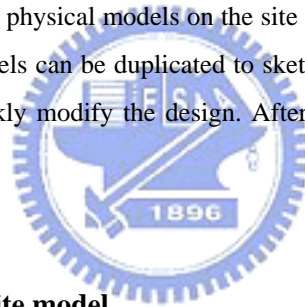


Chapter 5 System demonstration: a design process

In this chapter, a demonstration about how to use this system in the architectural design is presented. To start using the system, the designer first imports and sets the digital site model. After the digital site model is set, the designer starts to sketch a layout draft on a physical paper while seeing the augmented information. Next, the designer uses the sketch he just drew as the reference for sketching a perspective image. Besides the layout draft, other physical tools are also being used to assist digital sketching. With this perspective draft, the designer starts to construct a physical model. Sketches on both physical and digital canvases help the designer to quickly construct a physical model that looks just like the perspective draft he just drew. The designer then inspects this physical model on the digital site in different angles. Switching different physical models on the site is as easy as doing this with a physical site model. Images of physical models can be duplicated to sketching canvases. The designer sketches on the duplicated canvases to quickly modify the design. After all the works, the designer saves the project and exports some images.



5.1 Import and set the digital site model

The designer first imports a 3ds file as the digital site model for this demonstration. Figure 5.1.1 shows the screen when designer chooses the file to be loaded.

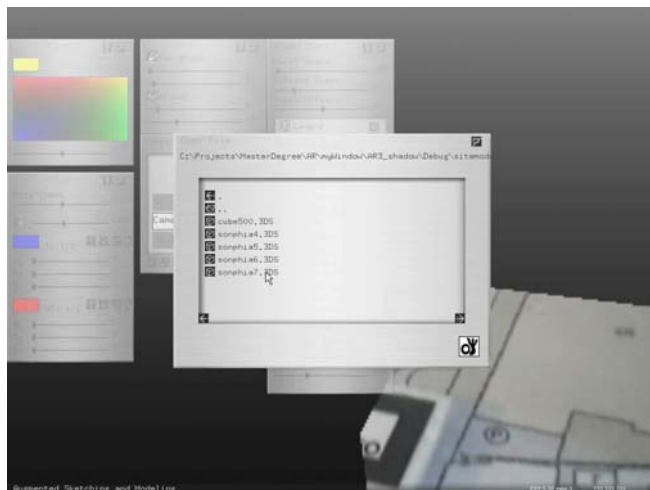


Figure 5.1.1: The designer selects the 3ds file for digital site model

After the digital model is loaded, the designer has to set the scale of the model to match the scale of the physical model designer wants to use. The scale can be changed later if the designer wants to move on to a larger physical model. The same digital model can be used with various scales of physical models. The scale of the system default sky can also be set. The system default sky is a sphere with the sky map that surrounds the digital model. Designers can set the scale of the sky to fit the size of the digital model. Figure 5.1.2 shows the image sequence of designer changing these scale parameters.



Figure 5.1.2: The image sequence of designer setting scale parameters

In order to integrate the digital site model and the real world, more settings need to be done. In figure 5.1.3, the designer sets the coordinates of the digital fiducial marker to fit the coordinates of the physical fiducial marker. The coordinates of the fiducial marker can also be changed at any time to suit the need of the view.

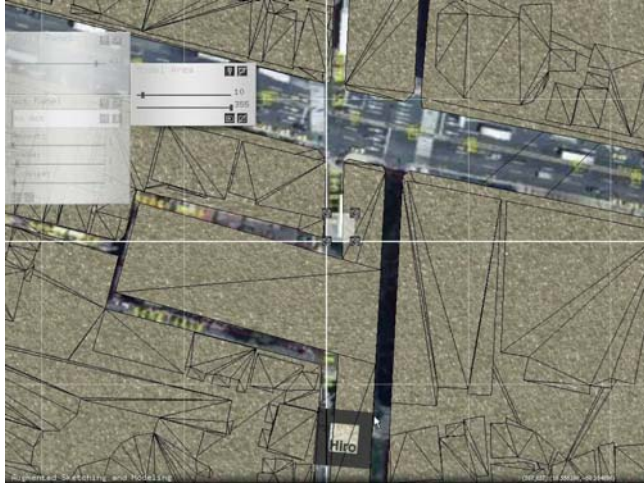


Figure 5.1.3: Designer set the coordinates of the fiducial marker

The boundary of the site also needs to be set by the designer to make the system able to do the depth sorting process. Figure 5.1.4 shows the interface for designers to set the boundary of the site. Using these settings designer just set, the system can now combine digital models and the physical world in real-time.

