

Discovering A New Approach to Communicating Architecture Through the Design of a School for Special Education

by  
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by Adam Douglas Halem

Submitted to the Department of Architecture on March 21, 1997 in partial fulfillment of the requirements for the degree of Master of Architecture.

## Abstract

Communication is a shortcoming of our profession. Go ahead and ask the ordinary person on the street to name a few famous architects. Hmmm- Frank, maybe Le Corbusier, maybe. How can we express our ideas and convey our process? How can we show our design in all its glory so that the client, the funder, the trustee, the guy that pays our bills, understand its purpose, form and function? Clearly we could just write a paper. We could include a couple of models, even a walk through on videotape. We could go to the client and show him all these things and try and convince him to hire us. Then we could hope that he will tell others involved in the funding and the building what we showed him. We could do this. We do, do this.

I wanted to discover a novel approach to communicating architecture. I want you to see my approach. This thesis is my new approach to this age old problem. I believe, as do a small number of other architects and designers, that the new approach lies in the use of today's multimedia technology. Oh a big buzz word "MULTIMEDIA". What a weird word. Multi - meaning many and Media - meaning, well just about anything, pictures, video, text, audio, 3D, 2D, you name it. So multimedia means lots of anything! The word tells me everything and yet it tells me nothing. Its ambiguous.

You see this is just the point. I cannot tell you. I cannot show you. You need to experience it yourself. This does not mean turning on a tape and playing it from beginning to end. It means much more; it means anything. We are finally free to do anything and everything to convey our ideas as much or as little as we want, and the whole time leaving the viewer, the client, in control.

This thesis is embodied in an interactive CD-ROM which is attached to this document or available from the librarians desk. It requires an interaction with the reader. This mode of interaction results from my investigation of how communication between the lay person and the architect should occur. I argue that this affords a richer and more complete understanding of a building and its purposes than do conventional methods.

Thesis Supervisor:  
Title:

William Porter  
Leventhal Professor of Architecture

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# Hardware and Software needed to run CD-ROM

There are some very specific requirements for running this CD-ROM.

## Minimum Requirements

- System software version 7.5.X or greater
- Macintosh™ Power PC Computer
- 120 megs of hard drive space (you can throw it out once you are finished)
- A monitor setting of at least 256 colors
- 24 megs of available memory (RAM)
- 4 speed CD-ROM drive
- Monitor set at 832 x 624 or higher resolution
- Quicktime 2.5 (included on CD)
- Sound Manager 3.2 (Included on CD-installs when you install the player)
- mTropolis Player must have suggested memory size set to 15 megs or (16,000 kb)

## Recommended Resources (but not required)

- 604 based Macintosh™ Power PC computer (such as a 7600, 8500, 8600, 9500, 9600 or clone equivalent).
- 36 megs or more of RAM - (more than 50 megs of ram will allow display of millions of colors)
- 120 megs of hard drive space
- Hard drive on a separate SCSI chain will make CD-ROM presentation go faster
- 8 speed CD-ROM Drive -(There is nothing like not waiting!)
- Stereo Multimedia Speakers (They really make the whole experience come alive)
- A monitor setting of thousands of colors
- A big monitor set to 832 \* 624 or higher resolution (832 \* 624 makes it fill the whole screen)

## Installation

- 1** Open the **FONTS** folder, grab all the font files and drop them on top of your system folder icon (LOCATED ON YOUR MAIN STARTUP HARD DRIVE)
- 2** Install mTropolis Player on your hard drive by running the **MTROPOLIS INSTALLER**
- 3** After the mTropolis player is installed, select its icon so that it is highlighted. Go to the **FILE** pull down menu and select **GET INFO**. At the bottom of this new dialog window, you will see a dialog box for setting a preferred size. Change the number in there from 6779 Kb to 16,000 Kb. Close the dialog box.
- 4** Now run the **QUICKTIME 2.5 INSTALLER** and install it on your startup drive. Select **RESTART**.
- 5** Now Drag the Folder labeled **SPECIAL EDUCATION** and Drag it to you hard drive of choice. Keep in mind that this folder is large \* 110 megs - you must drag it to your hard drive to run this presentation. If it is any consolation, you can throw it out when you are done! Sorry for this inconvenience, but it is necessary to get the throughput that this graphic intensive project requires.

## Running The Presentation

Open the **SPECIAL EDUCATION** folder on your hard drive. Double click on the File in this folder. If the presentation does not open and a message does not come up saying that the application cannot be found, then select the Mropolis Player Application and a dialog box will come up allowing you to select a file. Select the file in the **SPECIAL EDUCATION** folder on your hard drive.

## The CD is the New Paper

I sit here ruminating about how to write a thesis for my masters in architecture. I have come upon a stumbling block. Following history and academic tradition, masters' students have been organizing their design thesis in paper format. In more recent times some students included audio cassette tapes or video format to accompany their written materials. But, always it was the written part that mattered. The paper document was the container for line drawings. The paper was the container for photographs. The paper was the container of text. The paper was it. Yet paper has evolved.

My paper is a means to an end. Or perhaps the end of the beginning of a new revolution. Today the computer is the buzz word. We have a new paper. It's not made of trees. It's made of sand. It is silicon, it represents the next step towards a paper revolution.

This design thesis is (as are others) an exploration. I made it my task to explore the next level the computer could bring to Architecture. Architecture, blueprints, study models, final models, sketches, and watercolors have been the tools of architects for years and years. Today (leaving tomorrow open) the offices are changing. We already have CAD (computer aided design); we already have three dimensional rendering and digitizing. The tools are evolving. Our minds are able to see our visions of architecture before they are realized, and we can spend more time designing, refining and creating forms. But

alas we still come to a stumbling block. We have an inability to truly convey our process, our visions, our ideas, and most importantly our experiences to our clients. The profession still relies heavily on the use of presentation boards and models to speak to clients. Our clients have trouble understanding even detailed models as they would be in their 1:1 scale.

Communication is a shortcoming of our profession. Go ahead and ask the ordinary guy on the street to name a few famous architects. Hmmm- Frank, maybe Le Corbusier, maybe. How can we express our ideas and convey our process? How can we show our design in all its glory so that the client, the funder, the trustee, the guy that pays our bills, understand its purpose, form and function? Clearly we could just write a paper. We could include a couple of models, even a walk through on videotape. We could go to the client and show him all these things and try and convince him to hire us. Then we could hope that he will tell others involved in the funding and the building what we showed him. We could do this. We do, do this.

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By now perhaps you have noticed that in this thesis is a small CD-ROM. It is thinner than a book and thicker than a piece of paper. It is round and not square. So what! You might say. Well it holds anything and it probably costs less than this thesis document did to print. A CD is a container for multimedia. My CD is a container for my design, my process, my ideas, and most importantly my architecture. At this point I suggest you take this thesis paper and hand it back to the librarians. Tell them you don't need it anymore, tell them you've got everything, and take the CD-ROM! (Later you can return it).

After this I want you to go find a piece of silicon paper so you can display my CD-ROM. Go to a computer (in particular a Macintosh™). I want you to experience my architecture. If you're interested the rest of this tree (paper), it contains my manual for the CD; it also talks about the processes I have learned and invented while making this CD. A long and difficult task was involved in designing my building. But in the end I feel I have successfully conveyed all that I wanted to and something's that I did not intend, something wonderful. Enjoy!



## A Design of a School for Special Education

This design scheme attempts to alleviate the strong hierarchical order imposed on most school environments. It tries to present an environment that fosters learning by doing. It stresses the process of educating, and hence learning, instead of a set list of goals that 'all' students are supposed to know (old school model).

I envision my school housing 100-150 students ranging in grade levels from sixth through the twelfth grade. The school is to be privately funded and one of a number of such special education schools in which parents and child select the school that best fits their child's particular interests and needs. I would hope this could be a communal environment where all students and teachers would take their turn participating in the activities of the day (e.g., such as selling goods that they make at the store). Students would also participate in a morning meeting which would take place in the gathering room each day as well as in other everyday activities. This communal environment would be one in which students would learn together in small groups, having the opportunity to possibly break away and further explore special individual interests. The teacher becomes less of an educator, in the traditional sense, and more of a guide/counselor to the students. The counselor helps to stimulate the interests of the students and aids them in learning.

The computer plays a major role in the integration and functioning of the students as well as of the school. It

offers the school the opportunity to reach out to other satellite schools linked to the same system, not to mention other schools all around the US and the world. These computers could run programs such as Logo (as discussed in Seymour Papert's book-The Children's Machine) and have multimedia style knowledge programs (e.g. Britannica Multimedia).

