TEACHING IN A VIRTUAL CAMPUS AS A DESIGNED 'PLACE' IN AN ARCHITECTURE FACULTY

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ABSTRACT
The Faculty of Architecture at the University of Sydney has been using a Virtual Campus on the Internet for educational purposes since 1997. We have designed our Virtual Campus based on the concept of an online virtual world. A virtual world uses a spatial metaphor to design a virtual place that has functions comparable to physical buildings. Our Virtual Campus, therefore, functions as an extension to our physical campus. This paper summarises the present design and main uses of our Virtual Campus. The use of the Virtual Campus has been categorised into the following four areas: as educational environment in general, as an environment for Virtual Design Studios, as a place to study collaborative design and as an implementation to study design theory.

A VIRTUAL CAMPUS AT THE UNIVERSITY OF SYDNEY
In *Internet Dreams*, Stefik (1996) presents several metaphors that have developed around the concept and use of the Internet. Among these metaphors are the Internet is an information superhighway, the Internet is a marketplace and the Internet is a virtual community. These metaphors provide a basis and a direction for extending the Internet. The developments in virtual worlds as games and online environments for virtual communities have used many of the words and images of building design. This implies a conceptual metaphor of place that can be extended to architectural design and architectural education, leading to a virtual architecture.

The concept of virtual architecture has been developed in other contexts. Novak (1990) developed an 'instant' virtual architecture, free from the constraints of the physical world. However, this environment resulted in abstract forms and spaces, which tend to be disorienting and distracting. Anders (1999) has also commented on the use of abstract shapes for designing cyberspace. Schmitt (1999) highlights the use of 3D fake space to represent information about architecture.

In this paper we describe a specific application of virtual architecture – a virtual campus. Two primary uses of a virtual campus are online access to learning materials and a place for interacting with others. Providing a sense of place in which students are aware of the presence of others creates a learning community. We have experience in two types of online learning scenarios and their equivalent in traditional teaching: the virtual lecture and the virtual seminar. Experts in education methodologies have mixed views towards the efficiency of the lecture as an educational medium. However, an excellent lecture can be inspiring and it remains one of the most emulated models in online learning. The virtual seminar, in contrast to a lecture, is an online meeting to discuss a specific topic where the discussion is moderated. The major difference between the lecture and the seminar is in the expected roles of the lecturer/moderator and the students. In a lecture, students are expected to listen, take notes and occasionally ask questions. In a seminar, students are expected to come prepared to discuss a particular topic and they may contribute to the discussion as much as the moderator.

The Virtual Campus (VC) in the Faculty of Architecture at the University of Sydney (http://www.arch.usyd.edu.au:7778) is an online learning

environment that supports both real time interactions with others on the campus and access to learning materials (Maher, Skow & Cicognani 1999). The gateway to the VC is shown in Figure 1. The VC is designed to behave in a similar way to a physical campus. The VC, as a function-oriented non-recreational Virtual World, adopts a physical campus metaphor for its design. The VC is normally intended to be a functional extension to the physical campus. Firstly, the VC as a Web media enhanced environment reinforces the information intense education activities in the physical campus. It works as a material assistance to the physical campus. Secondly, VC can form a learning community in its own right.
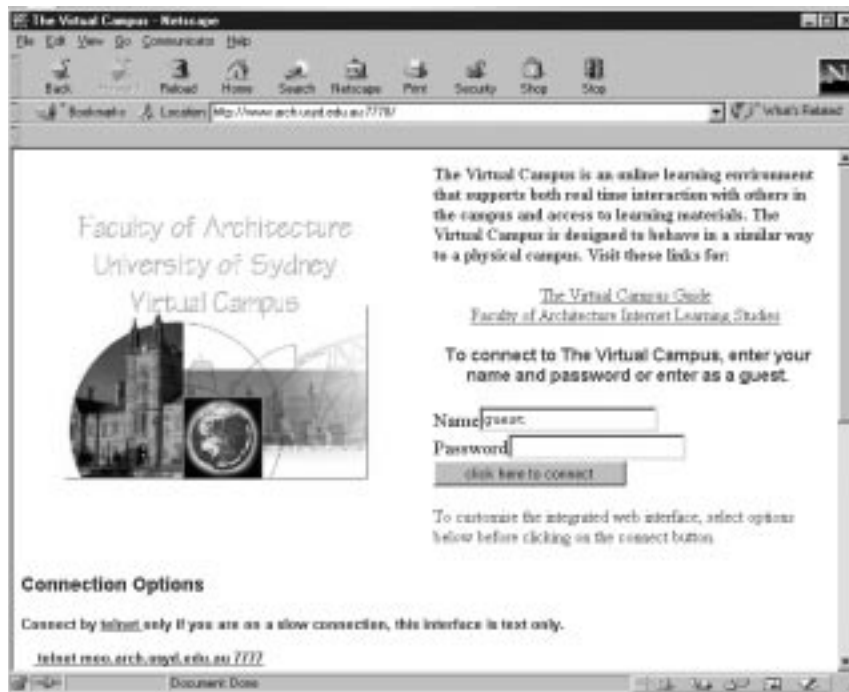

