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Conjectural Intersections: Conceptual design with form•Z

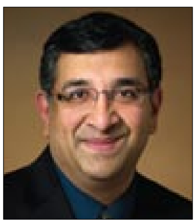
by Ganapathy Mahalingam

One of the common criticisms of computer-aided design is that design that is done using computer software such as **form•Z** is a virtual analog of "real" design done with materials or more tangible representational media. Proponents argue that most of design which can be done on a computer with software can be done with physical materials and hand tools. However, there is a realm where the virtual, computer-mediated representational world provides a conceptual design liminal that has immense promise.

This is the world of conjectural intersections. In a recent class at North Dakota State University, I asked students to visualize a simple conceptual scenario. I asked them to take two lumps of clay and visualize a form that is the intersection of the two lumps of clay. Of course, I had shown them what a form of intersection is, using a simple demonstration of the Boolean tools in **bonzai3d** prior to this request. I then asked them how they would create this form from the two lumps of clay. There was an air of puzzlement and then a student suggested that we could carve a form from one lump of clay, do the same with the other lump of clay, and fuse the two parts that had been carved out into the form of intersection. If the lumps of clay that had been carved out maintained their physical extents when being fused, the resultant form would not be a "true" form of intersection. Any further inter-penetration of the two lumps of clay that had been carved out would have to be resolved using the same method, which could lead to infinite regress.

How do we resolve this conjectural intersection computationally and physically? Could this be done with a plane of intersection? A plane of intersection between the two lumps of clay could be defined by a planar boundary that is shared by both lumps of clay. If the planar boundary is shared by both lumps of clay, then the points on the boundary must share the same spatial location. These points belong to the surface set of each lump of clay. Where they coincide, depends on the origin of the lumps of clay. A common origin for a lump of clay can be thought of as its center of gravity. The locus of the center of gravity of each lump of clay determines the points on the boundary of the plane of intersection. This should be obvious to users of **form•Z**. You create an object, then create another object, move the objects so that they overlap, and then execute the Boolean operation of "intersection" to get the form of intersection. Once you have a plane of intersection, you can slice the lump of clay at the plane of intersection in each of the carved lumps of clay and fuse the objects together. Now what if there is no plane of intersection, instead there is a 3D boundary in freeform space that floats around as a loop of a piece of string? This floating string could be fixed into a plane of intersection, otherwise how could you avoid infinite regress again in fusing the two carved lumps of clay together to form the physical "form of intersection?"

This is the stupendous form of parts of two physical lumps of clay occupying the same space, which can be the epitome of the challenge of giving human relationships between two human beings a physical form. Of course, in **form•Z**, you can intersect many forms together, giving rise to the physical form of "community." Besides, the form of intersection can be arrived at by three subtractions when two lumps of clay are involved. One of the lumps of clay has to give up the shared form. When multiple lumps of clay are involved, all the lumps of clay except one have to give up their shared form to arrive at the form of intersection. Is this mirrored in human relationships? Is this the realm of the "virtual" or the realm of the "real?" The architecture of human relationships and human community can arise from the "conjectural forms of intersection" made possible by George Boole and **form•Z**.



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