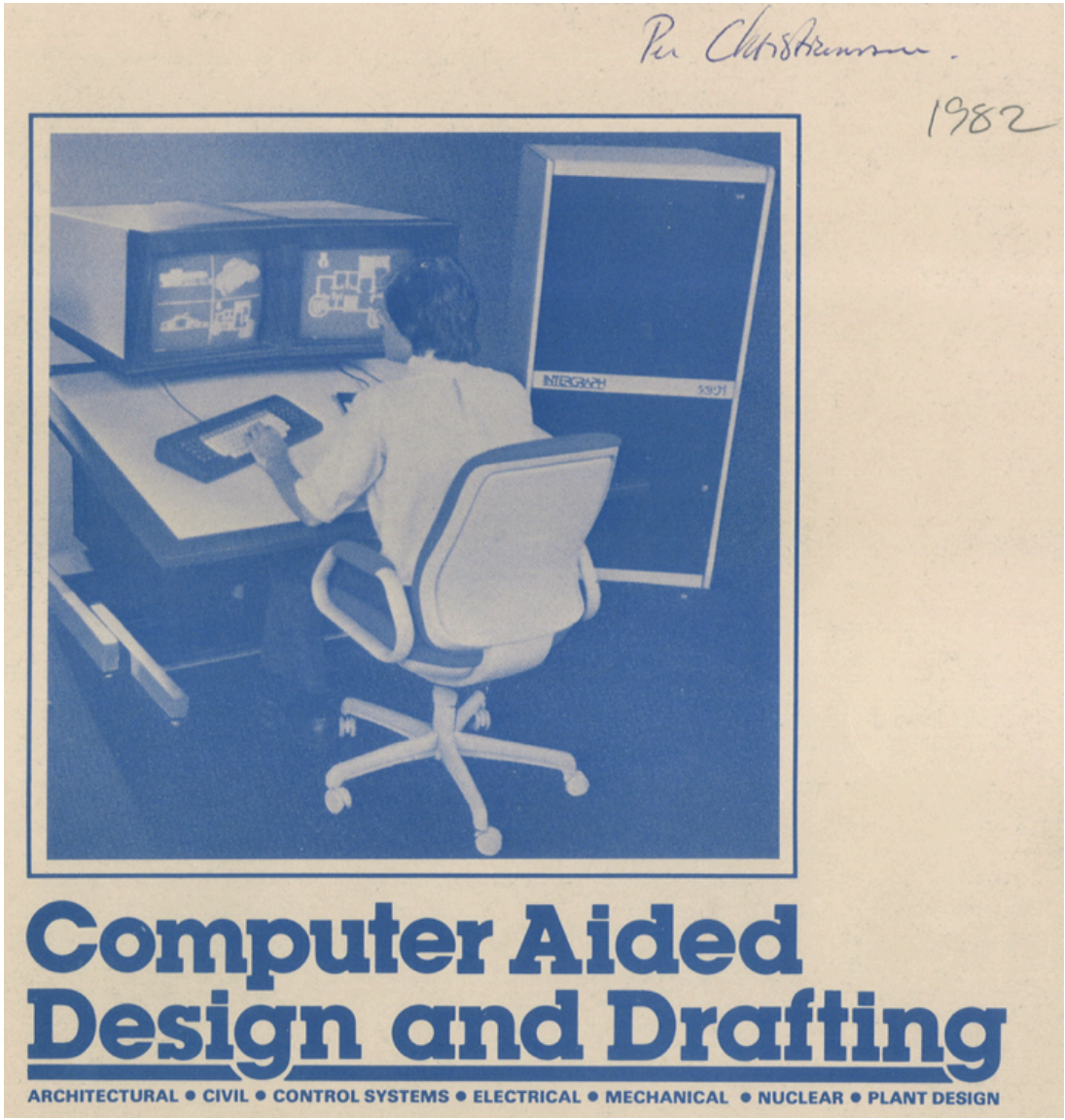
Cad installations in Sweden from Christiansson P et.al., 19xx, “Datorstödd projekering. CAD i tillämpning”. G13:1983. Byggforskningsrådet, Sverige (59 pp.)