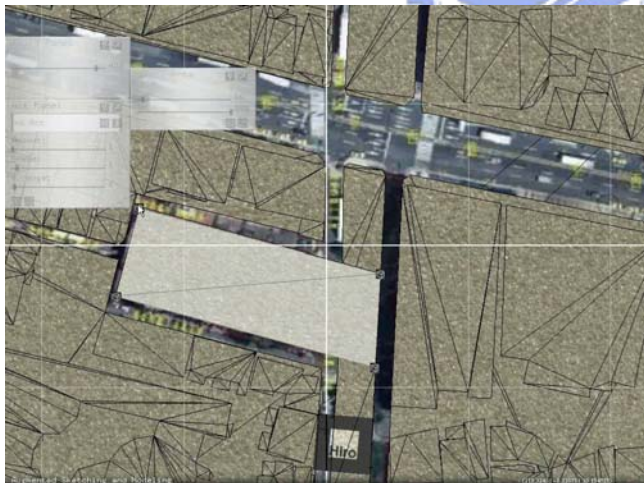


Figure 5.1.4: Designer set the boundary of the site

More information of the site can be set to make this digital site model able to provide more visual impacts to designers. In the left image of figure 5.1.5, the designer set the activities near the site. Image in the middle shows the site without activities and the image on the right shows the site with activities.

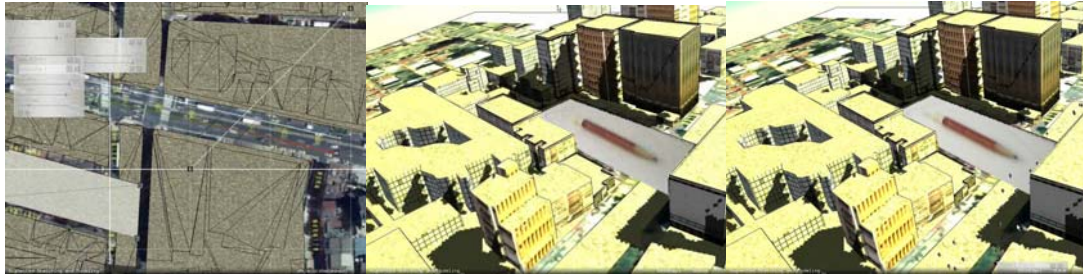


Figure 5.1.5: Designer set the activities on the site

Besides the activities information, the designer also sets the location of the site. This helps the system to calculate the position of the Sun of any time. With the position of the Sun, the system then calculates the shadows cast by nearby buildings. Designers can set the date and the time to whenever he/she wants and sees the site changes immediately. The time can also be set to change automatically. When the “time scale” parameter is set not to be zero, the system automatically changes the time of the digital site and calculates the proper position of the Sun and the shadows. Figure 5.1.6 shows the image sequence of the site at different time.



Figure 5.1.6: The image sequence of the site at different time

5.2 Sketches with augmented information

The sketching in this system can be divided into two parts: sketches on the physical paper and on the tablet monitor. Both these two kinds of sketches are augmented with information of other media, including each other.

Sketches on the physical paper

The designer in this demonstration first sketches the layout draft on the physical paper. With the system, the designer is able to sketch while seeing the augmented digital site (Figure 5.2.1). In figure 5.2.1, the designer sketches while seeing the shadow cast by the building next to the site. The designer is directly affected by what he sees and that affects the design.

