Transformative Elements

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The digital world allows for an expansion of design methodologies through new capabilities specifically afforded by computer technology, such as genetic algorithms used for generative design. Algorithmic functions provide the capability to simulate possible physical interactions among virtual objects, within the confines of the digitally generated virtual environment. This added dimension produces compelling results for designers who use these digital tools to guide their work and design process. For example, designers now are able to craft new types of forms, objects, spaces and structures using procedures and methodologies with the technical processes first developed from the field of computational science.

Digital tools are incorporated into the "creativity concepts", as described by Edward de Bono in his book *New Think: The Use of Lateral Thinking*, where the introduction of random expressions and ideas solves a problem creatively. These tools, such as 'the random entry' idea-generating tool and 'the concept fan' idea-generating tool, are used to create original forms and to facilitate out-of-the-box thinking. Digital design methods complement this lateral thinking approach, where the computer is given a set of simple preliminary rules to create complex unique end results, yielding multiple design possibilities. Using these digital tools to broaden creative horizons, the project Contiguous Environment I (CE1) investigates time-based transformations to develop a progressive series of structures and spaces.

CE1 uses these transformations to allow new objects to emerge and to show unique physical states at different times. With each stage of emergence, the process presents us with an opportunity for design exploration. The transformations often surprise us with their outcomes by revealing unexpected forms, while maintaining certain constant characteristics that underline the nature of a particular set, reflecting the designer's overall influence on these objects. This tactical approach aids in the propagation of unexpected tangents and ad hoc conditions under an overall design strategy. Interactions between computer-generated elements and explicitly designed elements bring out the "push and pull" between the two parameters, yielding further explorative results.

This partial control by the designer occurs by defining the beginning and end parameters to create an unexpected language whereby computer-generated outcomes fall outside the designer's immediate vision due to the direct, yet random, autonomy of elements. This autonomy is found in the composition of geometric transformations, changing boundaries and landscapes. The whole system is in harmony, integrating and connecting each element.

The interplay among changing elements, red spheres and lighting particles, and rigid and soft bodied objects visually ties the three landscapes that emerge in this project. The elemental transformations yield a certain mechanical quality, because they are defined as a sequence of time frames along a trajectory of space. They almost read as organic due to the way in which they move and work against their physical boundaries, but the logic of the computer and specificity of the chosen parameters transform this into a more synthetic language. This language is then rendered into an ani-

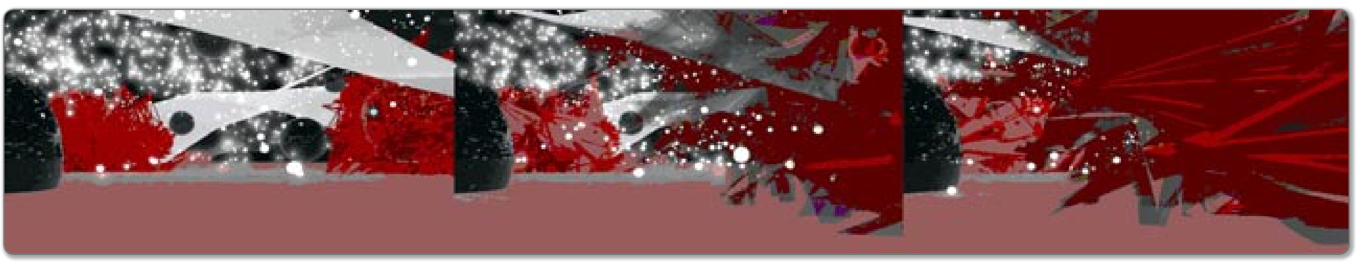

Figure 1: Spatial and elemental transformations.

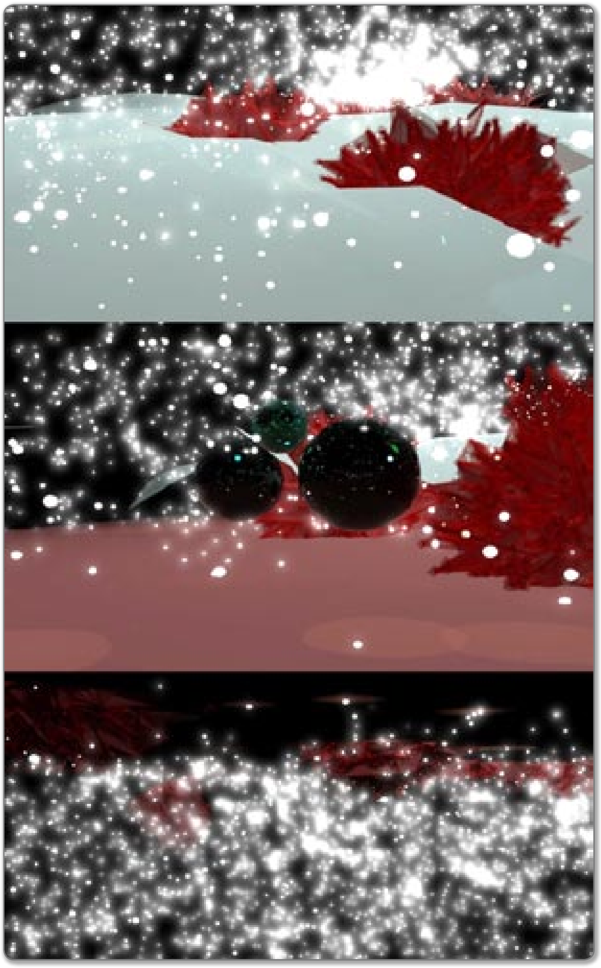

Figure 2: Three level visual system.