Konsultbranschen och CAD-utvecklingen

Företag	Antal anställda	CAD-system/dator/kapacitet			Antal installerade arbetsstationer (okt. -82)
VBB	1300	Intergraph (USA)	DEC PDP 11/70 primärminne 1 Mb yttre minne 2 × 300 Mb		5 st ytterligare 3 är beställda
Utrustningen används främst (hittills) på integrerade samhällsprojekt utomlands. På VBBs utrustning har också Bergman&Co utbildat personal och använt CAD-systemet i egna uppdrag. Även Theorells har utbildat personal. Den senast installerade utrustningen kommunicerar med datorn via telenätet. VBB planerar ytterligare en kraftfull utbyggnad bl a för Malmökontoret.					
Tyrens FFNS (arkitekt) Samarbetar via NordCAD	325 250	GDS (England)	Prime 550 1,5 Mb 380 Mb	Prime 750 1 Mb 380 Mb	4
En station är för produktion installerad hos vardera Tyrens och FFNS och två, delvis för utbildning och utveckling hos Nord CAD. Tyréns har haft systemet i produktion i ett femtontal uppdrag, varav 3 à 4 tillsammans med FFNS.					
Tekn. dr. Arne Johnson Ingenjörsbyrå	120	Medusa (England)	Prime 850 2 Mb 2 × 300 Mb		3
Företaget är ett av de hårdast satsande. Företaget har utbildat personal från arkitektfirman Höjer-Ljungqvist och samarbetar med entreprenadföretagen SCG och SIAB vid utveckling av Medusa-system hos dessa.					
J & W	950	Berit II	DEC Vax 11/780 1 Mb 3 × 174 Mb		3
J&W var på 70-talet pionjär med "ritsystemet" Berit (I), som företaget tillsammans med HSB utvecklade från ett franskt system Med detta som bas har J&W utvecklat det interaktiva systemet Berit II.					
DAPAB Elpagruppen H Hedlund & Co INPROJ KLT Konsult Rejlers Ing. Byrå Wahlinggruppen	1200	Medusa (England)	Prime 750 2 Mb 380 Mb		6
En strategisk och kraftfull satsning av sex el- och VVS-konsultföretag. Andra programutvecklare har bla härigenom anledning att på allvar beakta konstruktörers och arkitekters samarbete med installationssidan. DAPAB svarar för ägarföretagens utbildning och programutveckling samt utför uppdrag åt ägarna, men också åt konsultföretag utanför ägarkretsen.					
White Arkitekter	250	Rucaps (England)	Prime 250/2 0,5 Mb 80 Mb		2
Hittills enda göteborgsföretaget som satsat på CAD. Systemet har använts i 3—4 svenska uppdrag.					
Viak	750	DIGIKART (egen utv.)	HP 1000 0,5 Mb 85 Mb		5 varav 1 kopplad till stereo-instrument
Viaks egen utveckling började för ca 5 år sedan. Idag har man i produktion ett interaktivt system för kartframställning och system för ytterligare två specialområden på gång.					
Allmänna Ingenjörsbyrån	500	Computer-vision (USA)	CGP 200X 0,5 Mb 2 × 80 Mb		2
AIB har en arbetsstation med färgskärm för elektronikutveckling (produktion). Vid den andra sker systemutveckling och utbildning, varvid idag prioriteras mekaniksektorn. Utveckling på mark- och konstruktionsområdet följer senare.					
LEB VVS Teknik AB	110	Egen utveckling	Prime 350 0,4 Mb 96 Mb		1
Företaget har utvecklat ett eget ritsystem och överväger att koppla detta till likaledes egna beräkningssystem.					

CAD USA 1982

Bechtel was an early user of advanced 3D Cad systems for their plant system



CAD USA 1982

"The geometric modeling realtional database system ARCH:MODEL is presented as an operating system: it has a command monitor, editors, specialized analysis subsystems, and a large library of FORTRAN callable subroutines."

"The ARCH-MODEL system is a generalized software environment in which a variety of context dependent models can be built."

