Project Description

1. Relation of the Research to Current State of Knowledge

One of the key themes of today's technologies is *integration* between two or more seemingly disparate fields as a means for progress. From cars and computers to social groups and corporations, we see a great deal of effort spent on how to connect, integrate, merge, and blend into new entities.

One of opportunities provided by this new trend in integration is related to the aesthetics of its form. While much attention is being paid to the final stage of this integration, there is still opportunity in studying, experimenting, and addressing the in-between stages of the integration process. These in-between stages can lead to interesting discoveries and applications, a few of which this proposal will setout to address.

In the same framework, new entities, natural or artificial, are produced every day as the result of such integration. From merger names and company logos, to blending racial groups and multi-purpose appliances and architectural buildings, we are starting to see a trend towards a new direction of aesthetics, that of *blending*.

Since the early 90s, a new term was coined by computer graphics to describe the blending of two or more entities into a new one. The term is *morphing*. Even though morphing is not an official word in the English language, the meaning of it seems to be understood across fields. The commercialization of morphing, such as its omni-presence in the movie industry, has limited morphing's capabilities [1-12].

This proposal seeks to address the unique, and potential significance that morphing can have across seemingly disparate fields, such as language and words, music and sounds, design and 3D structures, or time and movement. Most importantly, this proposal will address the benefits of using the morphing concept as a starting point for constructing and helping define an important new aesthetic, the aesthetic of integration (blending). The tangible results of such study, will be software applications that could be used by scientists and poets alike, by artists and computer scientists, architects and dancers.

2. Proposed Framework

The proposed research will investigate and contribute to the new aesthetics paradigm. It will set out to collect, analyze, and synthesize aesthetic forms of expression, be it scientific or visual based.

The research will be made up of five categories. Within each categories there will be a collection/analysis phase of existing information, followed by a synthesis phase, where software tools will be developed to describe the process and to create new forms. The five proposed categories are as follows:

1) linguistic morphing
2) sound permeation
3) 2D shape interpolation/extrapolation
4) 3D form morphing
5) movement morphing through motion capture

In the analysis phase each category will benefit from a thorough research into its existing shapes and modes of expression. We will seek out to analyze and document all objects, shapes, sounds, images, words that may be part of the blending process, as it is described in everything from scientific structures to artistic forms of expression. The aesthetics of the blending process will be documented by using sources such as films, names, words, racial groups, etc. During the course of this important analysis phase, we hope to build a solid understanding of not only existing aesthetics of morphing, but also its effect upon other scientific and artistic processes.

In the synthesis phase, we will produce tangible software, downloadable over the Internet, that will strive to enhance the creative and analytic process of building structures for scientists and artists alike, be it tangible 3D forms, linguistic forms, sound structures, or even a cross-pollination from among all these disciplines. The software will allow one to build a blended object, an object produced as a result of the process of morphing. What will make this software stand out is its ability to let the user customize it, interpret it based on their needs, alter the parameters, and/or will allow the user to interact with the code-base itself in order to enhance their own solution. As a result of the interaction between the user and the software, a new aesthetic of the blend will invariably emerge, an aesthetic based not on the user adapting to a computer system but rather the user learning from, and interacting with, the program structure, producing unexpected and original results.

3. Process, Significance, and Case Samples

To follow is a structural description of the process, significance, and case samples of what this research will address.

Using human based genetic morphing as a starting off base, we will experiment with language and semantics. In our modern language, new words and meanings are being created constantly by the blending of our contemporary technology with social changes.

In our research, we will address the dynamic process of change inherent in modern language. In this context, our research will devise systems, using computer science, mathematical algorithms, and Java-based operative systems, and genetic processes, as the code-base leading to a blend of existing words into new entities. These new words would represent an ingenious way of "scientific visualization" on a semantic level.

Of particular interest to us would be to experiment crossing the boundaries of an English-based dictionary with regional expressions, street jargon, or even other languages. The question that our research will be informed by is about the meaning and the form that a word would take in this context. As an example, driven by a genetic-based

algorithmic process, what kind of meaning, and what type of form would a word take, whose "parents" were coming equally from sprawling neighborhoods of L.A. and from the street language of Japan? What will it mean to create a new name, for a possibly-yet to be defined object? Will this new meaning reflect the societies shift towards integration? Will this new word define a new way into its aesthetics visualization? Will that reflect something in the societies' aesthetics?