*"Certainly, some learning derives from great teaching and telling a good story. We all remember our good teachers. But a major measure of learning results from exploration, from reinventing the wheel and finding out for yourself. Until the computer, the tools and toys for these experiences were limited, special-purpose apparatuses, frequently administered with extreme control and regimentation (my excuse for not learning chemistry).*

*The computer changed this radically. All of a sudden, learning by doing has become the standard rather than the exception. Since computer simulation of just about anything is now possible, one need not learn about a frog by dissecting it. Instead, children can be asked to design frogs, to build an animal with frog like behavior, to modify that behavior, to simulate the muscles, to play with the frog."*

*Nicholas Negroponte  
M.I.T. Media Lab*

*obtained off of the web 1995*

Interaction with the computers would be promoted (but not forced) to all students. The computers become a means of expression for students who perhaps otherwise would be unresponsive. It also helps stimulate students' interests by creating a means of educational "escape".

Overall the computers helps stimulate discovery and learning.

The school, as a social environment, is carefully laid out to accommodate a wide range of grades (6 through 12) and therefore needs to be split into two groups (not schools )-a junior and senior group. The plan places upper class students (grades 9-12) on the second level and lower class students on the first. Home rooms are defined for each grade. Each of these home rooms have access to a small counseling, time-out room, that could be used for a multitude of purposes—medicine distribution, counseling, separation, and teacher offices. Each home room has doors leading into the other rooms of that particular group (senior or junior), allowing two or more rooms to gain visual and physical access to the others if needed.

The two groups also share spaces such as the public store, library (though books can be arranged with a young children's section), cafeteria, gathering room, workshop, music rooms, theater room, and activity/study room.

Each of the two groups have a privacy room for studying, resting and conversation as well as computer use available. These spaces also have an assigned teacher to sit-in during different periods to watch over and “join” the students; these rooms also have access to a counseling/ time out room (if necessary). A library is also to be available with computers, books, music (headphone systems) and a reading room. Located at the top of the school, to heighten its importance, the library allows students and staff a view of the city from all sides.

The two groups and their accompanying classrooms are located in an “L” shape. Administration and nurse services are to be located inside the “L” with circulation (and light gallery) in-between the two (classrooms and administration). Administrative services are divided between the two levels of the structure and located such that each group has its accompanying nurse/counselor at each level to better serve and generally oversee the students.

Each grade has its own home teacher and he/she is responsible for supervising their students (8-15 children) when they are not under supervision by another instructor. The schedule for students would be arranged to facilitate interaction between different grades.

Outside the building, located in an L-shape that hugs the building in the rear, is an outdoor activity zone. This space allows for two large open quadrants and 4 or 5 gathering zones, two of which would be filled with sand. A rusticated and irregularly shaped brick wall runs along Edgerly and is used to help define and secure the interior of the open space as well as to enhance the private side of Edgerly. Minor level changes occur in the open activity space to help create place and transition between outdoor zones.

## Why Did I Chose a School for Special Education?

The school for special education is important to me for several reasons. First of all the students of special education are individuals with individual problems. While some students have behavioral disabilities, and others have learning disabilities, all students have been removed from the main stream public school systems. They are seen as the misfits of school society. They are the ones that cause interference with the learning of entire classes, they can be disruptive, annoying and violent. But they are children. They, unlike perhaps yourself and certainly myself, were in most cases not brought up with the same love and caring we may take for granted. In more cases than not they come from single parent families. In many cases they have been abused or neglected. They are a minority, but their numbers are growing.

Many people (usually politicians) believe they are discipline cases and do not deserve special attention, let alone special schools. Yet studies show that when these juveniles grow up, they are the people most likely to commit crimes and perpetrate the syndrome of mistreatment experienced by them. It becomes a vicious cycle. Politicians complain that they are bleeding the educational funding of this country dry. There is obviously a great expense in educating these kids, still it must be done early when they are receptive and able to learn. If we don't do it during their school years, when they are still pliable; we will be paying for it in many other ways later. Indeed we already are paying for our education neglect.

The prison populations in this country have increased each year and so too have costs. Welfare systems are at their limits. We are paying for it.

I chose this project to be a school specifically designed to foster learning in these special education students. I chose it because its an important issue; one solution is to tailor education to fit these students needs. At a young age I was targeted by the Newton, Massachusetts public school system as having a "possible" learning disability. I, unlike the children I am discussing, was given the chance to go to a private school where class numbers were smaller and teachers spent more time tailoring the education to each students requirements. I was lucky. My experience taught me to love to learning and to want to educate myself even after school was finished. My design is modeled after my own experiences in public and private school systems and my interviews and meetings with actual special education students and teachers.

However there is another side to my reasoning. This project required more than most buildings do. Here there is a strong people side; there are issues and specific needs for this type of school. The school was the perfect model to use in order to create my multimedia project. It gave me the opportunity to share all of the above with you and let you see it first hand. I don't need to tell you! Let me show you!

Let's experience multimedia immersion- the next level of architectural presentation.

## Designing the Interface

The process that I used to design this interface was an interesting one. Most multimedia projects use a storyboarding method similar to that of a movie to layout the project. I took a different approach. I design as I go. Instead of working from a set storyboard the interface changed constantly throughout the creation process. I use an exploratory method for creating the interface. If something doesn't seem to be working, I will try another way.

The process of designing the multimedia interface is a search for which methods of presenting and displaying architecture make the most sense. I wanted a simple and clear presentation that required little knowledge or understanding from the viewer. I took into consideration that the viewer or user may be an architect, a teacher or even a student. With this range of possible viewers, simplicity and clarity were essential in my design decisions.

The final layout that I chose uses a widescreen format. The ratio that I chose for the actual size of the presentation is the same as that for a letterboxed motion picture. By utilizing a wide format, I am able to divide different areas of the screen into different functional zones. The wide format allows all these separate zones to fit well within the screen and preserves each individual character. The left hand top portion of the screen is dedicated as a sort of movie screen. It is here that the viewer will experience video, computer animations and interactive

virtual reality files (Quicktime VR). This is the place for the display of the content. The area to the right of this section is the main screen. Here is the largest space and it is this area that takes on the character of each of the eight main scenes in the presentation.

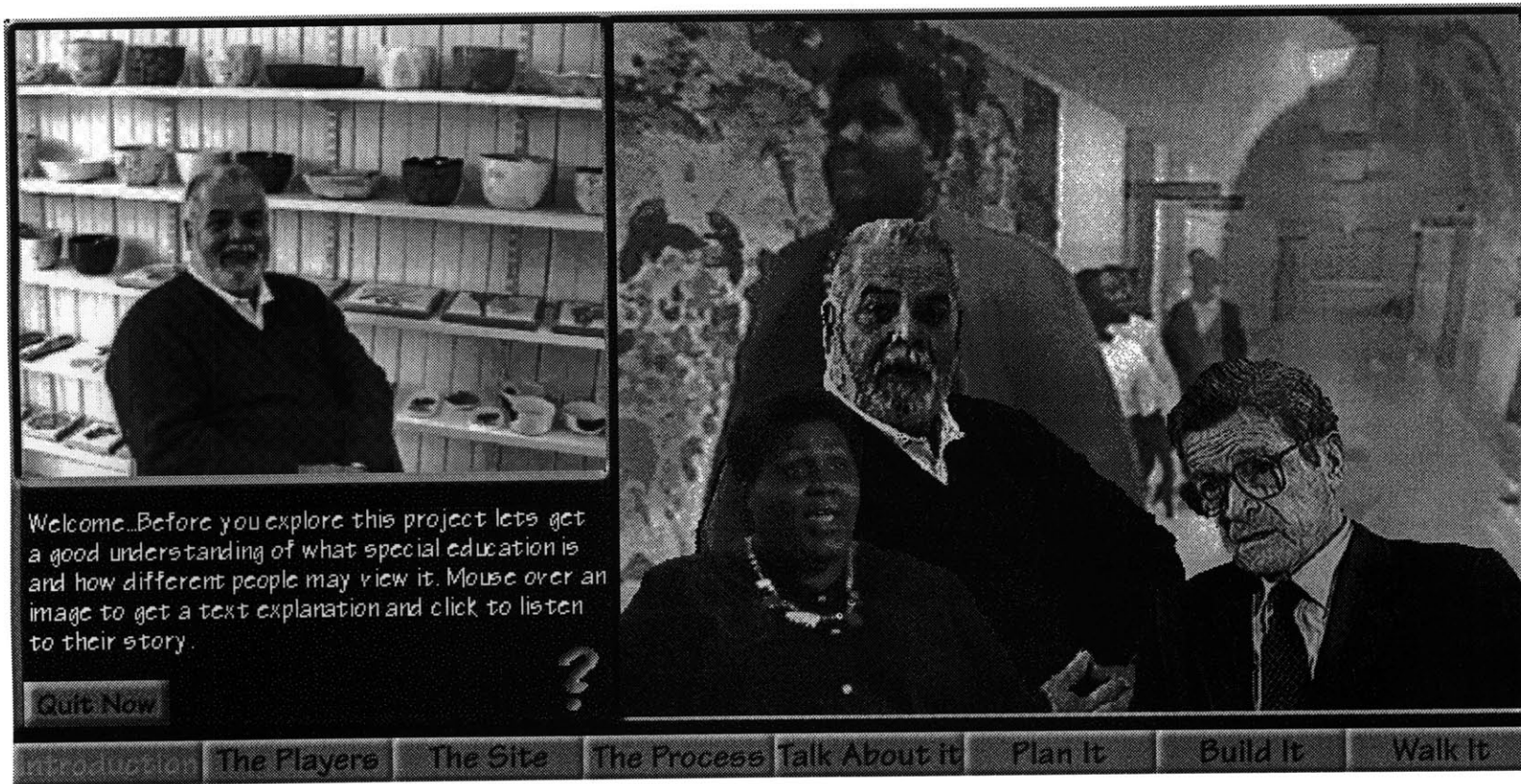
The main screens' content and style varies drastically from screen to screen. This is perhaps due to the fact that my approach to designing multimedia is the same as designing architecture. I tried hard to keep consistencies elsewhere but allowed the main screen to be much like a series of eight different rooms you would visit. Each screen contains its own style and flair, yet each scene most importantly is tailored to its purpose or function. This exploratory approach to design should be more apparent by reading the following eight sections on each of the screens in the presentation.