mation to create a visual dialogue of the elements against their boundaries. The frames are then segregated and studied, and the forms that are most suitable are taken to further develop new project iterations, spaces, and ideas.

Three distinct environmental levels emerge (Figures 1 and 2) due to the boundaries and elemental reactions. The elements are given predetermined starting and ending conditions. The computer calculates the transformations in between those points. What emerges from this setup is a visual hierarchy of systems. This becomes apparent through the levels that unfold as the transformations begin to take place. The way each element behaves and is perceived in the different areas form these three levels. The material properties that define the boundaries between environments become apparent as the elements begin to interact with one another.

The elements weave back and forth on the malleable upper surface, creating valleys and mountains to form the first level. It is the imposed geometry that carves through this first landscape, stretching into the middle and falling through the bottom layer. The second level is defined by the elastic surface above and rigid floor below, with rigid fixed circular structures. The red elements penetrate through the upper surface but never fully or completely exist in the second layer. The third layer, which exists underneath the other two layers, acts as a container for remnant red elements and scattered particle lights. This language becomes even more complicated and intricate due to the distinctions that emerge among the different layers.

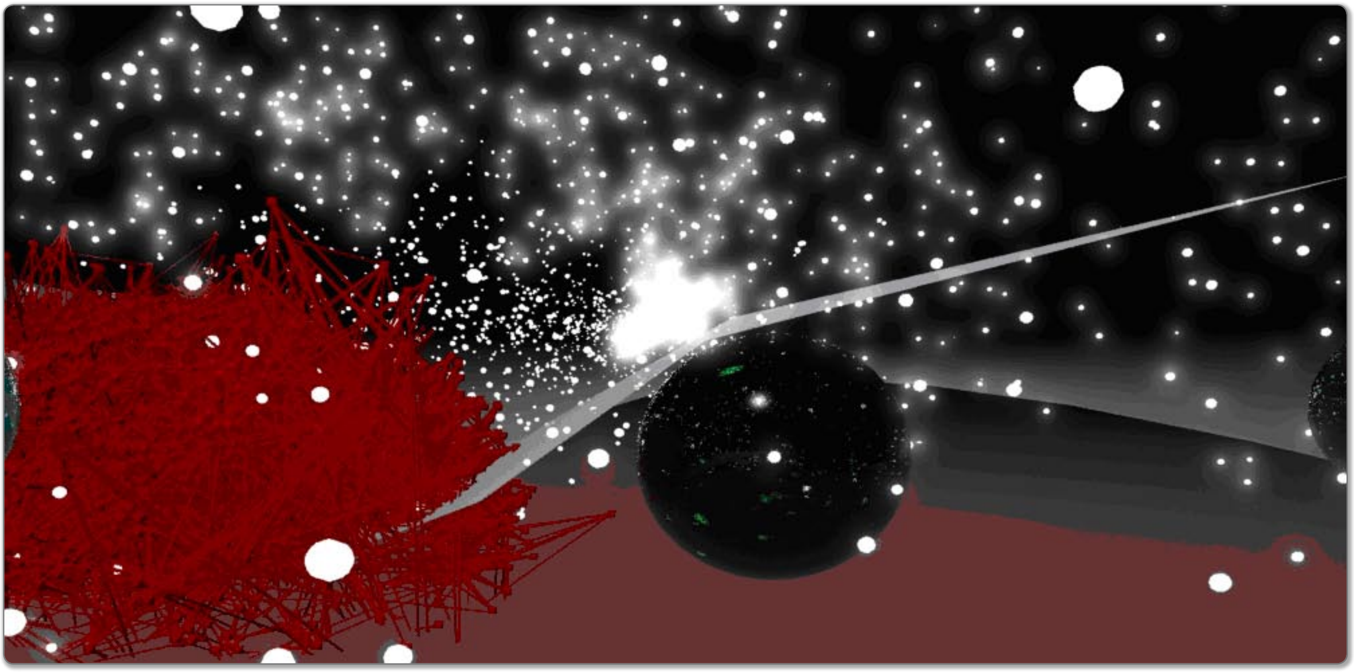

Figure 3: Two levels merging via flexible border.

