

Activities Oriented Environments

A conceptual model for building advanced CAAD systems

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Keywords

CAAD, CAAD Design Paradigms, CAAD User Interfaces, Architectural Design Management

Abstract

The Activities Oriented Design Environments, is a collection of proposals that will introduce important changes in the interaction procedures and integration mechanisms, in the design of CAAD software and the operating environments that support them. We will discuss how this environment uses the architectural activities as a reference for his organizational scheme, and the structural rules that control it's operations.

Justification

This proposal is the synthesis of a doctoral thesis research project, who's main objective is the investigation of the CAAD technology concepts and fundamentals, and their use in the design of an advanced conceptual model for an integrated CAAD that supports the architectural project activities, from it's early conceptual phases and until it's final stages.

The initial research, showed three critical deficiencies:

- 1- The lack of innovative conceptual paradigms,

necessary for designing advanced CAAD systems. The majority of the existing structural proposals (MITCHELL, KALAY, EASTMAN, BIJL, etc.), cover partial aspects of the existing technology.

- 2- The USER-COMPUTER interaction procedures are the most critical component of the CAAD systems. The CAAD programs, still use sophisticated interaction procedures, distant from day to day design activities. Users are constantly pushed to develop complex roundups, in order to develop a simple design task.
- 3- The lack of an organizational scheme necessary for the development of Architectural Design project activities with the aid of Computer Technology.

Theoretical Fundamentals

The first step for the development of an appropriate USER-COMPUTER interaction procedures, is the development of an alternative organizational scheme of the architectural design project activities, capable of integrating the computer technology in the daily architectural practice.

The main purpose of this organizational scheme is to share with CAAD systems developers, a set of simple terms, expressions and activities procedures necessary for the construction of adequate USER-COMPUTER interaction mechanisms, and a solid integration of the project information from the early stages of the design process.

Our major concern, was to search for a reduced number of architectural expressions capable of representing without confusion the majority of the architectural activities, considering that the architectural design activity has a sophisticated organizational scheme whose volume and intensity depends on many factors like the building type and the necessities program.

The first criteria for organizing this activities, is the Level of contribution. Some activities are essential for the development of the activities, those were called MAIN Activities, others participate partially in some critical moments, those were called AUXILIARY Activities. From the study of the other organizational schemes (RIBA, MITCHELL, etc.), we selected five expressions that has the capability of symbolically representing these design activities: DESIGN, PRODUCE and COMMUNICATE, as the Main architectural activities; MANAGE and ASSIST as the Auxiliary activities.

Design, represent all the creative activities developed in the architectural project. Produce, represent all the activities related to production of the working drawings and the management of the construction activities. COMMUNICATE, represents all the activities related to the communication of the design ideas. Manage, represent all the activities that control the organization of the project activities and the computer system. Assist, are the activities responsible of the users assistance, during the development of their activities.

This reduced set of representative activities will avoid conceptual confusions, each time the architect or project manager will have to define specialized activities; this approach will simplify the pre-

liminary planing of the projects activities and the USER-COMPUTER interaction.

The development of the whole organizational scheme, of the ACTIVITIES ORIENTED ENVIRONMENT will use a set of structural rules, that govern the main relations between the architectural design activities:

- 1- MULTIPLE LEVEL ORGANIZATION: uses the decision tree (ALEXANDER, 1975), to subdivide the project activities into multiple levels, each one represent a complex set of related activities. The multi level structure, will define the exact location of each activity in the organizational scheme.
- 2- repetitive Subdivision: progressively divides all the activities, main and auxiliary, at each level of the organizational scheme, into three subgroups of activities: DESIGN, PRODUCE and COMMUNICATE. These generic activities, represent at each level a complete set of highly specialized activities.
- 3- ACTIVITY GOALS: controls the level of development of the activities schemes, the direction of it's evolution and the election of the necessary shifts. The architectural design activity, doesn't follow a unique linear direction, they could evolve in several directions: front-back, left-right and parallelly.
- 4- MINIMUM DEFINITION LEVEL: represents the adequate moment for beginning the design activity, when the architect determines the main design goals, activities, and resources, necessary to develop it.

Operating scheme

The Activities Oriented Environments, could be used as the main User Interface for an existing operating system. This will allow the architect and all the design team share a unique working environment. The architect, will use it to organize the project activity, and the design team the activities

organization and the adequate tools for developing it.

The system will work as follows:

The chief designer will initiate the design planning assistant in the initial phase of the project. At this initial level, the designer will select the activity focus from the three basic activities (design, produce, communicate). Each one of them will define a sophisticated set of sub-activities. This goal will depend basically on some other design variables such as: objectives, resources, project program, etc. This initial goal is not going to be the definitive project planning, but will help him configure a global idea about the project needs, especially the computer equipment and programs necessary to develop it. For example: if the designer selects the design as a goal, the design planning assistant will lead him to the next level of definition in order to select from the established activities what he considers adequate to his design. At every level, the system will provide the user, upon request, the applications necessary to develop the selected activities and their availability in the market or in his own system, or the www direction of a company that develops it. In some cases, the user will be requested to go to a more detailed level of the organizational scheme, when the activity is poorly defined.

Once the basic need of the selected activities has been defined the user has enough resources to begin developing the basic conceptual idea in a neutral environment, which doesn't depend on a specific program nor uses a restricted data model. Each project will have his own container, which will integrate all the data (geometric, descriptive, images, bitmaps, etc.) related to the design. The data will be associated together by dynamic links.

The programs operating in the environment, will have the liberty to consult the project container and extract from it the information it needs, recognize the available links for updating all the data. The container will be able to combine different

types of geometric models (surface, solid, etc.) to give the user a complete liberty in the initial representation process.

The programs working in this Environment will use professional known terms to build the user interface, which will eliminate the necessity to learn different procedures in the system. The Environment will establish some basic interaction rules, which will not interfere with the interaction procedures necessary for each program.

This initial operating script allowed us to determine some investigation necessities in order to develop a full functional Activities Oriented Environment, these are:

- 1- The elaboration of a detailed scheme of the day to day architectural project activities, to use it as a global reference for all the design professionals.
- 2- This basic scheme will offer the computer manufacturers a precise orientation towards the real needs of the architects.
- 3- The need to design a flexible representation model that allows: a) the substitution of simple geometries with detailed ones to support the progressive refinement of the design, b) the standard 2D representations and technical drawing conventions.
- 4- The development of: a) Expert assistants that could act as seamless decision making tools for every activity; b) Learning assistants, to help reduce the users learning curve; c) Management assistants, to maintain the project activities and control their execution.

As we could observe, the Activities Oriented Environments as conceptual and operating scheme, is still in its initial phases. It will need an extensive collective work to refine it, develop the most adequate activity organization, and design all its operating components such as: interaction procedures, integration scheme and data representation models.

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