Before continuing on to the explanations of each screen, it is important to discuss some other layout decisions that were made for the entire presentation. First of all I needed a clear way to navigate all the scenes, such that I suggested a possible order in which to view them, but never restricted anyone from jumping around. After all, if I was using an exploratory method to create this, I wanted the viewer to feel free to have an exploratory experience while viewing the presentation. The eight screen buttons are located on the bottom of the scene and run the full length. From any screen one can always jump to any other screen.

Another consistency that I held in every screen was the text box. The small area below the movie screen is re-

served for text and a small symbol that is a question mark. This is where text information is always displayed. If ever the user moves their cursor over an interactive element within the presentation, a text description comes up to help them. Following this, if ever a viewer is confused about what a screen may be for, by placing their cursor over the question mark, a brief description directs them to what they can do.

Multimedia is my tool for communicating architecture. It gives me the ability to get my ideas across with impact, style and clarity. In many ways making this presentation was like directing a movie, I need to cast it (chose my parts), write it, and produce it. However there is one sharp difference, multimedia allows my story (or information) not only to be watched by my audience, but to be interacted with. Whenever an audience is involved in the decisions, the information becomes that much more interesting and we get our point across that much better. The old days of pasting up boards and building models is disappearing and a new virtual world is rising in its place.



## The Introduction Screen

The purpose of this screen is to introduce the viewer to the rest of the project and to establish a good understanding of what special education is and the issues it brings up.

At the beginning of the project, before I had moved onto the multimedia stage, I saw a news story by Dateline NBC about a woman named Corla Wilson Hawkings. Her story moved me. More than moving me, in five minutes it ex-

pressed exactly what I wanted to say about special education students and schools. One advantage to a multimedia project is that instead of trying to write what I learned in this story, I had the opportunity to allow the viewer to experience the same clip.

A few weeks after seeing the Dateline story, I saw a news brief on channel 5 WCVB Boston, about John Silber commenting on the state of special education in Massachu-

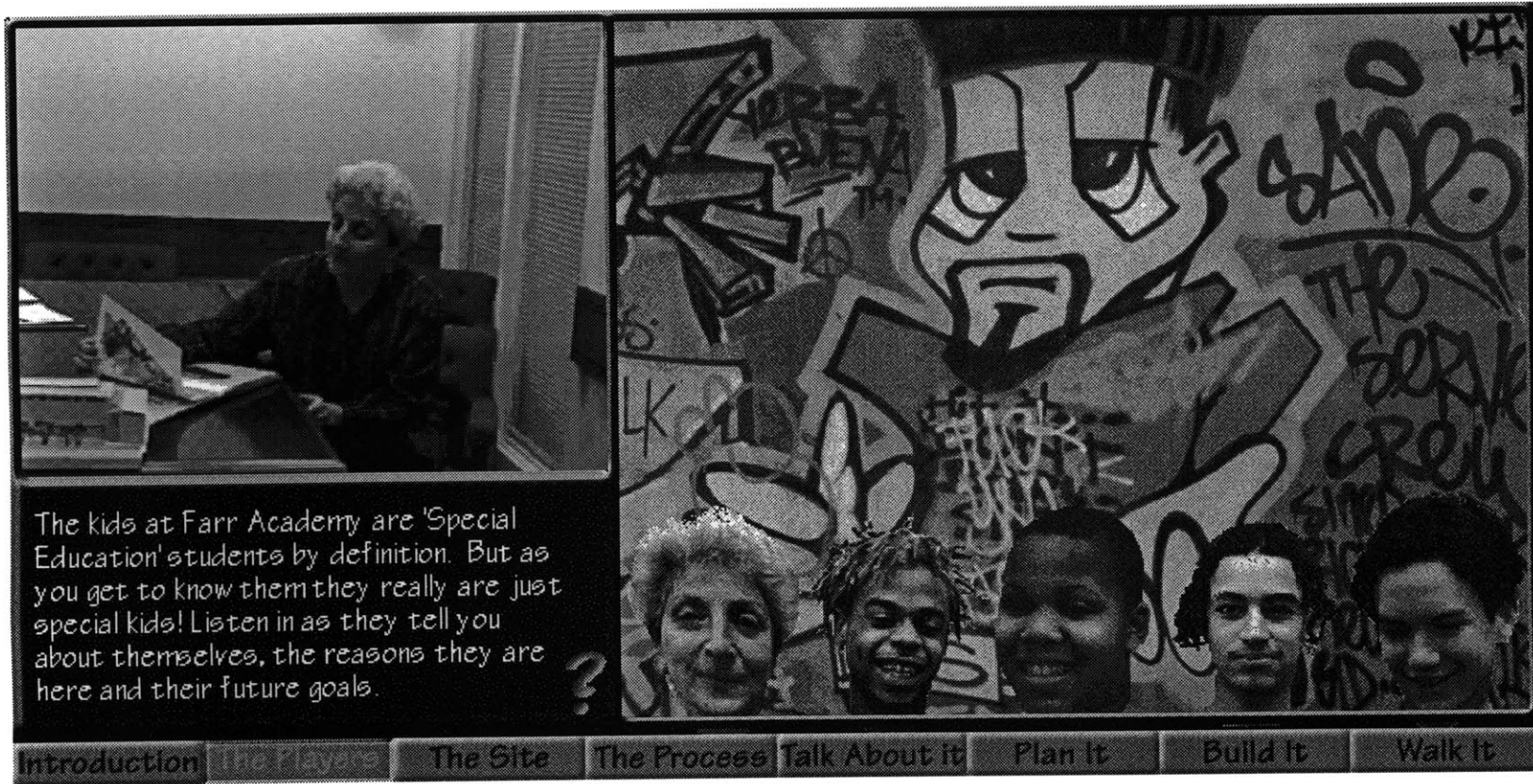
setts. This story, unlike the Dateline spot, disturbed me, making me realize how important it was to get my point across about special education. The story portrays a shockingly negative attitude towards learning disabled students. I chose to include this clip, since as I thought about my introduction screen, I saw it evolving into a debate between the different sides of the special education issue.

The next element within the screen is Tom Culhane, he is the principle and founder of a small special education school in Cambridge, Farr Academy. For this element I tried over and over again to use myself on video to explain what special education is and the issues it brings up. I wanted an introduction to the introduction screen. I had in mind the fire side chats from Master Piece Theater as an example. However, after numerous tries I realized that even though I was the one designing the building and had interacted with these students first hand, I was still not an authority on special education. For several months I had been working with the students and faculty of the Farr School. Since their help in the project was so integral, I asked Tom Culhane, director of the Farr Academy, if he could do my "fire side chat". Tom couldn't have worked out better. He covers all the important issues needed to preface the rest of this presentation as well as those of John Silber and Corla Wilson Hawkins.

Someone viewing this screen may choose Tom's story first. His story leads the viewer into my presentation, by giving first hand accounts directly from people involved in special education.

Also on the introductory screen, mapped behind the characters is a slide show comprised of images of the students and teachers in action. The purpose of this was to allow the viewer's eyes to wonder around the screen as he or she watches and listens to the main characters' stories. I believe that by giving viewers added information at the same time as the main movie is playing, I am more likely to hold their attention. This is a strong advantage to multimedia presentation. I am able to sculpt my own virtual dynamic environment for the viewer to become immersed in.