ARCH:MODEL

Version 1.3

GEOMETRIC MODELING RELATIONAL DATABASE SYSTEM

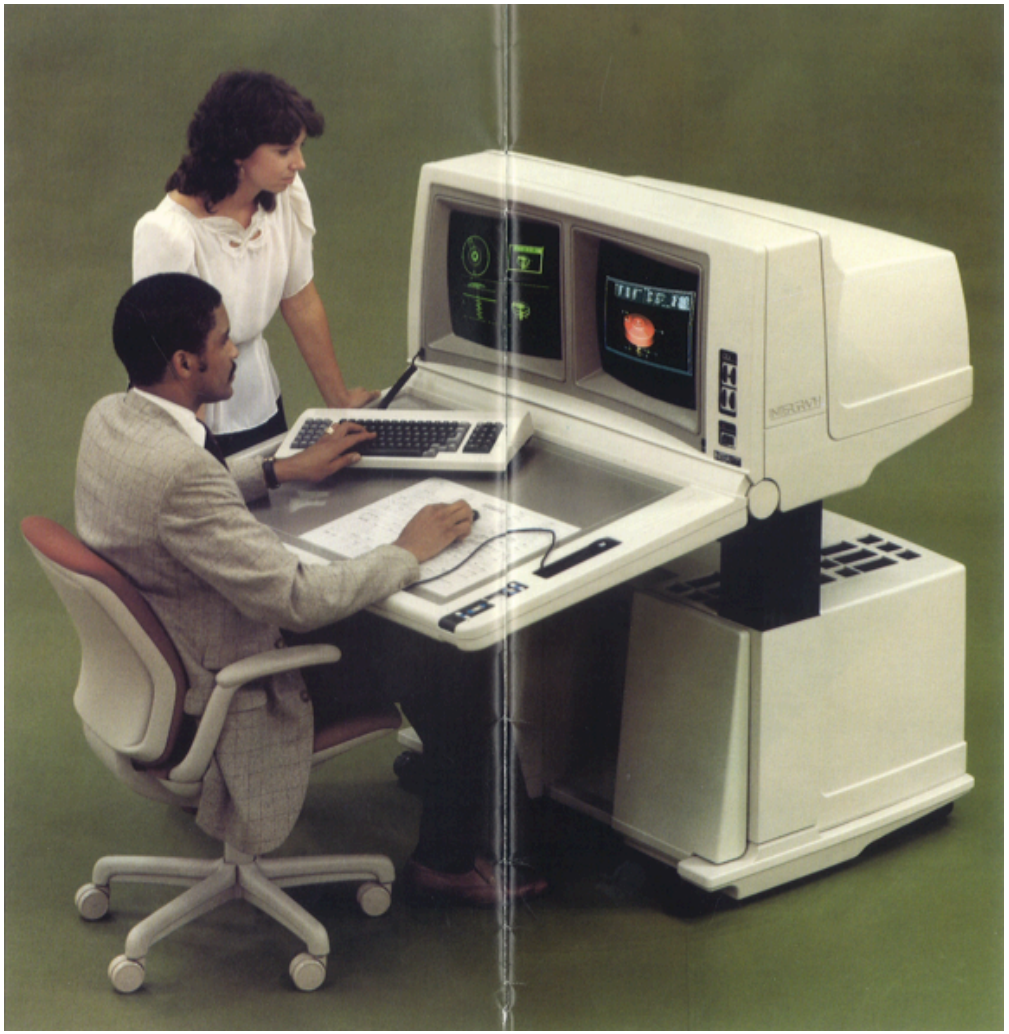
Harold J. Borkin, Project Director
John F. McIntosh, Relational Database
Patricia G. McIntosh, Geometric Modeling
James A. Turner, Geometric Operations

Architectural Research Laboratory
College of Architecture and Urban Planning
The University of Michigan
Ann Arbor, Michigan 48109

(151 pages)

CAD USA 1982

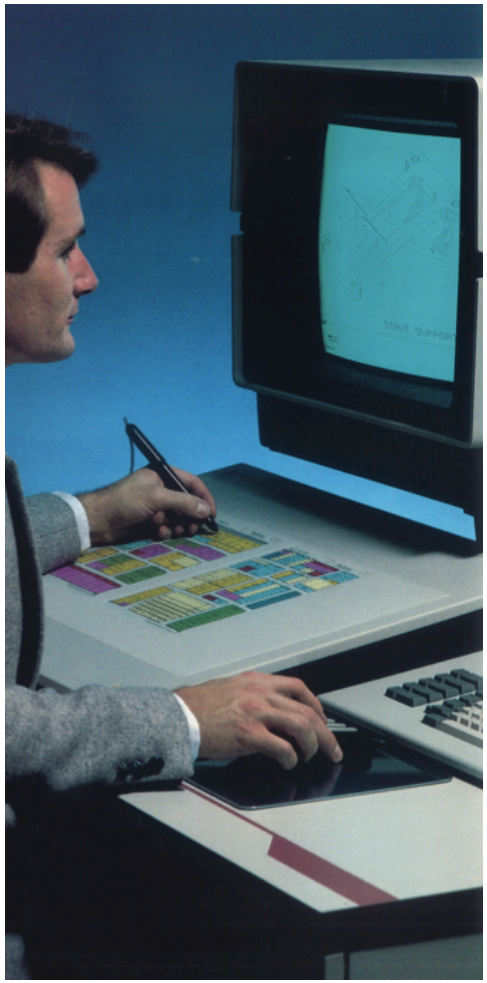
"Intergraph Corporation manufactures interactive computer graphics systems to meet the needs of a broad spectrum of engineering and mapping applications. Since its founding in Huntsville, Alabama, in 1969, Intergraph has has proress rapidly to become one ogf he leading suppliers of turnkey systems"



The MEDUSA system

Cambridge Interactive System (CIS) 1977-1980. Partner with Prime Computer, USA, 1980. Computervision bought CIS in 1983. Two versions after that (1) CIS MEDUSA on Prime and Vax computers) and (2) Prime Medusa (on Prime computers).

