

The V.C.net - A Digital Study in Architecture

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ABSTRACT

The "V.C.net" project is an Internet-based educational and communication tool for the architectural community. Its goal is to encourage students from architecture programs across the country and around the world to examine problems and collaborate in the exploration of ideas through the World Wide Web. The central concept of the project involves the creation of a simulated, vital urban environment constructed from various forms of digital data. This "virtual city" will be comprised of projects executed by students of architecture and urban design in the U.S. and abroad. Projects will be proposed for specific sites and will reflect real-world questions as they are mirrored in the virtual world. The city exists as a heuristic tool and is not intended as a copy of any existing human habitat. The ultimate goal of the project is to create a dynamic platform to study the interrelationship of various forces effecting urban development: architecture, planning, civil engineering, economics, social sciences etc. The project originates at the School of Architecture of the University of Detroit Mercy and is intended to be truly interdisciplinary.

THE CONCEPT

The last years have contributed heavily to the use of CAD modeling in architecture and particularly in architectural education. 3D CAD projects, whether by students or professionals, are widely published and analyzed. However, despite their often excellent quality and potential longevity, their useful life is generally very short. Over the years the students of the School of Architecture at UDM have made numerous 3D architectural projects in both CAD courses and design studios. Although it has never been fully implemented, we always planned to create a cumulative database from these files. This idea would have been more stimulating if there was an implied or actual spatial relationship between projects. The sites could be defined prior to the actual design process, and the relationship between projects could then become a condition for the inclusion of new projects in the database. This conclusion became the spine of our *V.C.net* project.

The *V.C.net* is an educational program based on a dynamic database built from the three-dimensional, architectural CAD projects. Together they form a "digital city"; each, individually represents a single "digital property". The V.C.net program exists exclusively through these models and is not a copy of any particular existing human habitat. Each property is stored in a separate drawing file and they all maintain their exact and synonymous physical position in the city. The sites are defined in advance and in the design process they are (individually and all together) subject to simulated forces to correspond with an urban environment. Using these files it is possible to assemble and analyze complex models of this "city", for any purpose or outreach.

THE METHOD

Despite the virtual nature of this program, we would like the *V.C.net* project to take into account complex issues and variables associated with real world problems. Urban forms reveal their nature best if studied in a dynamic

way - over time. Real cities are not particularly suitable for experiments: they are living organisms which don't forgive mistakes readily. The V.C.net may be a very convenient model to test theoretical ideas (although we realize that it may sometimes lack the painful ability of the real cities to actually verify the success or error).

The layout of the project is modeled after locations typical for contemporary American edge cities. An imaginary, undeveloped site has been chosen rather than an existing city for two major reasons: it offers more freedom for study and experimentation while avoiding the lengthy process of copying a real city into digital format; it also allows the manipulation of data to represent and reflect various changing conditions from the earliest phases of development (Figure 1). The *V.C.net* project is not designed to operate for only a specific period of time or to generate any final product. Instead, we are interested in the process itself and particularly in some specific aspects of it:



Figure 1. The current extent of the *V.C.net*.

- The *V.C.net* may become a common ground for architectural and urban experiments, regardless the actual location of the students. The project may generate a voluntary exchange of information and ideas between individual students or groups from different schools or disciplines, working in the same areas.
- The *V.C.net* may extend the life of CAD projects beyond the local studio and the end of the term, they will become the context for future studies. This may create an unprecedented opportunity for the students; they will become responsible for the environment they create and will be able to observe the implications of changing the context.
- Because the *V.C.net* consists of exclusively digital data, the program encourages experimentation and further study of the role of computer media in architectural design. It may provide us with some answers about the effects of change in our design practice upon the growing influence of the new types of initial data and expected output.
- The *V.C.net* project provides an opportunity to conduct studies in urban data management and analysis.

THE DATABASE

The quantity and complexity of information involved in describing the real urban environment may appear prohibitive for any attempt of simulation in the digital media. For this reason, two basic decisions were implemented to make the project feasible: to break the information about the city into the smallest logical "building blocks", interlocked, yet available for individual manipulation; to provide those "pieces" with a multiple identity (to store them in more than one way). The data structure should be flexible enough to make it possible to assemble any complex model from individual pieces (Figures 2 and 3). From the perspective of one year of development of the *V.C.net* program it must be concluded that it is really the database that is the heart of the project, although it does not