## The Players Screen

One of the most interesting parts of designing the school was the interviewing and teaching of a small group of special education students at the Farr Academy. I was lucky enough to not only meet these kids, but also to get to know them and their interests, lives and goals. This screen allows the viewer to peek in on some of the meetings I had with the students. Use this screen to be introduced to four of the students and their teacher, Bonnie Culhane.

This was one of the first screens I worked on. While designing this screen, I decided that the interface would work better if the buttons were designed to show what they were for graphically. In this case, the buttons are the faces of each of the special education students. This gave the effect of making them similar to a collage element in the scene. Behind them, in this interactive collage environment, is a slide show that displays various images of the school and graffiti art work by similar youths.



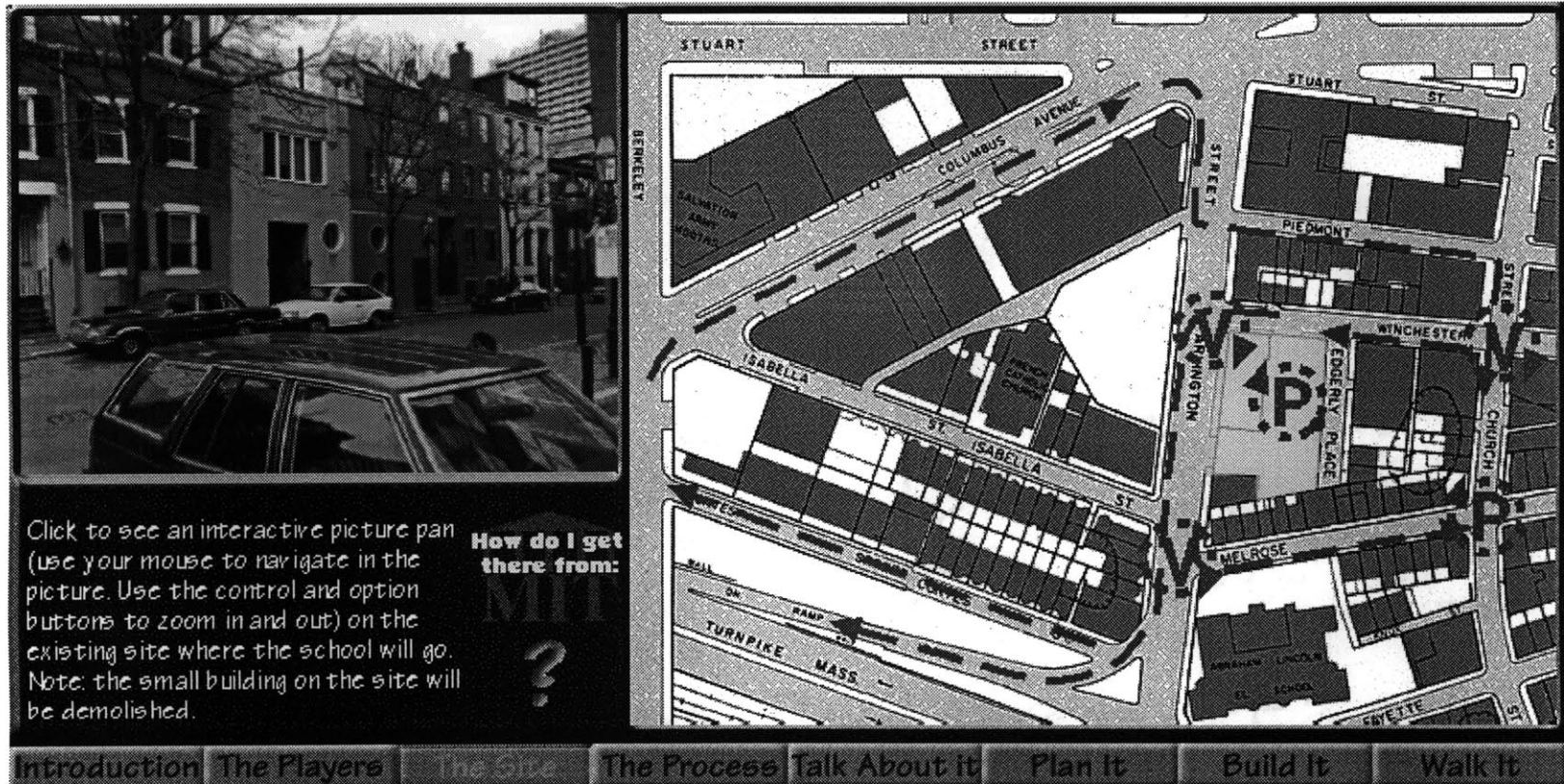
Originally each slide show image was like a giant button. If an image interested the viewer, they could just click on it and it would navigate them right to the appropriate location or scene of the presentation. The problem with this method was that in my beta testing I found that people would unwittingly click on the background and be launched to another location. Users said that because they did not expect to leave the scene, this made them feel lost within the presentation. After the testing, I removed this feature. However by doing so, I learned that my other buttons were confusing because they looked more like people than buttons (indeed they were!).

At this point, I made the buttons do two things when the mouse was just over them and not clicking downward. When placed on one of the students faces, they start to pulse in and out giving a warbling appearance. This is my way of denoting a clickable button. Also, while the mouse is over the button, a string of text appears in the lower left hand portion of the screen. This text is a description of the button's function, allowing each to be self-describing.

Most multimedia presentations use a standard looking button. These buttons are usually based off of buttons we may find on machines in the real world. These buttons are usually nondescript and can detract from the aesthetic layout of the scene. By using people as buttons, I am able to integrate them into the layout. The effect in this scene is that they become elements in a collage. This method allows me, as a designer, to worry more about creating a visually appealing layout than a lot of confusing buttons. Most importantly it creates a

visually appealing collage on the screen for the viewers. The goal is to keep their attention fixed to the environment and immersed in the presentation.

The video for this scene was filmed over a period of two months while meeting with the students and discussing my design for this school of special education. The "Talk about it" screen also contains footage recorded at these same meetings. All the footage was edited out of hours and hours of video, so that each clip I used was in answer to a specific issue brought up. In some cases I had duplicate responses from the same person in response to the same question. I wanted to allow the user the ability to see both versions. For example in this scene, there were two videos of Vinnie, describing himself and his goals. Instead of having two buttons for each clip, I have attached a randomizing algorithm to the button that calls up one movie and when clicked on a second time pulls up a different one. This adds a new level of dynamics to the presentation, making it harder to have the same exact experience two times in a row within one screen. It also keeps the presentation simple, by limiting the number of buttons.



## The Site Screen

The site screen was essential to helping the viewers locate the project within the context of the Bay Village area (in Boston). I wanted the viewers to see the type of neighborhood that the proposed school was to be located. I felt that the best way to let them experience the site was by allowing the viewers to drive down all the streets and see it first hand through the eyes of my video camera.

While on the site I also took photographs of the actual

site and a typical street corner. I took the pictures by standing and rotating myself, while snapping pictures in a circle until I got to 360 degrees. I then took these photographs and digitized them into the computer and composited them together to create one seamless panoramic picture. Then by using Apple's Quicktime VR technology, I wrapped the image around a virtual cylinder. By allowing the viewer the ability to rotate within this cylinder, one gets the feeling of being on the site and able to

turn interactively around, looking up and down, or zooming in and out. These virtual reality panoramas help to station the viewer in the site and give the viewer a truly immersive experience.