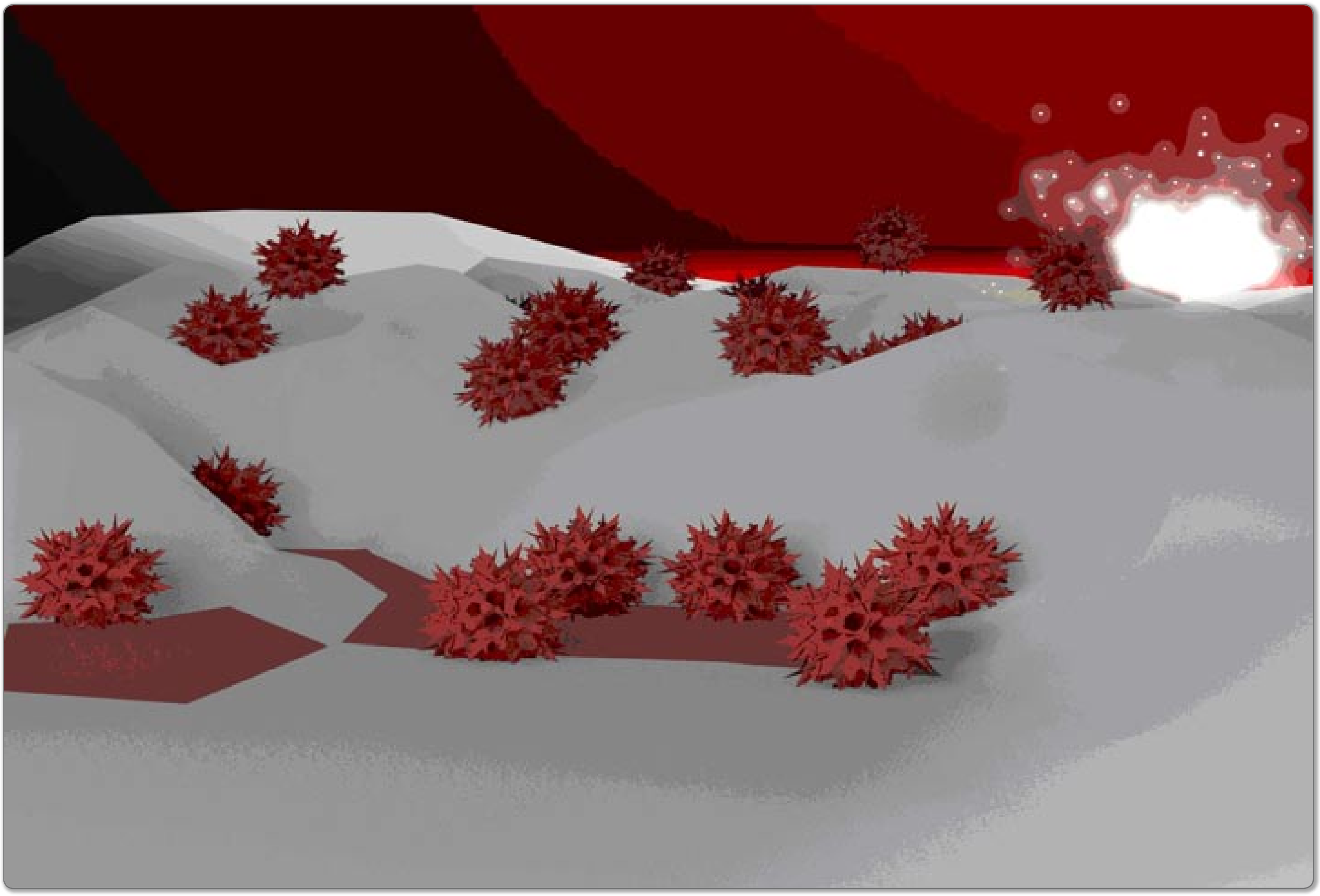

Figure 4: Intial elemental transformations of top level.

As boundaries and objects change, the structures morph in response, allowing new spaces to be explored. These spaces emerge from the folding of the boundaries between levels. As the elements move, their structures and skins change, creating derivative new forms. What is eventually left are new structural skeletons to analyze. All of this emerges from the work between the designer and the computer to propel these new series of spaces and objects to further advance subsequent iterations of the project.

Contiguous Environment I shows a small subset of the capabilities possible with generative design and lateral thinking. The progression of system transformations can be analyzed at any given point. This ability to generate new ideas using the computer has advantages as a unique way to lead the designer towards produce potential design solutions. The results given recreate the world and inform and propel the designer toward a more complex and intricate language. The overall atmosphere enables this project to create a landscape to be used on a larger project scale, with these transformations acting as the informative guide for new organizational structures.

Sophia Sobers is an undergraduate student at New Jersey Institute of Technology, obtaining a BS in Architecture and a dual-degree in art at Rutgers-Newark. Her areas of focus includes interactive, parametric, and digital design along with an emphasis in conceptual art. The broad range of digital and traditional education is used to influence and broaden her work, resulting in the creation of unique projects. Her art has been exhibited throughout the United States, from Washington D.C. to the Paramount Theater in Hollywood, along with a recent poster in the Siggraph 2010 conference.