Figure 1. Virtual Campus in the Faculty of Architecture at the University of Sydney

We currently have three types of learning modes within the VC (Maher 1999a):

1. Augment traditional lecture-based teaching with online learning materials and communication.

For this purpose, we use the VC as an extension of the lecture-based teaching in the physical campus. The VC serves as a Web media enhanced assistant to the lecturer and students alike. Students can get access to learning materials related to lectures, as well as participate in Web-based communication.

2. Support project work that follows an intensive face-to-face learning program.
   In the VC, we have set up the mechanism and facility that prompts the students' participation and involvement. We take advantage of a Web-based virtual world system to form a learning community that encourages education as group learning activities.

3. Provide distance learning with all interactivity and materials available online.
   We are also seeking ways to construct an E-learning, course-based system solely for online use. Students from all over the world can register and set up their own study plan in this fully interactive Web media learning system anytime anywhere.

THE VIRTUAL CAMPUS AS A DESIGNED 'PLACE'
The VC started as a pilot virtual environment in 1995 for a virtual design studio called StudioMOO. It is based on a text-based MOO (Multi-user Object-Oriented) system (Maher 1999b; Cicognani 1998). Now the VC has been developed into a composite and assorted education and learning complex in both functional and implementation terms.

The VC is an example of function-oriented virtual worlds. It is for non-recreational use (Curtis *et al.*, 1993). Like many popular virtual worlds of this kind, the VC is designed using a physical place metaphor, or more specifically, an architecture metaphor. Other examples of virtual worlds using the place metaphor are illustrated in Figure 2 and described below.

