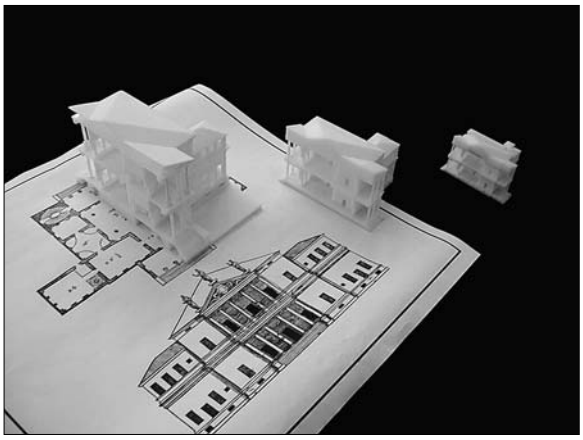

FIGURE 14-4
Physical Model produced by a 3-D printer.

FIGURE 14-5
Luminous Table developed by John Underkoffler and Hiroshi Ishii, in use in the design studios at MIT.

by the Luminous Table, developed at MIT's Media Laboratory by John Underkoffler and Hiroshi Ishii (Figure 14-5). Users of the Luminous Table directly manipulate physical model elements such as wooden blocks. Video cameras and computer-vision software are used to construct, in real time, a corresponding three-dimensional digital model. Computations are instantaneously performed on the digital model, then the results are video-projected back onto the physical model. Dimensions, areas, and volumes can be calculated and displayed, accurate shadows can be cast, airflows and pedestrian flows can be simulated, and so on.

An alternative approach is to employ some combination of immersive, stereoscopic displays and tactile feedback devices. In the future, we can anticipate "smart clay" and other means of accomplishing the close, interactive coupling of physical and digital models. Figure 14-6 illustrates potential future interrelationships of graphical interaction with two-dimensional displays, tactile interaction with smart clay and the like, and the digital model.

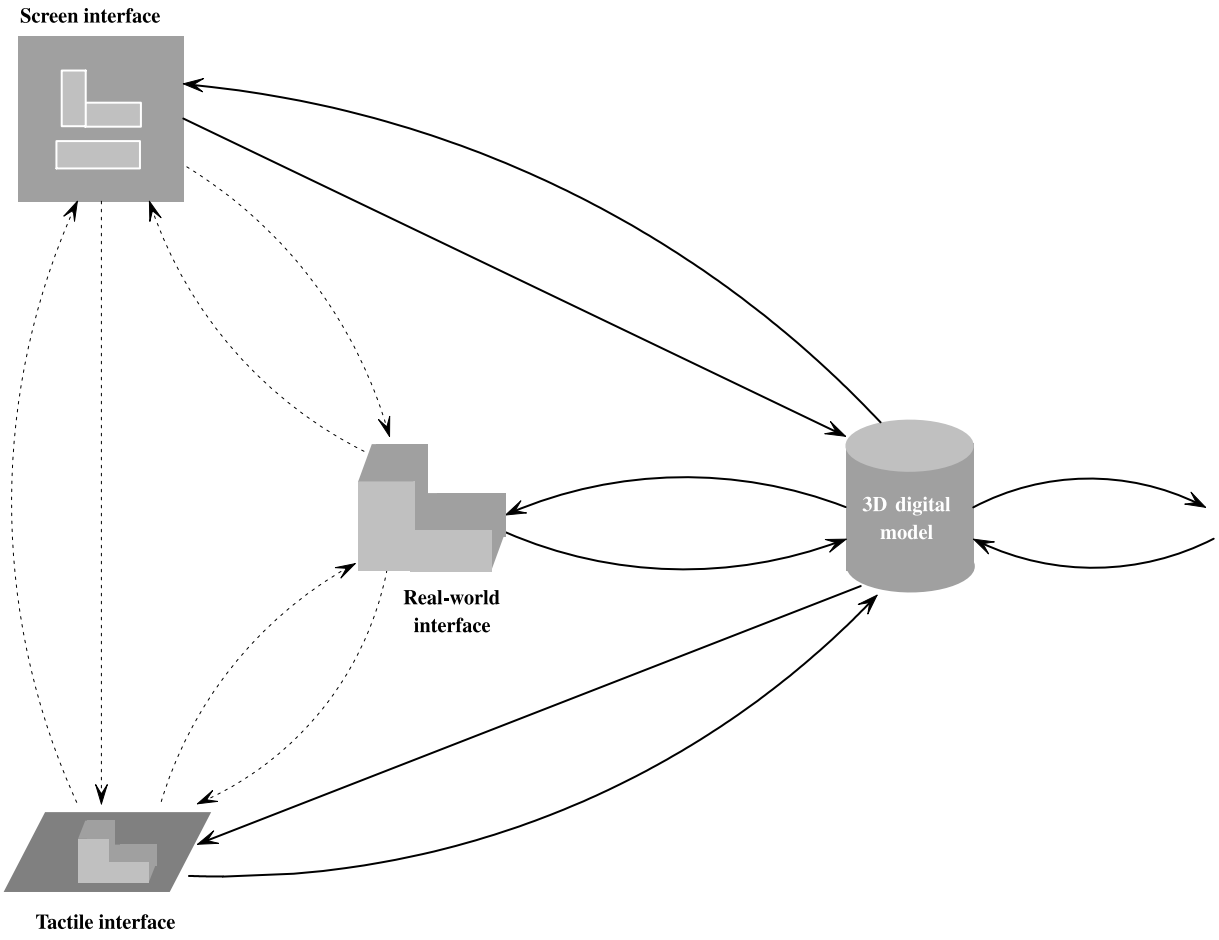

FIGURE 14-6
Relationship of a 3-D digital model of a building to different types of interfaces: traditional, 2-D on-screen interface, 3-D tactile interface, and the constructed building itself as a real-world interface. Heavy lines show actual connections and lighter lines show implicit connections.