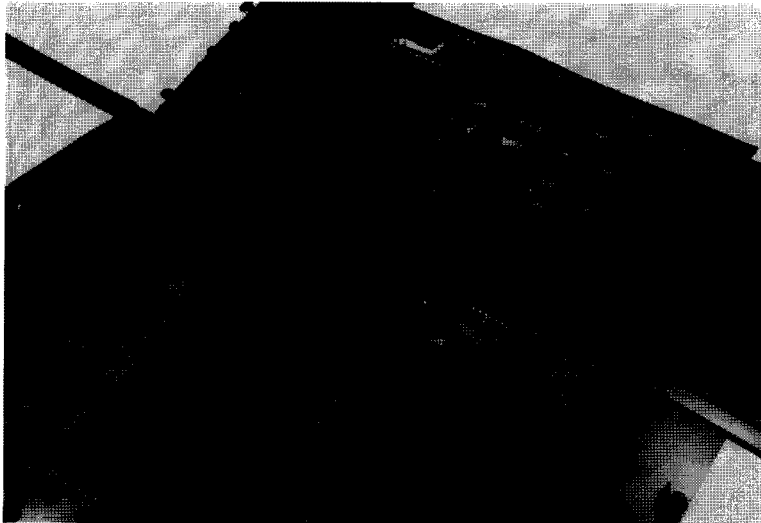


Figure 2. The area of the *VC.net* used in the Electronic Design Studio in the School of Architecture at the University of Detroit Mercy, Term II, 1996.

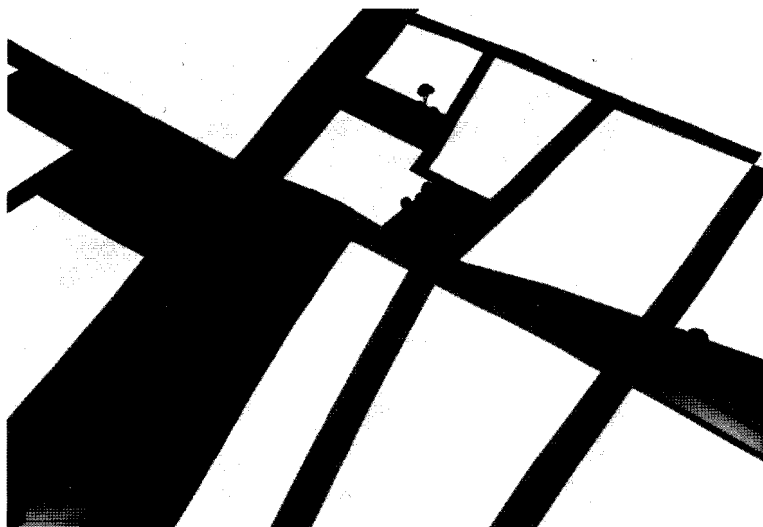


Figure 3. An example of the database contents: the drawing shows all properties zoned "commercial, light" and more than 0.3 acres on the street grid.

include any 3-D information. Two techniques were considered for the database structure. First, to include a complete individual database entry in every drawing file (which does not eliminate the need for an external database to store all property names); and second, to create a complete, external database with references to the addresses of the model files and containing all other information. The first model would be more desirable upon the creation of the projects, but the second one provides more flexibility and makes the project more format-independent. The database contains a variety of information divided into five sections:

- project file references (local and remote)
- property information (size, current status and use etc.)
- design information (designer's name, school, date etc.)
- planning considerations (zoning, overlay district projects etc.)

- utilities (to be used upon more complete urban simulation)

The property files of the program are currently available in AutoCAD v. 12 format. The data management tools have been developed in AutoLISP to be utilized in an AutoCAD environment. Each unique filename in the *V.C.net* database defines a single property, the smallest unit for the urban environment. The properties are uniquely defined by the three dimensional boundary lines. Two separate properties will not be parts of the same basic drawing file. If one property is subdivided, two files emerge out of one, each of them with a unique name. The names of the property files are derived from the physical location of the site. The properties can be also joined and in such case the new one can be named after one of the old properties, or it can be assigned a new and unique name.

The complete information about every site is stored in two separate drawing files. The first is described as the Urban Definition file (UD), and is created upon the initial definition of the site. At the minimum, this file will

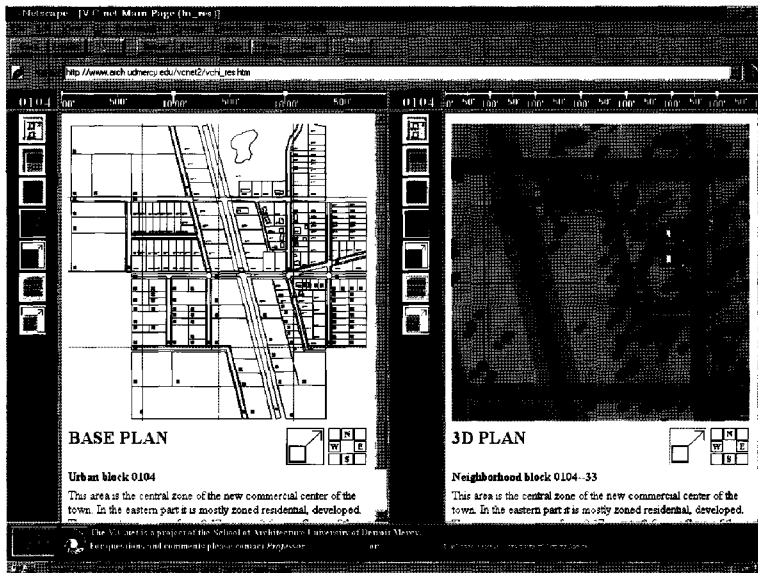


Figure 4. The World Wide Web tools for the current *V.C.net*.