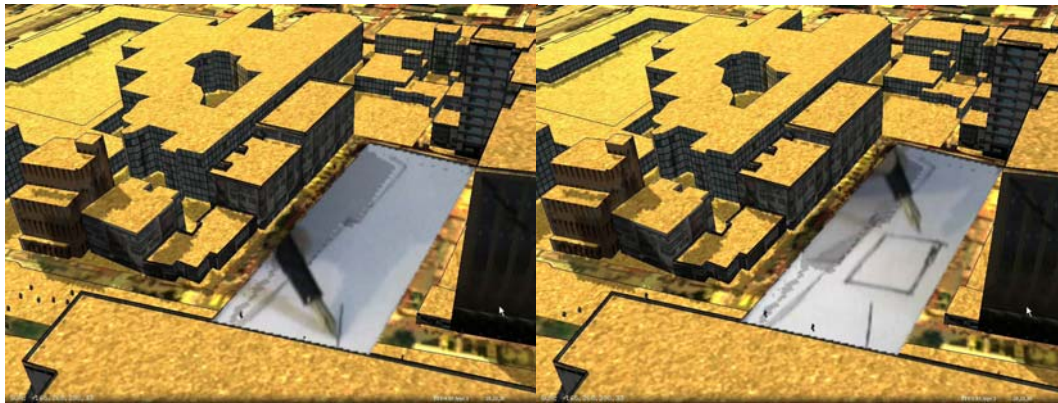


Figure 5.2.1: Designers sketches on a physical paper while seeing the augmented digital site.

Sketches on the tablet monitor

After the layout draft is done, the designer can use this draft to assist sketching a perspective draft. Moreover, other physical tools can also be the references for digital sketching. As shown in figure 5.2.2, the designer uses a cardboard to help him draw the correct perspective. By using the system, designers can sketch with more precision.

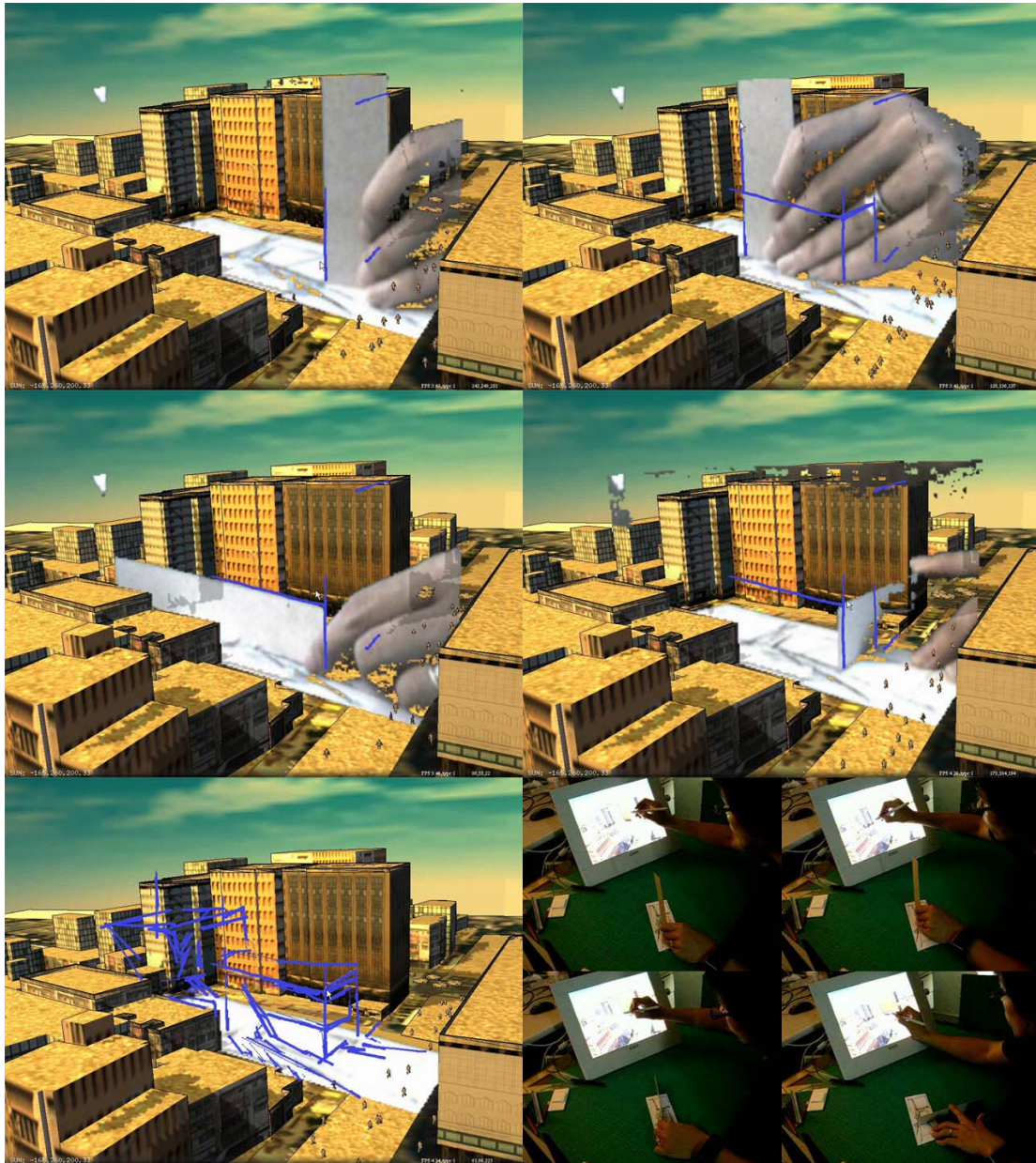


Figure 5.2.2: The designer use 2D physical sketches and 3D physical tools to help him sketches on the tablet monitor.