- Tappedin (http://www.tappedin.org:8000)
  Tappedin resembles a conference centre to evoke a professional atmosphere and encourage the kinds of discourse one would find at a conference facility or institute. Image maps of graphical layouts of floors, wings, rooms, lobbies, *etc.*, reinforce the spatial metaphor. An elevator is used to move the user vertically within an office building with the upper part empty for new users to occupy.
- Virtual U (http://www.vu.vlei.com/)
  Virtual U uses the buildings in a university to arrange the activities and the materials needed for a campus learning environment. It uses images of the 3D landscape of the campus to orient the user. It also uses the images of the 3D formed visualisation of the workplace appliances to represent
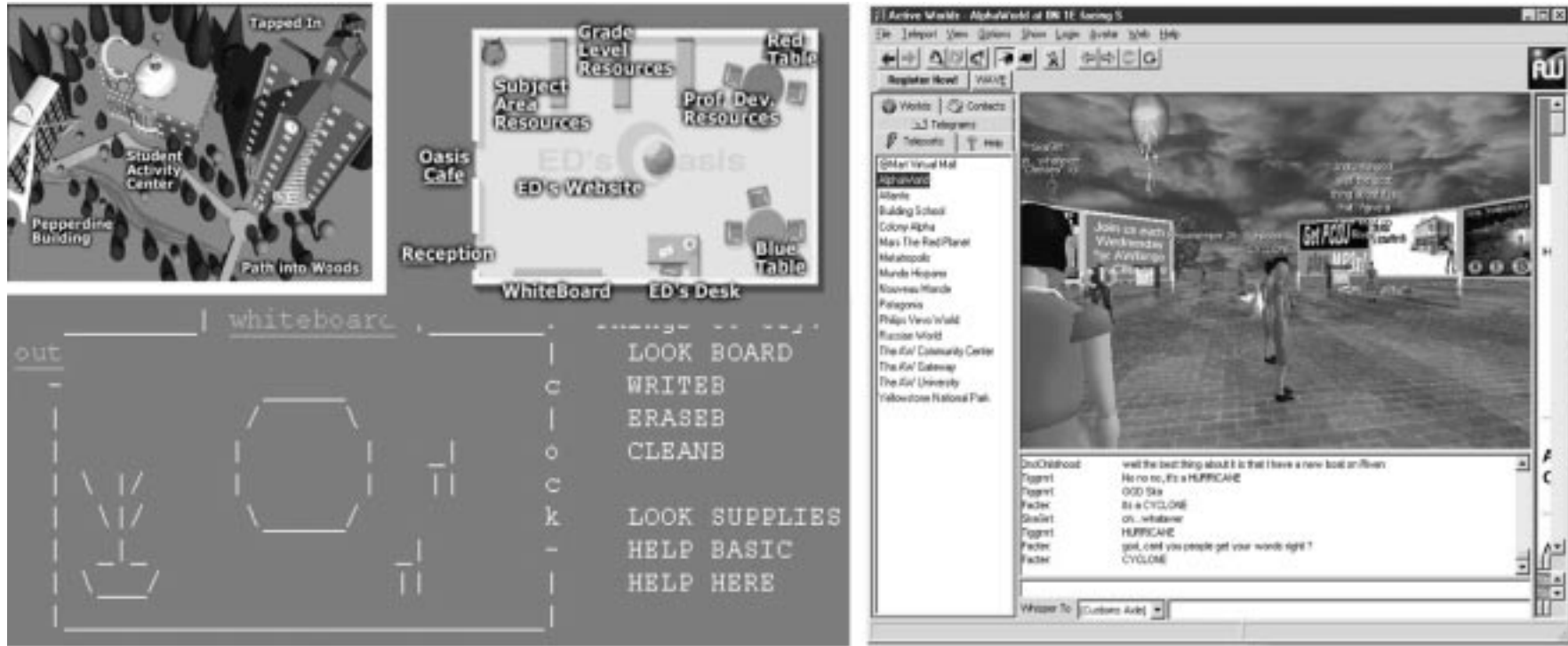
Figure 2. The design of virtual worlds as 'places'.

functions and activities.

- ActiveWorlds (http://www.activeworlds.com/)
  ActiveWorlds is a 3D virtual worlds system. The whole system is a universe where the user can connect to different worlds. A world is a given size, virtual, geological territory surrounded by the panoramic horizon image that gives a world illusion. The territory has 3D models of buildings and landmarks that users built with the provided building blocks and modeling tools. In ActiveWorlds, a 3D world is the basis for the users' exploration. The basic functions of the world are talking and building.

- VWorlds (http://www.vworlds.org/)

VWorlds is a virtual worlds software platform developed by the Microsoft research group. The virtual worlds system based on VWorlds can mix the 3D visualisation with the function of the place by implementing object inheritance.

We have trialed a variety of online interactive software platforms, including Teamwave (http://www.teamwave.com), ActiveWorlds (http://www.activeworlds.com), and conferencing facilities like NetMeeting (http://ww.microsoft.com/netmeeting). Currently, we are using WebCT and ActiveWorlds for course facility and virtual design studio respectively. However, we based our VC on the original StudioMOO because it provides a persistent place and community in an online environment (Cicognani 1998).

Virtual U

VWorlds

Figure 2. The design of virtual worlds as 'places'.

Active Worlds

Figure 2. The design of virtual worlds as 'places'.

The interface of the VC that adopts 3D visualisation is shown as Figure 3. It shows that the VC takes a building and room metaphor and resembles physical places. It provides a familiarity that is needed for organising information, navigation and communication. The VC, as design places, adopts the consistent use of a physical place metaphor. The benefit of doing so is that it helps students to understand and interact with the VC based on their physical experiences. The experience and knowledge of a familiar world can be a useful basis for figuring out the subjective experience of an unfamiliar one (Lakoff & Johnson 1999).

