

THE TECHNION PROGRAM OF  
COMPUTER AIDED ARCHITECTURAL DESIGN

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A. GENERAL REVIEW

There is only one school of architecture in Israel - that of the Technion, Israel Institute of Technology. The approximate number of students is 750, spread over five undergraduate study years (approximately 120 students per year) and another 100 graduate students (most of them in city planning).

CAAD is taught in the Technion since 1969. At the beginning, only at the graduate level, but since 1970 at an undergraduate level also. The Faculty of Architecture and Town Planning was the first Technion faculty to introduce to its syllabi a formal course in CAD.

The Technion offers the M.Sc and Ph.D degrees in Architecture. Several students prepared theses in CAAD. There is an increasing demand by students to take a degree in CAAD.

The emphasis until recently was on research and courses for students wishing to be "clever users", or experts in CAAD and not just "simple users". Paradoxically, courses for "simple users", when compared with courses for experts, require more sophisticated hardware and good software, which was not available at that time. This year, for the first time, we introduced CAAD in two design courses (perspective drafting and sun-shading modelling).

There are advantages in starting CAAD on a high, expert level.

1. There is now a group of young faculty members who teach design courses and who are experts in CAAD, so that it is relatively easier to introduce CAAD to the design courses.
2. There is some software developed by this group that can be used in design courses.

Most of the software developed until now was in the direction of generating design solutions. Some work was also done in the simulation and appraisal of given buildings. However, most of the software was developed for Batch processing, and as such is not sufficiently friendly, and much work has now to be invested to change the software to a friendly interactive mode. When this is done, we shall be happy, in the near future, to make our self-developed software available to the public.

## B. HARDWARE

From 1969-1980 the Technion's main frame was used (IBM 360 and later IBM 370). The work was done in a Batch mode using punched cards, printers, and graphics performed by a plotter.

From 1980-1982 the work. was done on. a mini-computer (PDP 1V 34) with an on-line plotter and a printer which belonged to the Faculty of Architecture and another engineering department In 1983, we could not use the mini-computer any more, as no position for a computer operator was approved by the Technion management.

During 1983 the CAAD courses and some research work was done on four micro-computers (Superbrain, with 64k bytes and 2 diskettes) and a graphics' printer. The Technion main frame was also used (IBM 3081D and IBM 4341/II).

In 1984 we acquired our CAAD laboratory, which included: CDC Cyber 170-720 (together with the Faculty of Civil Engineering) and five graphic terminals with touch screen and tablet each (Viking 721); two graphic printers; a small plotter and a printer for heavy prints. Large plots will be done on the main plotter in the Computer Center, that will serve other faculties. We still have two Superbrains with graphic printers connected to them. However, next term every student will be able to lease or buy a micro-computer and some 200 micros will be spread over the Technion, connected to the main-frame high quality printers and plotters.

## C. SOFTWARE FOR CAAD

### 1. CDC general CAD software

Includes: CD2000 (wireframe), ICEM Modeler (solid modeling), Tigs (Terminal Independent Graphics System).

The CD2000 and ICEM Modeler can be used in design courses for geometrical modelling and drawing of perspectives.

The Tigs is used by researchers and expert students to develop CAAD software, including 2D and 3D interactive graphics.

### 2. Goal and bible

Just arrived. Hoping to use them soon in design courses for appraisal of design projects. In the future Vista will also be ordered.

### 3. ACA software

Integrative CAAD system developed in Israel by the ACA company. This software was used last year in a design course for geometrical modelling and drawing of perspectives.

## D. SOFTWARE DEVELOPED IN THE TECHNION

Several CAAD programs were developed in the Technion over the years and are listed below, according to subjects:

### a. Spatial Arrangement and Evaluation of Layout of Complex Buildings

#### 1. A Model for Space Allocation in complex buildings,

E. Shaviv, D. Gali, 1974 (Batch).

#### 2. Decomposition Recomposition model for Multi-Cell Systems,

E. Shaviv, R. Hashimshony, A. Wachman, 1977 (Batch).

#### 3. A model for Transforming an Adjacency Matrix into a Planar Graph.,

R. Hashimshony, E. Shaviv, A. Wachman, 1878 (Batch).

#### 4. A Model for Evaluating Activities Layout in Dwelling Units,

Y. Kalay, E. Shaviv, 1979 (Batch).

#### 5. A Model for Turning a Graph into a Rectangular Floor Plan,

J. Roth, R. Hashimshony, A. Wachman, 1982 (Batch).

- b. Climatic and Solar Design Tools
  - 1. A Model for the Design of External Sun-Shades,  
E. Shaviv, 1975 (Interactive).
  - 2. A Model for Predicting the Thermal Performance of Buildings,  
E. Shaviv, G. Shaviv, 1977 (Batch or Interactive).
  - 3. A Model for the Determination of Solar Rights In Solar Communities  
E. Shaviv, 1984 (Interactive).
- c. Computer Graphics
  - 1. A Model for the Design of Surface Structures,  
E. Shaviv, D.P. Greenberg (Cornell University), 1970 (Batch).
  - 2. Computer Program for Perspective with Hidden Lines,  
E. Shaviv., 1976 (Batch).
- E. SOFTWARE IN DEVELOPMENT
  - 1. User Interface with Emphasis on the Program Stage,  
R. Ben Moshe (Ph.D. Candidate), Supervisor: E. Shaviv (Interactive Computer Graphics).
  - 2. User Interface for Environmental Design Evaluation,  
D. Katz (M.Sc. Candidate), Supervisor: E. Shaviv (Interactive Computer Graphics).
  - 3. A Model for the Evaluation of Re-parcellation of Residential Quarters,  
Ofer (M.Sc. Candidate), Supervisor: E. Shaviv (Interactive Computer Graphics).
  - 4. A Model for Generating Residential Buildings Using a Shape Grammar,  
R. Oxman (Ph.D. Candidate), Supervisor: E. Shaviv (Interactive Computer Graphics).
  - 5. A Decision-Making Model for Solar Retrofit,  
R. Zohar (Ph.D. Candidate), Supervisor: E. Shaviv (Interactive-Energy).
  - 6. A Model for Designing and Evaluating the Geometry of Passive Solar Public Buildings,  
B. Malul (Ph.D. Candidate), Supervisor: E. Shaviv (Interactive Energy).

F. CAAD COURSES

All courses listed below are elective.

a. Past

1. Computer's Applications in Architectural Design (expert)

Instructor: Prof. E. Shaviv.

4 credit points. Was given from 1969-1974 (undergraduate and graduate).

The purpose of the course was to expose the students to computer hardware and software, computer's applications in architecture, computer graphics and mathematical models in architectural design.

The language taught was Fortran IV. Batch Process and Graphics on Plotter. Enrolment. 50-60 students of architecture and town planning.

b. Present

1. Computer Aided Architectural Design I (expert)

Instructor: Prof. E. Shaviv.

3 credit points. Is given since 1974 (undergraduate and graduate).

The purpose of the course is the same as the former one, with greater emphasis on 2D graphics. Since last year, emphasis on interactive computer-aided design and interactive. graphics. Enrolment: 50-60 students.

2. Computer Aided Architectural Design II (expert)

Instructor: Prof. E. Shaviv.

3 credit points. Is given since 1974 (undergraduate and graduate).

An advanced course for expert students. The purpose of the course is to expose the students to 3D geometrical modelling, integrated CAAD systems, and mathematical models in architectural design. Interactive work on touch screen and tablet. Language: Fortran V (Fortran 77). Enrolment: 15-20 students.

3. Computer Methods in City Planning (expert)  
 Instructors: Dr. R. Hashimshony, Dr. J. Roth.  
 3 credit points. Is given since 1974 (graduate).  
 A similar course to CAAD I with emphasis on applications and models in city planning.  
 Enrolment: 10-15 students.
4. Mathematical Models in Architectural Design (expert)  
 Instructor: Prof. E. Shaviv.  
 3 credit points. Is given since 1975, not every year (graduate).  
 An advanced course in mathematical modelling. Emphasis on developing advanced mathematical models and algorithm to be solved on the computer. Enrolment: 5 students.
5. Design Course Geometrical Modelling (user)  
 Instructor: Dr. J. Roth.  
 Part of a general design course., 1984 (undergraduate). The use of ACA software for geometrical modelling to evaluate certain 3D aspects in the architectural project.  
 Enrolment: 10 students.
6. Design Course - Solar Energy Design Seminar (user)  
 Instructor: Prof. E. Shaviv.  
 Part of the Solar Design Seminar 1984 (graduate). The use of computer's design tools developed by E. Shaviv for designing sunshades, sun-insolation and energy performance of buildings. The use of SERI-RES software also. Enrolment: 10 students.
- C. Next Year  
 (Courses that will use the CAAD next year).
7. Design Courses - Geometrical Modelling and Appraisal (user)  
 The use of Bible and Goal in different design courses.  
 Enrolment: Different groups of 10-15 students.

8. Morphology I (user)

Instructors: Prof. A. Wachman, Dr. R. Hashimshony, Dr. J. Roth.

3 credit points.

Use of software developed by Hashimshony and Roth for line and plane symmetry groups. Part of the exercises to be given in the course. Enrolment: 120 (compulsory).

9. 2D Design (user)

Part of the exercises to be given in the course.

10. Design Course -Passive Solar Communities (user)

Instructor: Prof. E. Shaviv.

Part of the solar design course - 7 credit points (undergraduate).

The use of energy computer's design tools developed by E. Shaviv. Enrolment: 30 students.

Let me summarize: The CAAD courses that can be given depend greatly on the hardware and software available.

**Order a complete set of  
eCAADe Proceedings (1983 - 2000)  
on CD-Rom!**

**Further information:  
<http://www.ecaade.org>**