See also http://en.wikipedia.org/wiki/MEDUSA



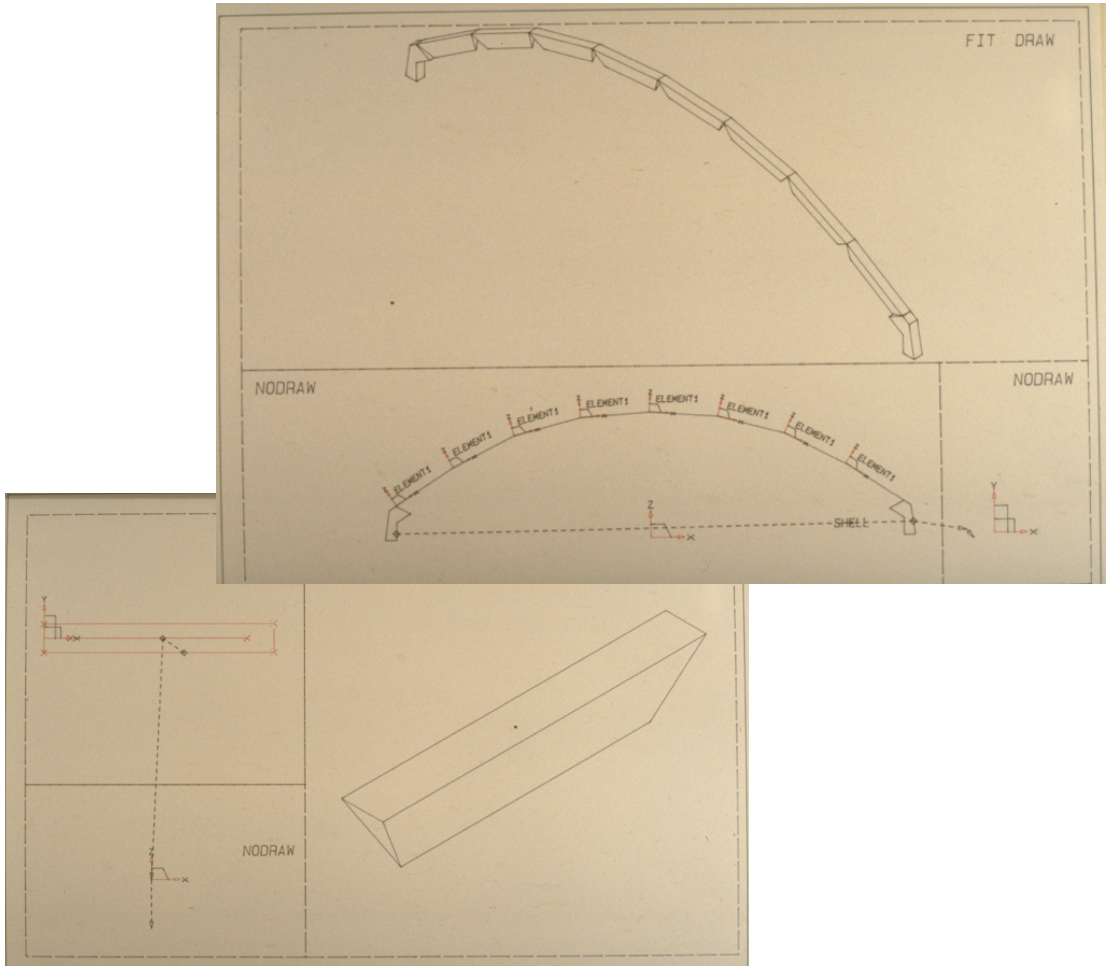
Så här arbetar du med MEDUSA:

När vi har utformat arbetsplatsen har vi tagit stor hänsyn till såväl ergonomiska frågor som till operatörens bekvämlighet.
MEDUSA styrs med s k menyteknik vilket erfarenhetsmässigt är det smidigaste och säkraste sättet att arbeta på. Instruktionsmenyn har en unik färgkodning som är mycket lätt att lära sig. Bildskärmen har hög upplösning vilket bidrar till tydlighet och mindre ansträngning för synen, vilket är viktigt. När vi har utvecklat Medusa har vi noga sett till att systemet inte lägger onödiga begränsningar på användarens sätt att arbeta. Kommunikationen med systemet är logiskt och enkel att förstå. Detta har också visat sig i praktiken då operatörerna redan efter några få dagars utbildning har kunnat utnyttja systemets alla möjligheter utan några som helst problem.
I utrustningen ingår en separat textskärm för hjälptexter, frågor mm. Ett separat digitaliseringsbord för ritningsinmatning kan också erhållas. Det är enkelt att hantera olika menyer liksom det är enkelt att vid behov skapa nya.