5.3 Making physical models with digital sketches

The construction of the physical models can be assist by sketches with the system. As shown in figure 5.3.1, the designer can not only uses the layout draft but also the digital perspective sketches as the references for constructing physical models. With the camera and the system, the digital sketches can directly project on the physical object. Designers can see where the cardboard should be cut through the monitor. This helps designers to quickly construct 3D physical models that conform to the 2D

digital sketches.

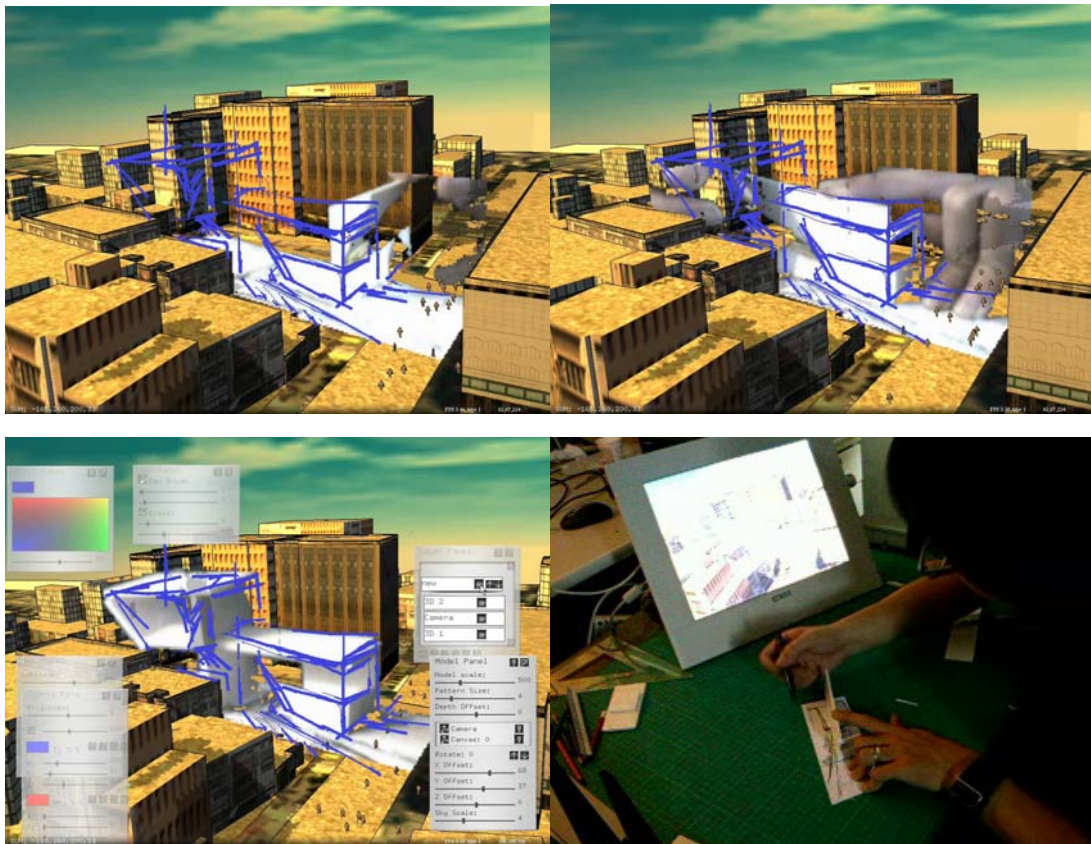


Figure 5.3.1: The designer uses the 2D digital sketches and physical sketches to help him construct the 3D physical model.

5.4 Inspect and modify different physical models using sketches

Since the digital site model has already combined with the real world, designers can move the camera and inspect the design in any angles. Switching between different models is as easy as doing this with a physical site model. Figure 5.4.1 shows the images of putting different physical models on the digital site.