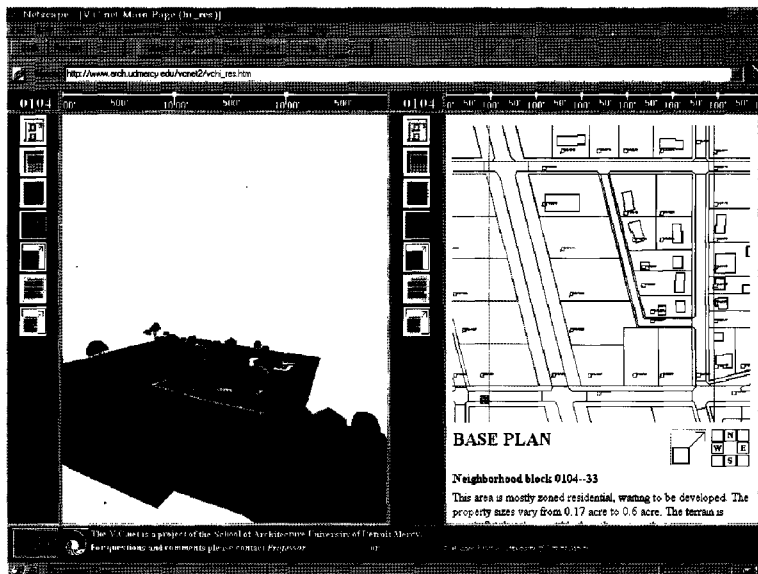


Figure 5. The VRLM model and the base plan of the selected area of the *V.C.net* as displayed in Netscape.

exist for the land that is in its initial state or is vacant and unimproved. The Architectural Definition file (AD) will exist for the sites after the architectural project has been completed and included in the database. The UD file contains a simplified 3D model of the property and the graphical information about the constant and variable properties of the site. It is understood that mainly this type of file will serve the purpose of broad analysis and context studies, while architectural models will serve very specific purposes of neighborhood studies, etc. We also use VRML (Virtual Reality Modeling Language) models for on-line viewing and casual access to 3-D data. Theoretically, every file format satisfying the simple requirements of the supported data would be acceptable to represent one or all models used in the project.

The structure model of the *V.C.net* data was created to facilitate the 8.3 filename convention, although it is anticipated that upon the more common use of long file names this should change. Within the constraints of eight character file names, it is possible to define properties for the area of 2,500 square miles without sacrificing the flexibility of the structure. File names allow one to devise applications that will read the information they contain and use it to manage the data efficiently.

THE PLATFORM

Projects for the particular locations in our program will be accepted from students of architecture from ours and other schools of architecture and urban design. A single person or a small group cannot provide enough variety to contribute as much as the multicultural communities of the cities. For this reason we are publishing the *V.C.net* project on the World Wide Web (www.arch.udmercy.edu/vcnet/). Using the familiar WWW navigation tools students can find specific information about individual sites, download files and, in return, submit their projects (Figure 4). Obviously, every design will remain the artistic and intellectual property of the author. No student or professional other than the original author will be able to use such project other than for educational purposes: primarily context presentation and studies. The WWW tools for the *V.C.net* project make extensive use of the advancing VRML standard (Figure 5). All existing sites are available for "visiting" in this format. In fact, an entire trip through the

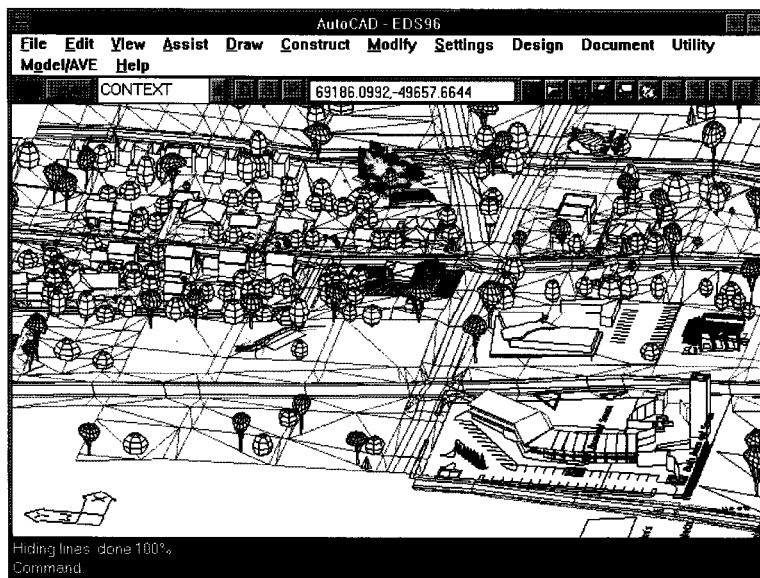


Figure 6. The Electronic Design Studio 1996: an early phase of design with all projects shown together.