THE USE OF THE VIRTUAL CAMPUS FOR LEARNING AND FOR RESEARCH

The VC has been the basis for a learning environment and for research in virtual design. We present these aspects of the VC in four parts:

1. The VC as an educational environment in general
2. The VC as an environment for virtual design studios

Figure 3. The Virtual campus as a designed virtual place.

3. The VC as a place to study collaborative design
4. The VC as an implementation to study virtual place representation

VC as an Educational Environment

Students enter the VC using a Web browser that places them in the 'Main Hall', a place similar to a physical building of a typical architecture faculty. Then, from there they can go to a required course workroom or anywhere that is accessible. They can also go to their own office that they designed for themselves. From the Main Hall, places in the VC are grouped according to functions into five categorises. They are Offices, Classrooms, Resources, Professional, and Conference. For lecture-based courses, students go to a Classroom. Unlike the physical world though, each course has a separate room. At present, the courses that are taught in the VC are:

- AutoCAD – Introducing AutoCAD 2000 through tutorials and a modelling project.
- ArchiCAD – Introducing ArchiCAD 6.5 through architecture design projects.
- Hypermedia – Introducing the effective design of Web sites.
- Digital Communications – Presenting the methods and tools of Digital Communications needed for collaborative design.
- AI in Design – Introducing knowledge, background and theories for understanding and modelling design.
- * Virtual Architecture - Developing and extending the knowledge of virtual architecture as simulation and as functional virtual place.

A classroom, for example Virtual Architecture, is illustrated in Figure 3. The first thing a person sees when entering the room is the description of the room in text, 2D or 3D forms. In this part, there are links of available related materials for learning. There is also list of people in the room. The people normally appear in a virtual identity, which prompts the participation of students. The awareness of other students helps to form learning communities. The course is commenced in the communication part, referring to the lower part of the room interface in Figure 3. In this part, people send messages to each other in real time. Other forms of asynchronous methods, like message boards and email, then complete this method of communication. On the left part of a classroom, there is a column area that lists the icons of several Web applications. These applications are tools appropriate for a classroom like a slide projector and a whiteboard. Among them there is one that links the classroom to a course material extension – WebCT, see Figure 4.

WebCT is a dedicated Web software package targeted at delivering course material as Web pages. In addition to Web pages for course content, it provides many tools for learning such as a Calendar, Bulletin Board, Course Content, Submissions and Online Quizzes, as shown in Figure 4.

VC as a Virtual Design Studio
The most direct use of the VC in an architecture faculty is a virtual design studio (VDS).

The use of a VDS in our faculty dates back to 1996 (Maher *et al.*, 1996). At that time, students used the World-Wide Web and video conferencing for the collaborative development and presentation of their designs.

With development of the VC in both technology and design, the concept has been expanded in our VC into the following aspects:

1. As a collaborative architectural design exchanging and practicing environment
2. As a reference to understand the design of Virtual Worlds.

Figure 4. WebCT-based course and course materials.

3. As an environment to design virtual entities in a virtual design environment, for example, virtual architecture.
4. As virtual architecture modelling tools, for example, in the VC's Active Worlds extension (http://www.arch.usyd.edu.au/kcdc/aw/). Active Worlds as a 3D environment with modelling and design tools to help architectural students to collaboratively model physical architecture and virtual architecture. Figure 5 shows the virtual architecture office in the Active Worlds.

VC as a Place for Studying Collaborative Design
The VC has also been used to study designers using computer-mediated, collaborative environments (Maher, Simoff & Cicognani 1999; Gabriel & Maher 1999). These studies consider the difference between working alone and working collaboratively using communications and modelling tools.

One study analysed the design activities in the VC that are based on the place metaphor (Maher & Simoff 2000). The VC differs from other collaborative design environments

that use a desktop metaphor. The VC not only creates a sense of place but also creates the identity of the people in the place. In a physical studio, a person's appearance, personality, and knowledge become known through the interactions in the collaborative design. In the collaborative design activities in the VC, the designer appears as an avatar in the virtual place. The study considers two approaches to developing VC as a collaborative design environment: the design office and 'designing in the design'. The design office approach involves the development of a virtual design office that facilitates the collaborative design teams. Designing in the design involves the development of the collaborative architecture design in the virtual model of the designed architecture.