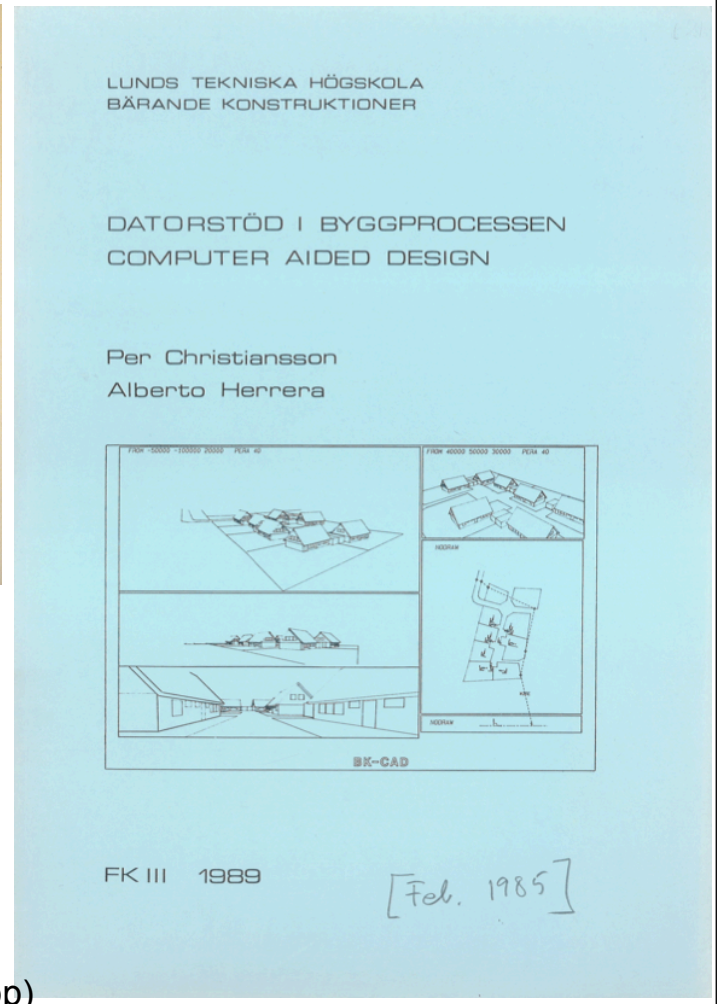
CAD Software History

Cad WS 1982. Lund University

The MEDUSA system. Lund University 1982- 1/2



Medusa modelling techniques.