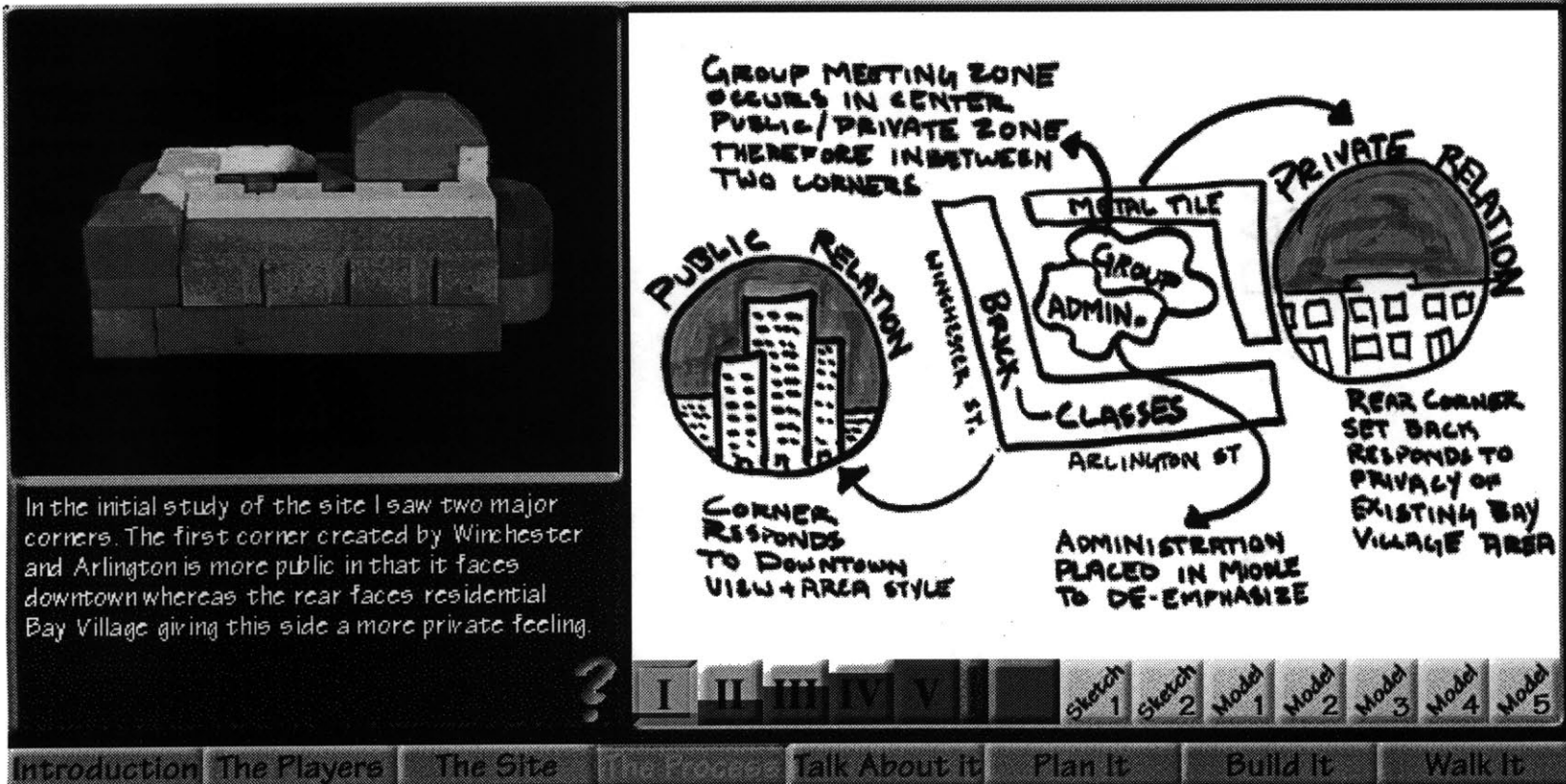
Once I had all my video clips edited into separate driving and walking paths, and I had attained all of my Quicktime VR files, I was ready to start authoring the site screen. I decided that the best way to navigate these multimedia ingredients was to use a typical site plan that showed the streets buildings and sidewalks. By placing arrow paths on the picture, I was able to denote a particular video clip that the user could opt to watch. Keeping with the format of buttons for the rest of the presentation, I now had to decide what these buttons should do to denote their "buttonness". I chose to send a red dot travelling along the arrow paths to show the path as well as the direction of intended travel. Now, when the user places his mouse over a path, the path dot activates and the red path turns green. To further root the viewer in the interface, he is also given a text description of the video path, before and during viewing of the clip.

Next, I needed to come up with a descriptive icon for representing a Quicktime VR panoramic. I also had a few video clips where I literally pan the camera in a circle, but it is not interactive like a VR file. I chose to use a "V" with a dotted circle around it for the video panoramics and a "P" with a circle around it for a Quicktime VR panoramic. "P" stands for picture based (because it is composed of photographs). These two icons needed to activate when the mouse was over them, so I used the red dot again here, except that this time it traveled indefi-

nitely in a circle. These buttons, like their video partners, also give a text description.

After this detailed explanation of the site, I realized that I needed to explain exactly where the site was in the larger context of Boston. Since this thesis is for MIT, I chose to show the viewers how to get to the site from MIT. Here I shot video out my car while driving to the site (someone else was driving). I then went back to my studio and cut the video to a song appropriate for driving and added the "how do I get there from MIT" button to the scene. Now when the user clicks here, the edited drive to the site cues up and plays.

The Site screen is one of those scenes with too much information on it. This is the advantage to a CD-ROM over other formats. I can give the viewer a wealth of information and leave it up to them to edit in or out what they do or do not want to see. The importance of this method of disseminating information allows one to feel more involved in the presentation. When the viewer is in control, they feel more compelled to continue. By placing control bars beneath all of the movies, I allow the viewer to perhaps fast forward down one of the streets (maybe they are in a hurry). Many multimedia presentations are still linear in fashion, like a movie. If someone starts to watch a movie and doesn't enjoy it, they will just stop it and eject it. With this type of multimedia, I can allow differing levels of interaction and allow the viewer to bounce. This bouncing metaphor, unlike the linear one for a movie or film, is dynamic. It is more engaging because when it is not interesting to the viewer they can move on - on to anywhere.



## The Process Screen

The process screen was essential. I needed to show that it is possible to include analog information in a digital presentation. Analog information being drawings, models, sketches, and anything that we are accustomed as architects, to see in our original real world format. This task was daunting to say the least. By scanning in all of my sketches and drawings, I found that I had to decide on one dimension and orientation for all of my sketches. Now, I needed to take these images and organize them

into sections that would allow me the ability to present a small number of buttons for a large number of drawings and models.

After a few early attempts I decided that the design process I used could be broken down into five stages (roughly). Each stage need to be different from the previous and next stage, but still had to show an evolution through the design. So that as one stage is viewed, the

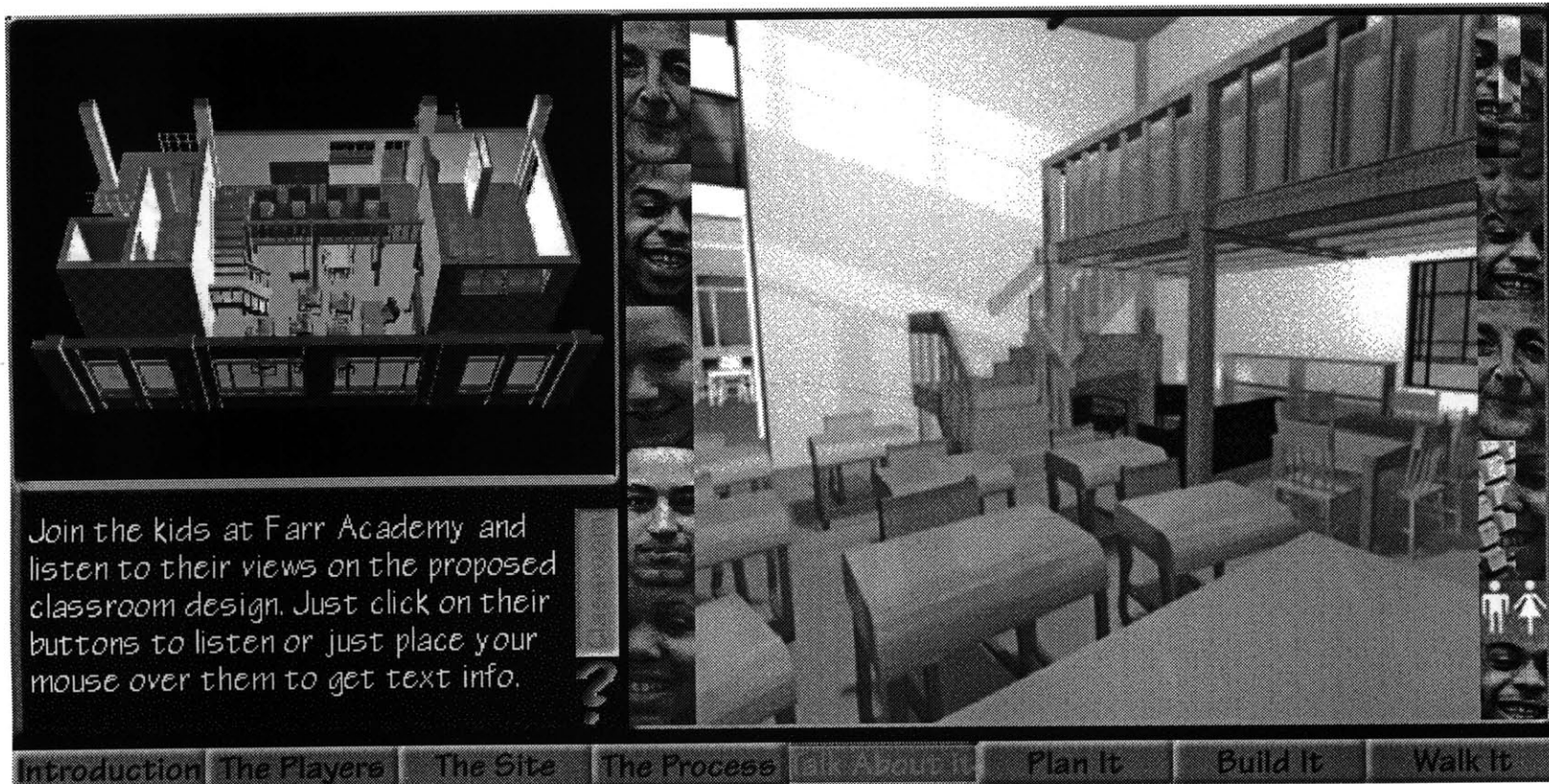
next stage should appear to be directly influenced by the prior stage. For example, if one looks at the colored foam model in stage one, and then looks at the next stage, a direct transition between the two will be evident. The small tower coming up is in the same position. A curved rear cafeteria is still a curved wall, but a bit more defined. This allows the viewer to see my early and later drawings and get a good feel for my design process.