VC as a Study of the Representation of Virtual Places
The VC as a functional virtual world needs to be designed. Current design studies of virtual worlds design and design in virtual worlds have considered the implementation and interface levels (Maher 1999). There is a lack of research of the basic design theory on how to represent and model the design of a virtual world.

Since the VC takes a place metaphor, namely the architecture of a physical campus, we can start by analysing and comparing the design function, behaviour and structure in both design worlds. This gives us a better understanding of the
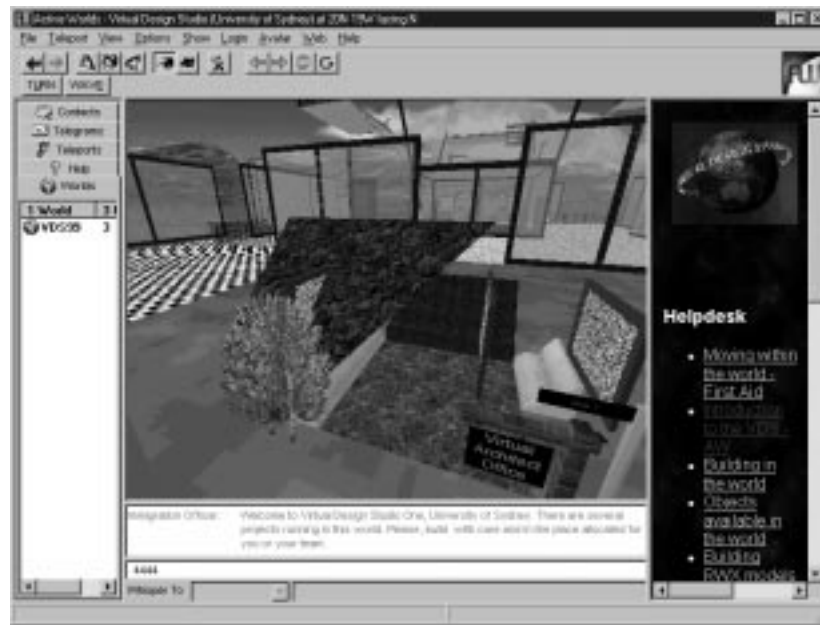

Figure 5. Active Worlds as VDS for the virtual campus.

metaphorical nature of the VC design. In the VC design, the architecture metaphor has not only been used as an approach to commence the virtual design, it has also been used by designers to understand the design objects in a virtual design environment, refer to Figure 6. The design artifact in the VC is a software object in the object-oriented virtual world system. These objects form places that have their own design function, behaviour, and structure – f, b, and s. We refer to the equivalent design function, behaviour, and structure in the design of a physical building as F, B, and S. As a starting point, we use F to bestow f with new meanings for a VC. Functions F, of the physical campus buildings. and rooms and f, of the VC buildings and rooms, are the same in the sense that they both are intended for the same purpose. B is used to name and understand the b in the metaphorical design of the VC. S and s are not the same. In the VC design, there is a layer of understanding that goes beyond mere analysis of f, b, and s in the design artifact as an object. There is something like a shell in the VC to make the metaphorical design artifact into something else, for example, in our case from a software object into an virtual architecture that functions as if it is a physical classroom.

A model for the metaphorical design of the VC is based on the theory of people's understanding of subjective experience based on metaphor (Lakoff & Johnson 1999). The model has three parts as follows:

- CB (Conceptual Basis)
  CB defines the basic concepts and conditions of the existence of a design object through a categorisation of object classes. CB is the object in the object-oriented software platform of the VC. Categorisation can be conducted at different levels and abstractions. When generalised, CB serves as the basis of any possible representation of the design in the VC.
- SF (Semantic Frame)
  SF defines relationships among the things in the VC. It is constructed according to the metaphor. It is implemented in the design objects as the mechanisms corresponding to the basic functions of the VC like communication, activities, information access, navigation, *etc*.
- RS (Realisation Shell)
  RS is a shell that realises the meaning the designer wants to put into the metaphorical design. In design representation and design modelling, RS is not randomly allocated or assigned. For example, the 3D representation of objects is part of the RS when it contributes to the spatiality that gives meaning to the design. RS is linked and derived from SF.