LUNDS TEKNISKA HÖGSKOLA
BÄRANDE KONSTRUKTIONER

DATORSTÖD I BYGGPROCESSEN
COMPUTER AIDED DESIGN

Per Christiansson
Alberto Herrera

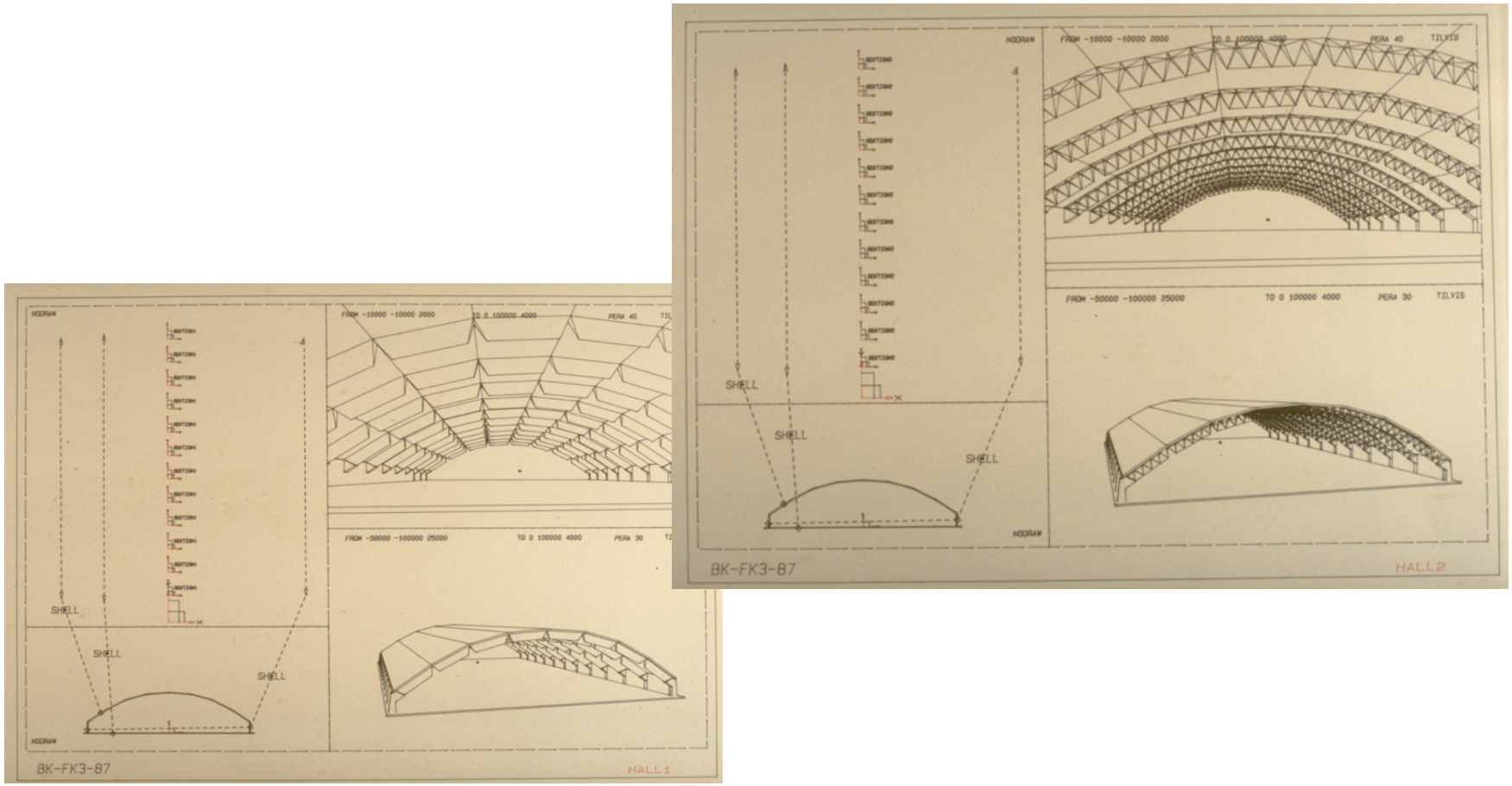
BK-CAD

FK III 1989

[Feb. 1985]

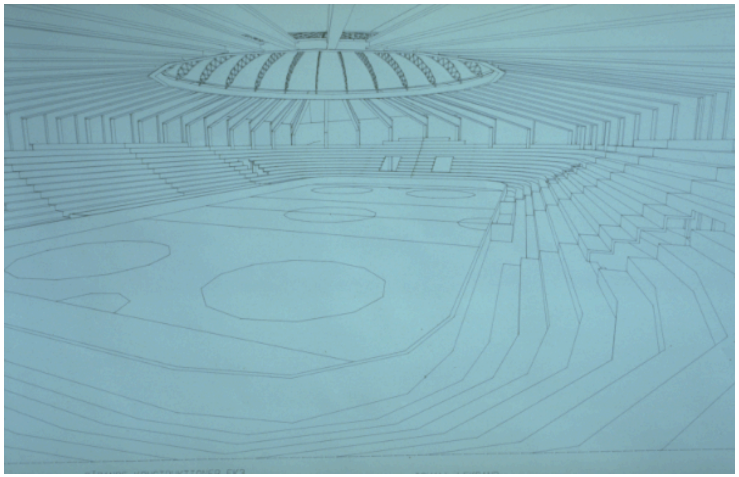
See also (190 pp)

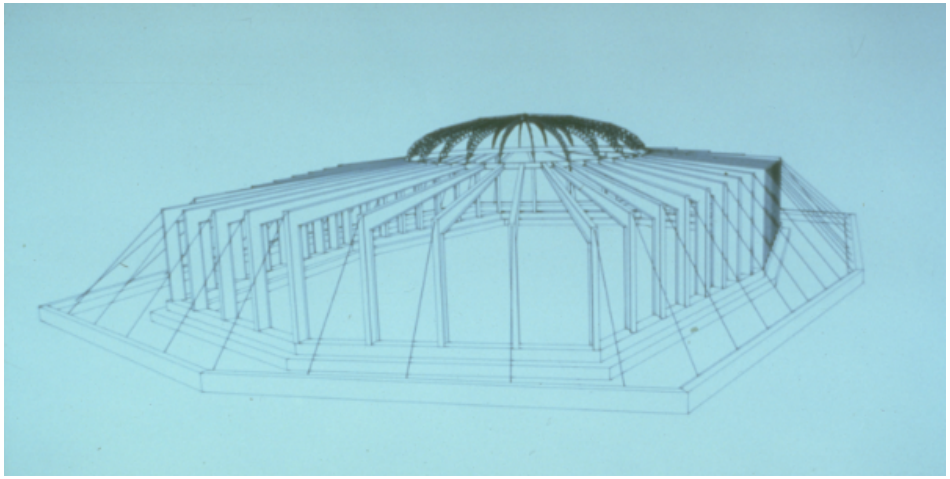
The MEDUSA system. Lund University 1982- 2/2