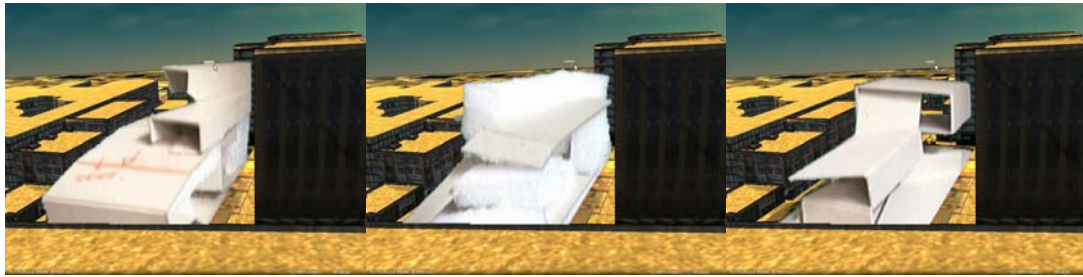


Figure 5.4.1: The designer inspect different physical models on the digital site

The images of the physical models can be duplicated to the sketching canvases. The coordinate of the camera can be stored in each canvas. Therefore, when designers browse through these images, the camera of digital site model can be adjusted to conform to the canvas that designer is watching (Figure 5.4.2).

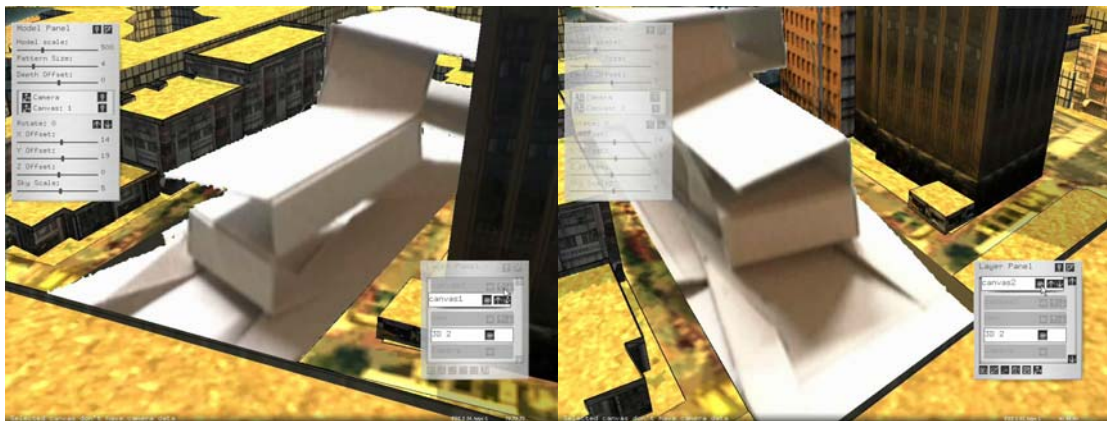


Figure 5.4.2: The designer uses the camera coordinates stored in canvases to browse through different angles

When an image of physical model is duplicated to a sketching canvas, designers can directly manipulate the sketch and modify the design quickly. Figure 5.4.3 shows the designer tries to cut off parts of the model and sees how it would look like. This allows designers to quickly generate ideas using the manipulation of sketching and the result of physical model.

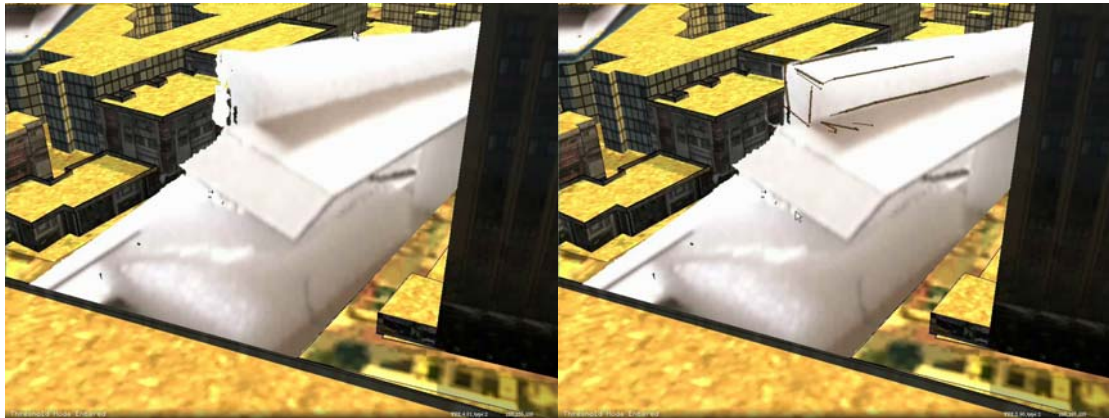


Figure 5.4.3: The designer transform 3D physical model into 2D digital sketches and sketches on it.