This was becoming a powerful screen, but it needed to be more. I needed more than just pictures of models, I needed them to be three-dimensional. Drawing scan and represent themselves nicely on the screen. Drawings indeed are two dimensional entities as is the screen of the computer. Models are so much more. In real life when we view a model we can turn it around and feel and see its existence- we interact with it. I needed my models in their digital format to have the same type of interactivity.

Again I used the Apple Quicktime VR software. I went to a kitchen supply store and purchased a plastic "Lazy Susan" and spray painted it black. Next, I bought a piece of black velvet and laid it up against the intersection of a wall and a floor in my studio. Placing the model on the black cloth on top of the Lazy Susan allowed me to keep the camera still and the object (model) rotating. I snapped pictures of the model through each step in what became a full 360 degrees worth of photographs. I then converted these sequential frames into a quicktime movie and then into a quicktime VR object. Now my models were interactive and three-dimensional.

The screen was evolving itself. I had created a virtual pinup space. It was this screen that allowed the analog to coexist in the digital realm. Due to the playback speeds of today's CD-ROM's and computers, I am forced to reduce the resolution of all the images contained within this CD-ROM. It affected this screen the most. I know that in future systems this will not be an issue. One could imagine that it would be helpful to be able to zoom in and out of these drawings, in order to see the details.





## The Talk About It Screen

While teaching and interviewing the students at Farr Academy, I learned that they had the most to say about the design of the classroom. We started by looking at plans, sections and elevations and small scale study models. I quickly learned that the students had trouble understanding the building from these items. After a lot of explaining and attempting to discuss with them exactly what made this classroom design different, I finally decided they needed better visual aides. I built a large scale model

of the classroom (1 inch = 1 foot). I constructed and used doll house size furniture and even added the doll house dolls to the classroom to help give a better sense of scale. It worked. For the following two sessions, the students not only understood the classroom design, but started to better comprehend the drawings and models they had seen earlier.

The students gave me all sorts of helpful feedback on

the design of the classroom. This screen not only lets you see these special education students in action, but also lets you get a good understanding of their needs for a specially designed classroom. Later the students got a chance to see the computer animations and walk throughs of the school. Their reactions were astounding, all of a sudden the students were having a debate on layout of the school. I learned that it takes a lot of initial effort to get through to these kids, but once you have sparked their interest, they become incredibly involved and absorbed in the learning activity at hand.

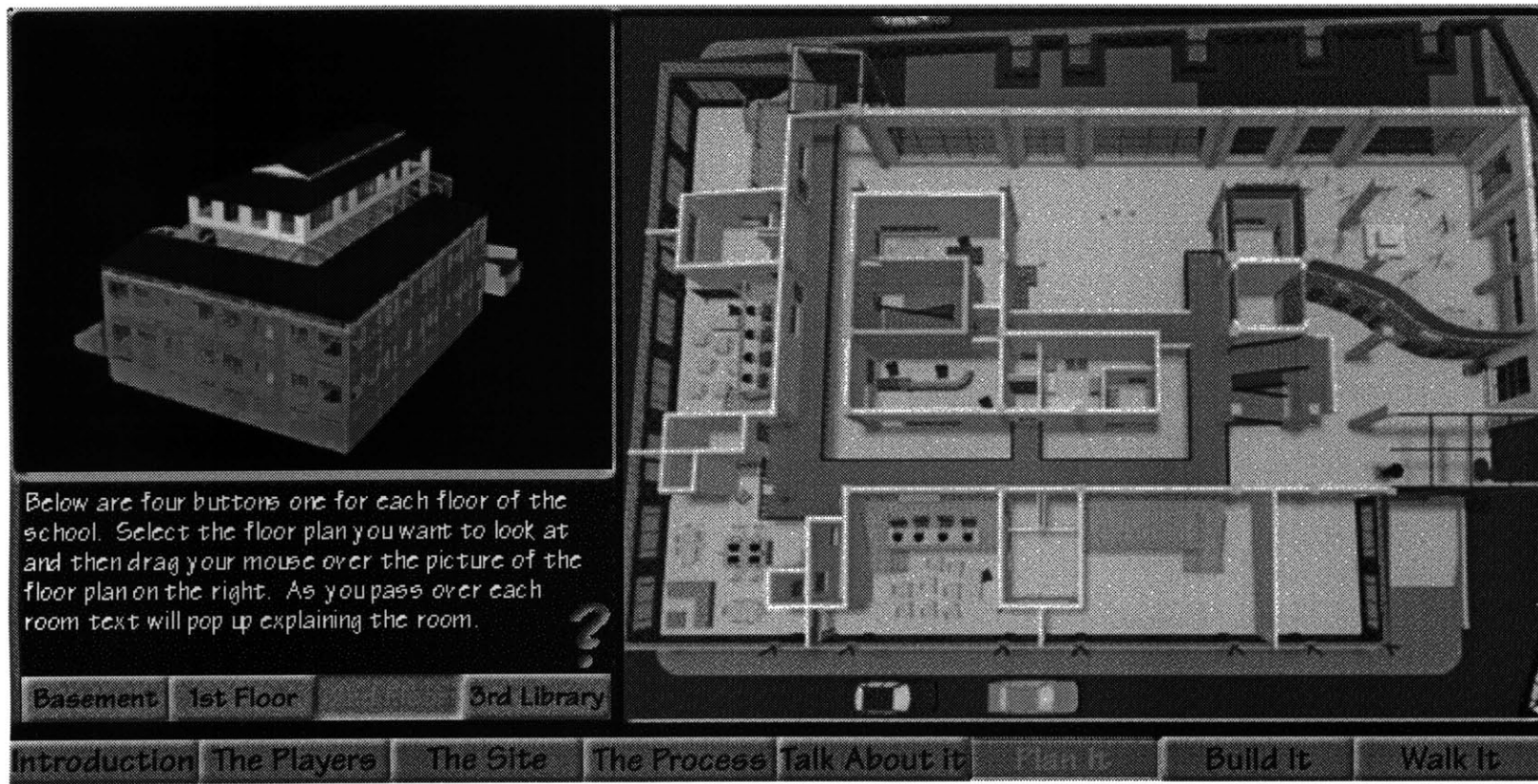
When designing this screen I wanted to capture several important concepts. First, I wanted the screen to help the viewer completely comprehend the classroom. Second, I wanted the screen to portray the special education students commenting on the design. I wanted the students to be the guides, sharing their viewpoints on the design with the viewer. Third, but most importantly, I wanted the viewer to see that they really are just normal kids (with special problems).

To do this I divided all the video footage into clips that comment on a particular aspect of the design. I then found that each clip was utilizing a specific student and a specific issue that was at hand. I chose to make the buttons that pull up each clip be as descriptive as possible. I designed each button such that it not only pulled up a text description, but also the graphical appearance might suggest what each clip is about. For example, there is a clip where Vinnie tells of his seven month old daughter and the possibility of day care in the school. To make

this button graphically descriptive, I put a picture of a baby with his face. To further enhance this effect, I added the noise of a baby screaming, when the button is clicked.

The buttons were an important element in the screen, but I needed more, I needed visuals of the classroom. When the students commented, the viewer needed to see the classroom they were discussing to help root the viewers in the current topic. I did this by taking a series of 50 still images of the classroom that, when cycled like a slide show in the background, create the effect of walking through the classroom. To further this I added in a button labeled classroom. When the viewer clicks here a completely virtual model of the classroom is loaded. The user can take this model and rotate it in any direction to further his knowledge of the classrooms layout.