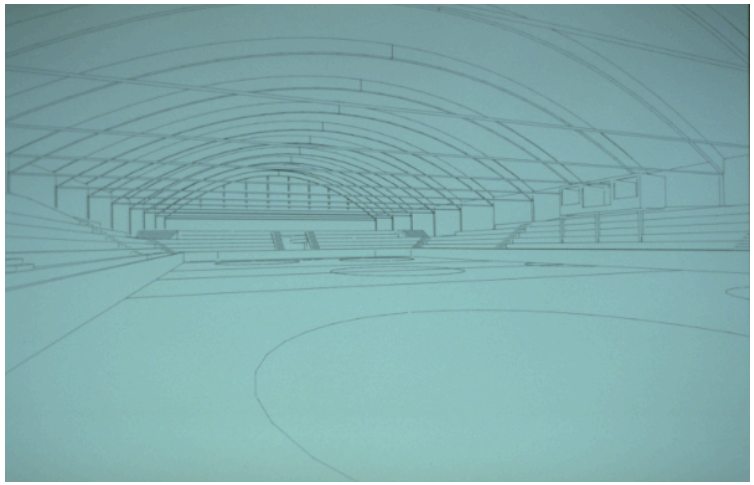


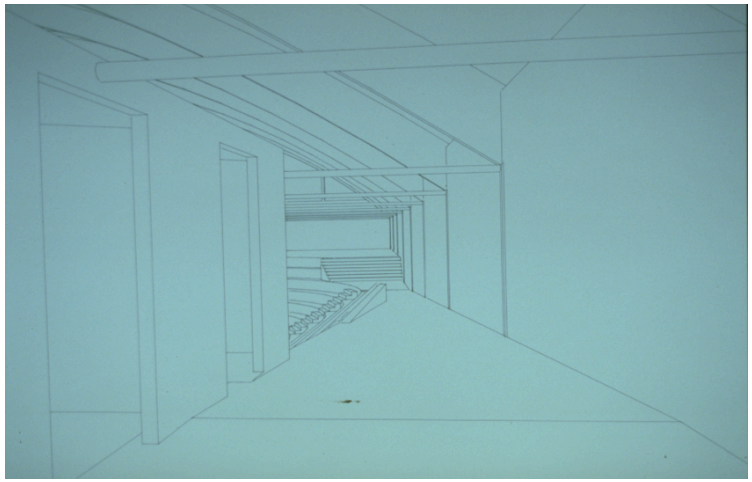
Medusa modelling techniques.