Moreover, designers can extend this feature by adding the manipulation of physical models too. In figure 5.4.4, the designer erases a part of the physical model image and replaces that part with the camera image. By doing this, designers can put any physical models on the site and see the combination of different physical models. Since the camera keeps capturing the images, designers can quickly switch between physical models or modify the model while seeing the combination image.

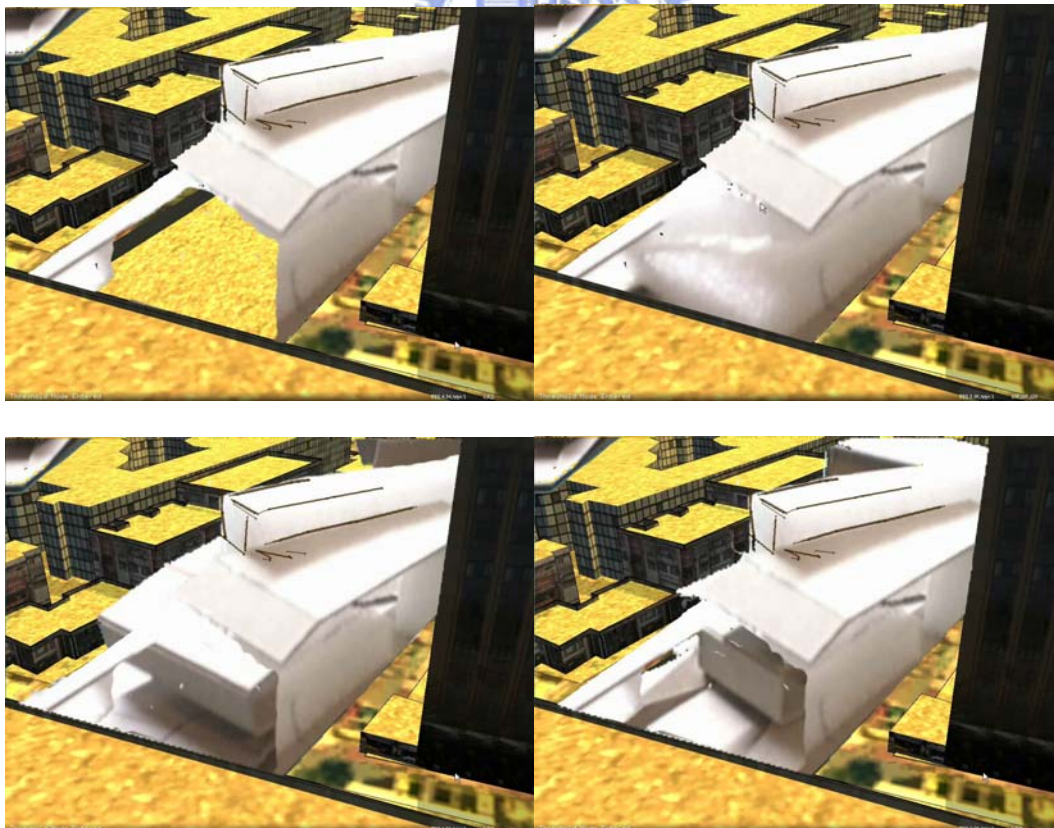


Figure 5.4.4: The designer use 2D digital sketches and the camera to quickly combine different parts of various physical models

5.5 Export

Designers can select visible canvases and export the digital sketches to jpg files for displaying and printing. The export of animation is not supported in the system yet. However, designers are able to use any screen record software to record the animation.

The system also allows designers to save the project as an .asm file. This file stores all the settings made by designers. For the canvases, the system creates two JPG files for each canvas and places them in the same directory as the ASM file. The filename of the JPG file is generated by the system according to the ASM filename. When an ASM file is loaded, the system also loads in the corresponding JPG files for the canvases. Therefore, designers can save the project completely and continue later.