4



## The Plan It Screen

Beginning with this screen, the information presented is purely digital. Meaning that, all the images are generated by the computer. The “Plan It” screen holds a view of each of the floors in the system. The viewer is given the option of being able to cycle between all four floors of the building. Once the viewer has chosen a floor, if they drag the mouse over a space in the building, a text description comes up explaining the particular space.

The students at Farr Academy had trouble envisioning the design three dimensionally from looking at standard floor plans. I learned from this test that it was essential to my viewer that the plan be represented clearly. This did not mean doing hard line drawings on mylar sheets and scanning them in. This meant that I had to represent a plan known typically as a two dimensional slice of a building into a three dimensional virtual slice of the school. Yet it was important that it still acted as a plan does by



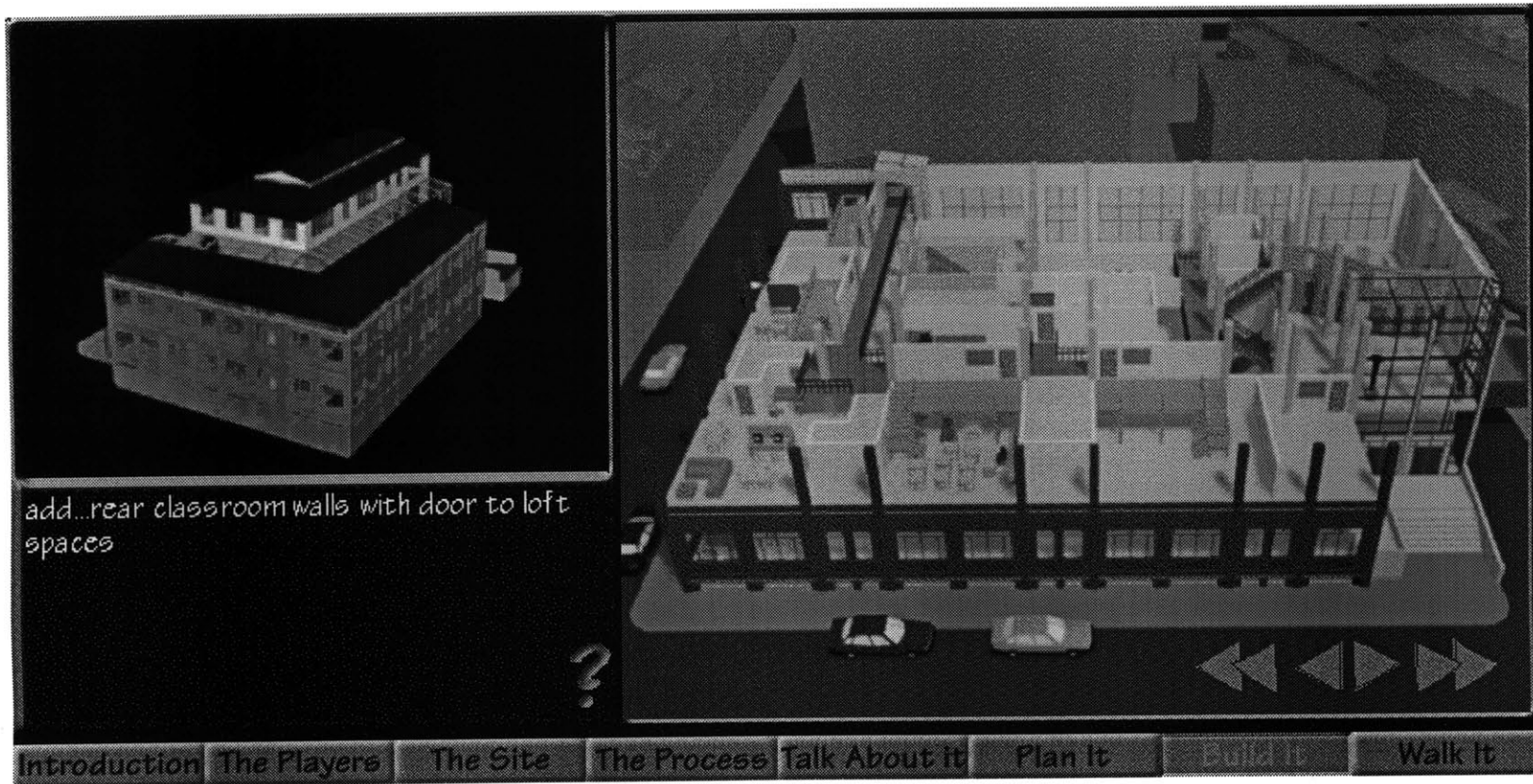
showing the proposed layout of a floor.

Taking advantage of the computer, I needed the plan to communicate in an interactive way with the viewer. By breaking the pictures of the plans down in to their constituent parts, I was able to attach a definition to each space. For example, I would carefully cut up a plan so that I was left with a jigsaw puzzle of rooms, corridors, stairs, and elevators. Then I would reconstruct them on the screen and attach a string of text to each one. The ending result was that now the viewer could do more than just look at a plan and try to understand it. Now, they could just touch the room that they wanted to know more about to receive more information.

In a perfect world I would have had more time to devote to this project. Had I found the extra time, it is perfectly possible to have each room come up with more than just a text description. An animation or Virtual Reality Panoramic could instead appear giving the viewer the ability to pick and choose which room they want to experience. The drawback was the time involved in setting it up so that every space had a matching “experience.” This would require me to render out a panoramic for each puzzle piece I used. I used over 110 pieces; that’s a lot of rendering time.

The screen holds a singular view to the plan so that you can’t rotate it. This is one drawback to a three dimensional representation, its perspective falls off because you are viewing it from a different point of vision. Being aware of this, I opted to use a virtual model of the entire school building in the upper left portion of the screen.

This virtual model allows for complete rotation and exploration. It is the same as a real model except that its not! The advantage of this model is that now the user is able to see a direct relation between the plans and the virtual model via direct comparison, thereby giving them a better understanding of the school design.



## The Build It Screen

Following the “Plan It” screen I needed something that allowed people to better understand how a building is put together. I wanted to allow people to see the creation of my school one step at a time. The “Plan it” screen successfully allows people to understand the layout of the school’s floors, but it leaves out the parts. In this screen I wanted to address the actual creation of each floor. All buildings are made up of a series of walls, columns, beams, floor slabs, etc. All buildings are also made

up of doors, windows, furnishings, railings etc. How could I express the construction of each of the parts big or small, so that the viewer would completely understand the buildings parts as well as its layout.

From the very beginning of this project, I knew I had to construct my three dimensional computer model with this in mind. As I started the modeling, I came up with an advanced yet clear system for modeling out the layers of