The MEDUSA system. Lund University 1982-



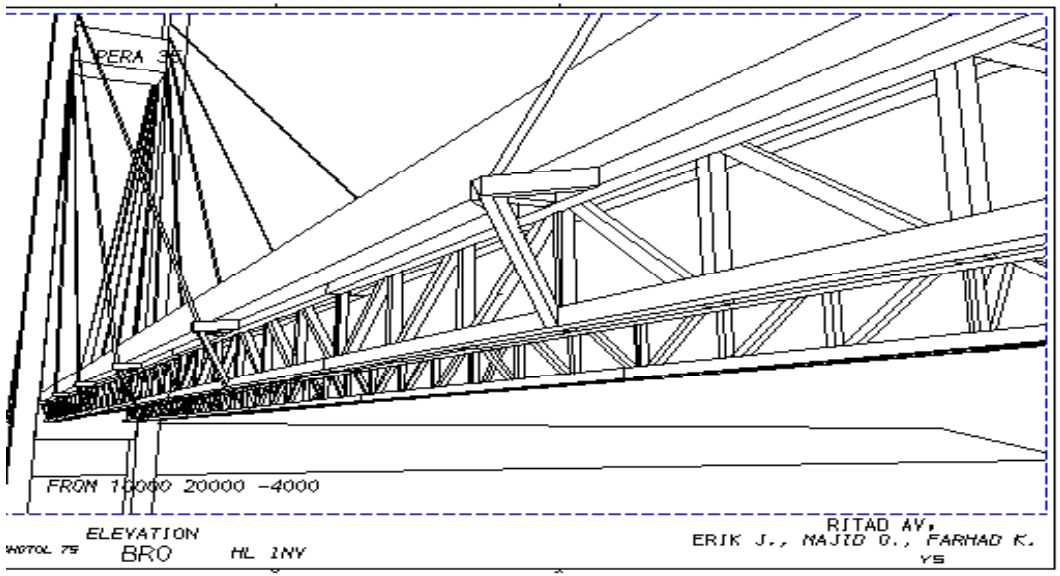






Student works 1986 KBS-Media Lab, Lund University

The MEDUSA system. Lund University 1982-

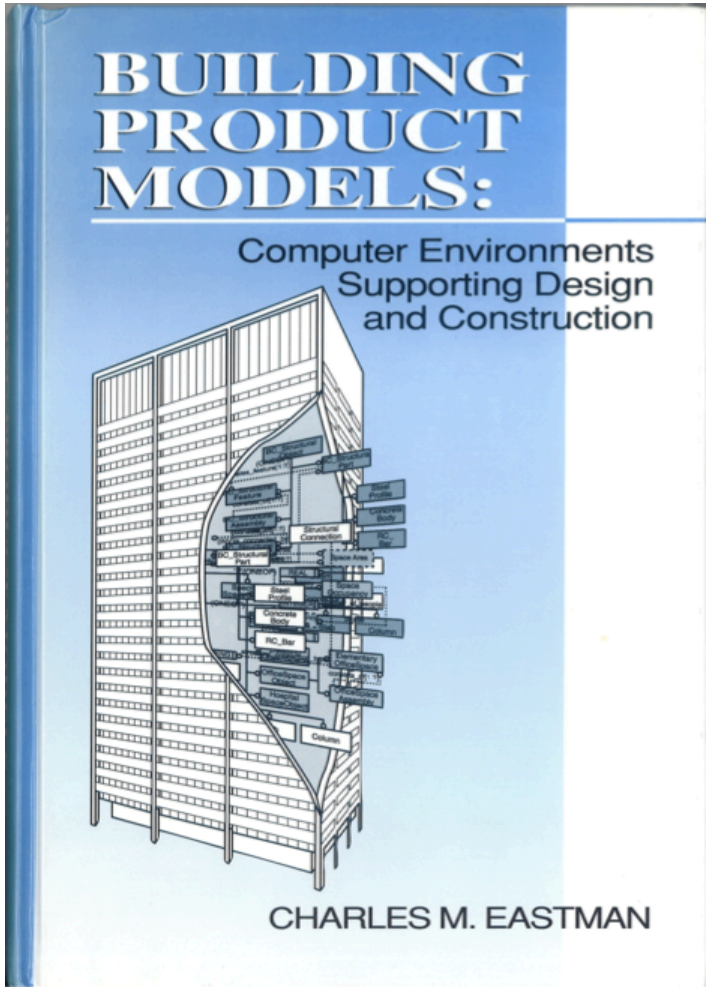


Student works 1987 KBS-Media Lab, Lund University

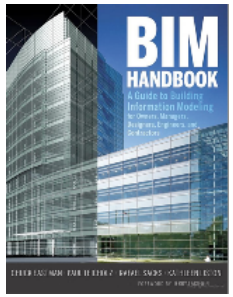
CAD Software History

More to read on Building Product Model History.

Published 1999. CRC Press. 411 pages.



From the BIM handbook



p.29 -
2.1.2 Object-Based Parametric Modeling
(in the 80s)

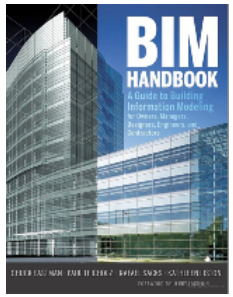
p.33 (2.1.3 Parametric Modeling of Buildings)
"Conceptually, building information modeling (BIM) tools are object-based parametric models with a predefined set of object families, each having behaviors programmed within them, as outlined above"
p.34 Table with examples on Base Objects given for in ArchiCad, Bentley Architecture, Revit Building, and Digital Project (Gehry Technologies based on CATIA). [wall, column, door, window, slab,....]

p.35
"One functional aspect of BIM design tools that is different from those in other industries is their need to explicitly represent the space enclosed by building elements"

2.1.4 User-Defined Parametric Objects
.."predefined objects that come with a BIM design tool capture design conventions rather than expertise"

p.43
2.1.6 Object-Based CAD Systems
"ADT also supports custom-defined extrusions and other B-rep shapes but does not support user defined interactions among object instances" ("Several CAD-systems in use today are not general purpose parametric modelling-based BIM tool...")

From the BIM handbook



p.44

2.2 Varied Capabilities of parametric modelers

"The range of rules that can be embedded in a parametric graph determines the generality of the system. Parametric object families are defined using parameters involving distances, angles, and rules, such as *attached to*, *parallel to*, an *distance from*. Most allow 'if-then' conditions."

p.46

2.2.1 Topological structure

"Topology and connections are critical aspects of a BIM tool that specify what kinds of relations can be defined in rules".

2.2.2 Property and Attribute Handling

p.48

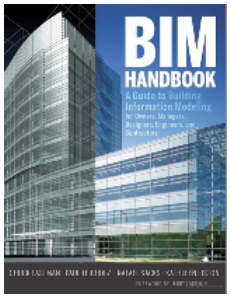
2.2.3 Drawing Generation

A drawing is much more than an orthographic projection

p.50

"Current top-level drawing functionality supports bi-directional editing between drawings and models".

From the BIM handbook



p.55

2.3.1 Discriminating capabilities
- User Interface
- Drawing Generation
- Ease of Developing Custom Parametric Objects
- Scalability
- Interoperability
- Extensibility (scripting support, APIs)
- Complex Curved Surface Modeling
- Multi-user Environment

(We add here Property and Attribute handling)

p.57

2.3.2 BIM Tools for Architectural Design
- Revit
- Bentley Systems
- ArchiCad
- Digital Project
- (AuoCad-based Applications) (not parametric modelers)
- Tekla Structures
- (DProfiler)

END

http://it.civil.aau.dk