These principles of research, based on computer-generated genetics, will also be applied in experimenting with morphing sounds. By developing the software to blend two or more sounds, we hope to create a third dimension for the sound, a permeation between sound waves, the "in-between song." This new song will combine the signals of the two original "parents" into a new form of song aesthetics.

Of most interest to us, from the point of undertaking, is finding the mathematical principles and forming the bases of expressing and describing the "in-between-ness". What would a morph between Chopin and Samba sound like, how will it be made, and how is the nascent new technology of Jini, for example, going to interact with our devices, to produce such as an in-between song. And most importantly, how is this new song going to change our perception of the role of music and our interpretation of melody and its aesthetic principles?

In the third category we will study shapes, such as polylines on a two dimensional plane. How does the averaging between different number of points look like, throughout time? How does the in-between shape change as we interpolate closer to one of its parents? What happens if we extrapolate beyond the parent? What does it look like to combine three or more parents? We will not investigate the image processing morphing since extensive work has already been done there, but we will use it when necessary (i.e. in texture mapping).

This stage will inevitably lead us to investigating 3D morphing. Here the challenge will be to morph geometric objects made of unequal number of points, each possibly with its own motion and physical dynamics. Within the 3D models we will seek to develop tangible software that will encourage further experimentation, play, and learning. What does the cross between an elephant and a weasel going to look like, as one would render them into 3D forms? How is the "elastic character" of seemingly

incompatible geometric and physical states going to affect our experience with, and understanding of, the hybrid object?

What would a cinema-library (or should we say *cibrary*) look like? What if architects or designers could take the essence of using this powerful blending program and apply it to prototyping new devices or structures. Furthermore, what if, in morphing 3D models, one would enhance the blending with movement and time. What would the visual aesthetics be like, for a simulation of what a couple would experience when dancing a morphed sound between a waltz and a tango? What if our system could then motion capture their physical movement and average the motion points over time thus producing a hybrid dance of "in-between-ness"?

In the last experimental category we will focus on the blending of movements over time. We will average motion capture data using the sound blending in category two to create motion, movement, and dance made out of existing ones. For example, a tango dance and a waltz will produce a whole new aesthetic of movement where the motion points are averaged to produce in-between steps. Can you imagine such a movement aesthetic?

By producing this work, we hope to generalize the blending of aesthetics processes in order to provide a tool for experimentation, inquiry, and production for new entities. The implications of somebody using a such software-based system will go beyond creating mere visual aesthetics, extending into quantifying and qualifying the important impact that mathematics, computer science, and new technologies have upon our daily life, even in a most underlying way.

4.Conclusion

As outlined above, we believe that such research will permeate fields of computer science, music, physics, the arts, and architecture. Connecting through a common software, scientists as well as musicians, architects and dancers, could start connecting in ways previously unavailable, by sharing a common sense of discovery, experimentation, creativity, and play. The tangible results of using the software could extend to anything from visualizing quantifiable elements in a context previously unavailable, to interpreting the results of scientific research through a new form of presentation.

The software will provide the bridge to blending the quantifiable with the unexpected, the experimental with the unforeseeable. It will not merely be an instrument of visualization, but a medium through which ideas, concepts, and data can be blended and collaborated within, rather than with, an intelligent computer system. Most importantly, such an undertaking requires the cooperation of two brains: that of the human, and that of the computer, for without one another it is impossible to plan or execute the blended objects.

Each of these categories will contribute to our understanding of new aesthetics and the creation of a new dimension. Will the results of this research change our perception of the relationship between the maker and the thing being made? It is our hope that the results of this research would eventually contribute to changing our perception of how science and mathematics can mold seamlessly into the creative process, on a visual, experimental, as well as semantic level.

We believe that the results of this research will not stifle creativity, in its formally understood way, but it would rather permeate the barrier between creativity and experimentation and computer-based code systems.