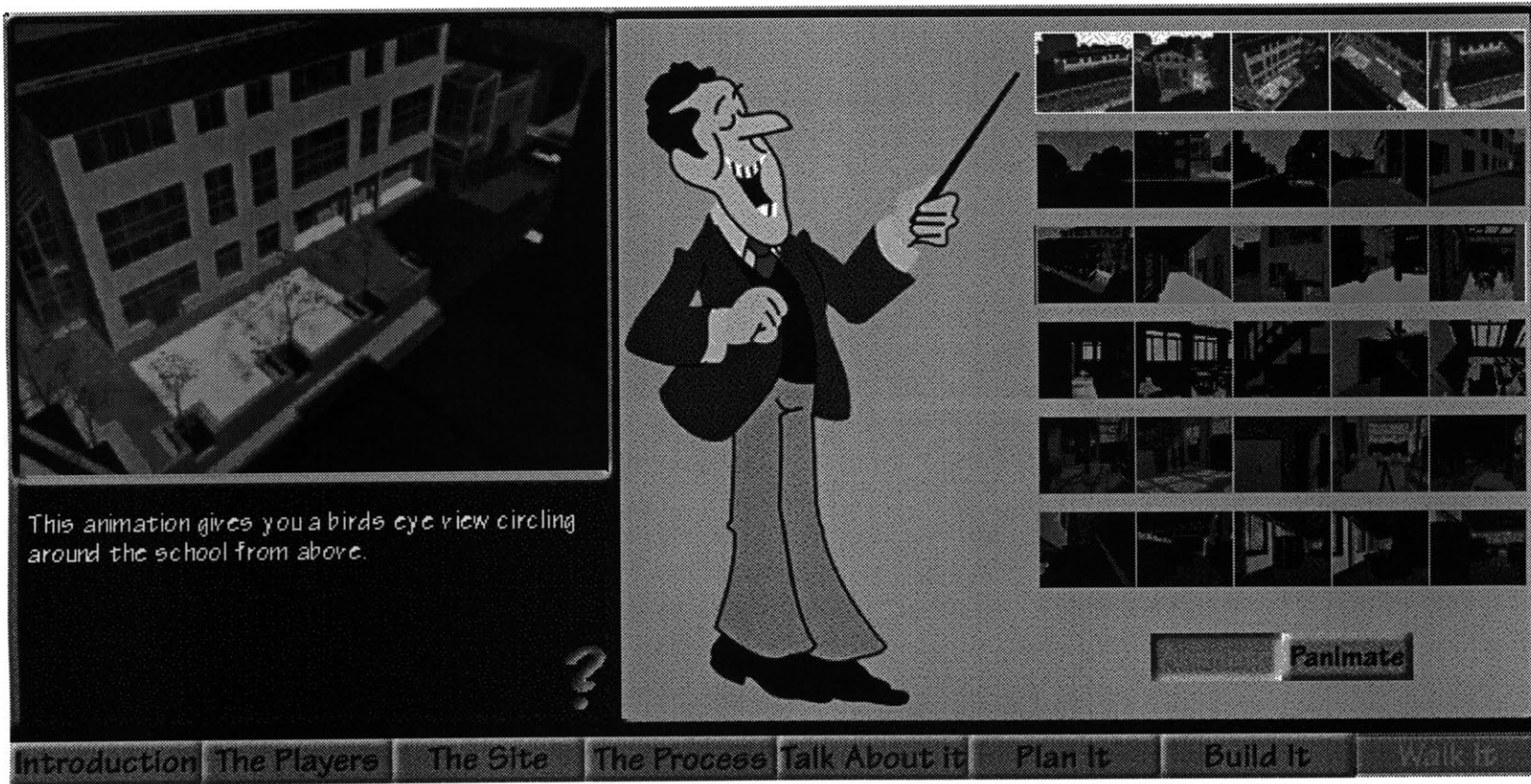
the project. First, I had four sections, one for each floor of the building. Second I broke each floor up into the rooms on that floor. Third (and this is where the number of layers grew), I divided each room into its final parts -- furniture, windows, back wall, front wall, doors etc. By the time the model was complete, I had 272 layers.

After this model was done I had the task of rendering out each of the 272 layers, so that I was left with 272 parts. I basically had a giant bunch of three dimensional parts, which when put together in a very specific way would form my entire school design.

The trick was how to present this to the viewers, so that they can not just watch the creation of my school, but also interact and be able to see how each part fits. They had to be able to back up or move forward. Whenever necessary in order to help them see how the building, my school, goes together like a giant 3D puzzle. After all a building is like a giant puzzle made up of a bunch of puzzle pieces.

I believe that the "build it" screen accomplishes what I wanted it to. I made it simple and clear. There are only four buttons for the user to navigate. A green arrow pointing right allows the user to click forward adding one puzzle part for each click of his mouse. As a piece is laid in its appropriate place, a brief text description will pop up. This text explains not only what the part is, but also tells the viewer what its material properties are. For example, as it lays the concrete slab that will hold the first floor, it tells us that this piece is cast in place during construction and that it's made up of poured concrete with steel reinforce-

ment. Once I had completed this portion of the screen, I realized that the screen was wonderful for a step by step construction of the building, but it needed more. I wanted the viewer to be able to animate the steps into a movie, like a time lapse film of the construction of a building from ground up. The beauty of this is that when played in reverse, it would be a movie of the de-construction of a building from ground down. I added two more buttons, each with a double arrow (like a fast forward button on a VCR), one pointing left, the other pointing right. The right double arrow moves the viewer forward (construction) as in a movie and the left moves you back (de-construction). Now the viewer is given the choices. Whether they chose to step forward or "fast forward" to construct or step backward or "fast rewind" to de-construct, they can now understand the parts and the construction of the school.



## The Walk It Screen

The “Walk It” screen is the finale in many ways. It was the last screen I did. It is this screen’s intention to take the viewers previous experiences of the prior seven screens, and end it with a truly virtual representation of the school. I called the screen “Walk It” because it allows the viewer to go on a series of paths and literally walk through the spaces. It was important that viewer had seen the previous screens, because now their own ideas of how the school would look can be answered.

I broke this screen down into two main parts. There is the animate section, which is like the video paths on the “Site” screen. And there is the panimate section, which contain virtual Quicktime VR files. Both of these types of files are similar to the quicktime panoramas seen on the “Site” screen. The difference between this scene and the “Site” screen is that the paths and panoramas here are all computer created.

The interface was difficult to decide on. I wanted it to be similar to the "Site" screen, except that I wanted there to be paths through the building that the user could click on to access the paths. The problem with this method was that the paths I had for animations were more dynamic than the video paths I had shot with a video camera. Unlike the animation camera, the video camera is limited. The video camera is limited to my body and where I can carry it to. The animation camera can fly. The video camera can still only fly as does a helicopter, whereas the animation camera can fly like nothing you have ever seen before; it is not limited by drag or gravity, only by my imagination. Because of this, I could not keep the camera traveling like a video path. The "Site" screen represented things two dimensionally because my video paths were all filmed at ground level (one plane). Because of this I needed to rethink the interface's representation of an animation path.

I decided to represent each path as if it were a contact sheet for film strips. A contact sheet represents sequential shots in short filmstrips. The difference is that I am representing motion not thumbnails of still images. But, since animation (like a movie) is made up of a bunch of stills, I could grab key frames from the animation and represent just those frames in sequential order. So the first frame of a strip is the first frame of the animation. The last frame is the last frame in the animation. The middle frames represent even increments of middle frames in the animation. I felt that this representation is clear and simple and allows the user to get an idea of what the animation path will be before choosing to watch it.

For the animate section of this screen I had already committed to a layout that was working. So instead of using a map to locate the virtual reality panoramas, I wanted to use the contact sheet metaphor that I had created for the animations. Since my panimations or Quicktime VR files are actually two dimensional representations wrapped around a cylinder, I took advantage of this. By unfolding a quicktime VR file, one is left with a distorted view of the entire virtual space being represented. I used this picture as my contact sheet image to aid the viewer into deciding which one they want to see.

Both the animations and the panimations have text that comes up and describes the associated virtual images. To further tell people which button/contact sheet element they are over with their mouse cursor, I have added a visual aid. I placed a man with a pointing stick in the scene. As the viewer moves the cursor over an animation or panimation button, that button highlights and his arm moves so that he is pointing at it. Originally, I had designed this screen so that he would talk and explain each one verbally. The problem with this method was that as the user moved over each one forward and back again, the vocals would cut in and out before finishing as the mouse moved past each icon. The audio descriptions became a cacophony of sounds as the mouse jumped between buttons. I opted to stay with the text descriptions. This also was consistent with the prior seven screens.

## The Future of Applied Graphics and Computers in Architecture

The underlying complexity of this presentation is important to recognize and understand. A multimedia presentation can beguile the viewer, making it appear as a simple undertaking. However, there is a great deal of work and a lot of technological power required in such a project. The parts that make up this presentation are analogous to the ingredients in a complex recipe. The recipe or presentation making is just one step. There is still, of course, the design of the school itself, but more than this, the creation of each ingredient is in itself a process. Doing the video work alone took months of filming, editing, compositing, compressing, and tweaking. There were four separate applications used just in the creation of the video. The process of doing this work today is still time consuming and at times tedious. Yet it can be done and is being done.

Technology, like a fine wine, needs to age. It gets better over time. There is not just the hardware and the software, there is more to our technology. There is a new field emerging; it is not one that is easy to define and many people don't even realize they are a part of this progression. It is the field of applied graphics, and just like multimedia, it's confusing. As our technology evolves, our ways of working in this profession must evolve with it, and they do. We see it today. Architecture offices are just starting to get the hang of Computer Aided Design software, and are actually utilizing it. Our drafting table has evolved and our ways of working have evolved. Ap-

plied graphics is an evolution of learning; it demonstrates how we can apply technology in new ways and how we can sculpt our machines and ourselves around our needs and future growth.

Our technology today in the field of Architecture is still in its infancy; it's a baby, and we too are babies in our evolution of learning how to utilize it. But we must evolve, just as our buildings and our forms have for centuries. Darwin didn't consider the computer when he talked of evolution. The future looks bright. Over time the software or the "tools" of our trade will start to change, to create products like this presentation, which are more attainable in the short run than in the long run. All the parts, I believe, will become much simpler and easier as our tools and our interaction with them adjust toward some goal which will of course always be changing itself--The cycle of life marches on...

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## **Illustrations**

All illustrations are by the author. Illustrations are snapshots taken from the CD-ROM portion of this thesis. CD-ROM is labeled "An Interactive Thesis by Adam D. Halem".