developed area can be conducted exclusively in the Virtual Reality. This medium has been added to the project recently, and it presents great potential for further development and interesting new features.

THE PROJECTS

To initiate the program, the structure of the *V.C. net* has been made available to the students of our school through the Electronic Design Studio. The Studio had a vertical structure and included nine students from third to fifth year level, all of them with previous computer and CAD experiences. Each student was assigned a site in the *V.C.net* and was given a social need to be addressed. The first group had the advantage (or disadvantage) of working with the primarily empty area while the future ones must deal with an emerging context. The first projects ranged from residential development to a fire station and were all programmed for a community of 2,000 people. Taking advantage of the *V.C.net* data, we were able to introduce several novelties in the problem structure and the functionality of the studio project to create a Design Studio electronic work space. Custom AutoLISP routines allowed students to instantly access all of the context information as well as the most current development of other



Figure 7. Electronic Design Studio 1996: final assembly of student projects with complete context.

students' projects. Above all, the entirety of the graphical information included in the database (although quite incomplete) was also made available to the students to facilitate their analysis of the neighborhoods. The depth of immediately available information was highly regarded by the students. They learned to manipulate large quantities of data and work continuously with the context.

This project was the first one for the students where literally all the design information was supplied in electronic format. Initially it could be observed that the majority of the students felt intimidated by the computer tools and had difficulty with the early design phases. Most of them created hard copies of selected information to use with traditional tools, but the completeness of data available on the network made them return to computers relatively fast (Figure 6). The immediate context and land contours were most frequently used, which also contributed to early three-dimensional studies. The particular students' responses to the current context of the site enhanced the suburban nature of the first *V.C.net* area. There was no attempt on our side to change this process with more specific planning, but it promoted use of the master plan and overlay district plans. The designs from the Electronic Design Studio 1996 have been made a permanent part of the *V.C.net* database and will be used in the future as part of the existing context (Figures 7 and 8). The students welcomed this concept and are looking forward to seeing further developments of the project.

It is necessary to point out several difficulties we have encountered. When presented with the assignment, students immediately asked questions about physical properties of the *V.C.net* such as location, climate etc. as well as demography and social structure. As conceived, the program currently omits those important local issues. We hope

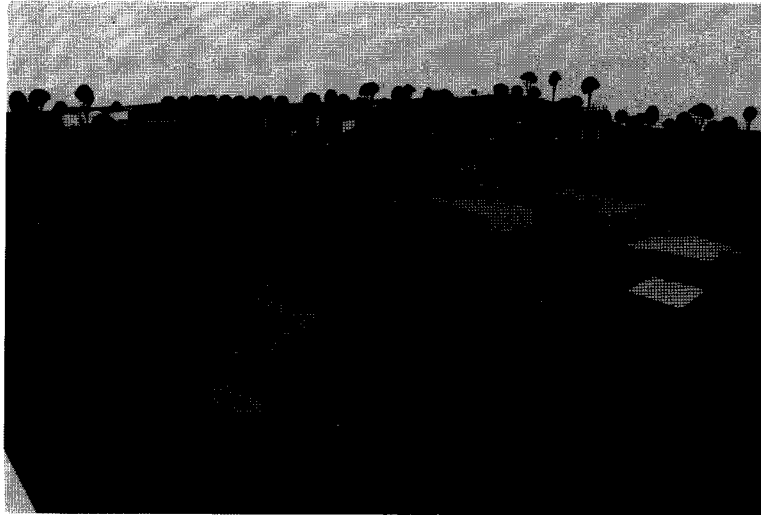


Figure 8. Same area as Figure 7 but viewed from the opposite corner of the development.

to introduce at least a basic level of simulation in these areas in the near future. In a very interesting way, the abstract nature of this project made the students more aware of the actual information they possess and immediately react to while working on the "real" assignments. A definite problem is the lack of an understandable social structure to which to respond.

This first studio project for the *V.C.net* has provided interesting material for further development of the program. It has generated profound interest among the students, and we are definitely going to continue the experience. We would like to invite the professors and students from other schools to participate in this experiment. We also continue looking for new solutions and more consistency in the structure of the program.