The representation of the VC that, based on such a schema, can be a model for the design of the VC. It can be used as the model to construct the design tools or design system built into the VC, which can be used by students to build virtual architecture and expand the VC environment. Such a model also ensures the consistent use of metaphor, thus improving the design of the VC.
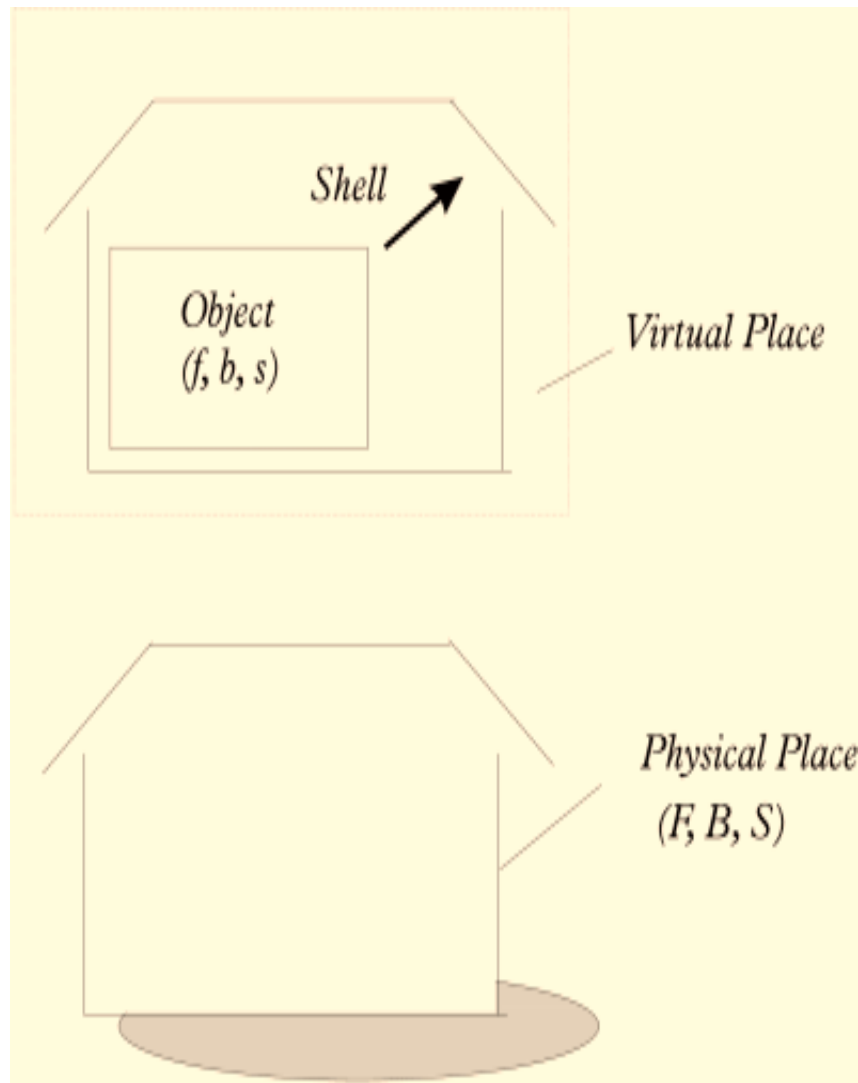
Figure 6. VC design takes physical design as metaphor.

CONCLUSION

This paper gives a brief view of Virtual Campus and its uses for educational purposes in the Faculty of Architecture of the University of Sydney. It shows that the VC is a multi-user virtual environment that serves for non-recreational use. It is metaphorically designed as a virtual place. It is used for both fundamental architecture course learning and design research level studies. The Virtual Campus is different from the Physical Campus due to the uniqueness of interactive and digital media. The VC is constantly changing and it continues exploring the potential of the Virtual Worlds. We intend to develop it into an advanced Web learning environment that serves as an alternative to the physical architecture building.

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