Artwork Evolution

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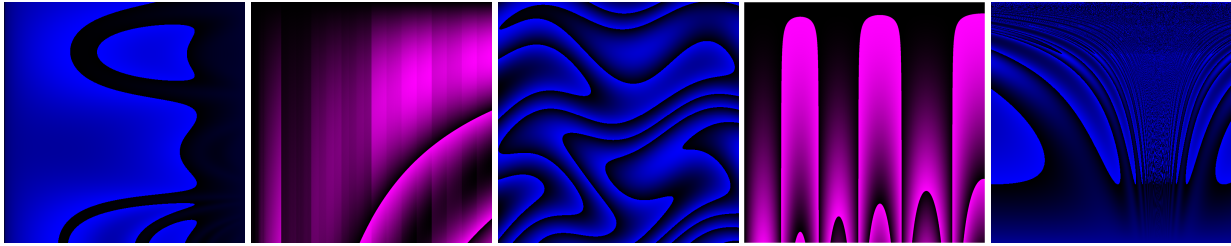
Figure 1: *Evolved artwork*

1 Introduction and Motivation

Creating digital artwork requires a lot of time, talent, and effort from artists and programmers. It takes artists hours to design pleasing artwork and programmers even more time as they develop and debug complex graphics shaders. One way to aid in the creation of complex art is to use evolutionary computing called genetic programming. Genetic programming can be used to create mathematical expressions that can be rendered as an image. The image can be used as a texture in a 3D scene or as a starting point for additional artwork.

Over the past two decades there have been numerous experiments using genetic programming. Sims [Sims 1991] introduced the topic to the graphics community and explored computer generated art. His work was developed on a CM-2 supercomputer using a variant of Lisp. At the time, computing power was expensive and very few people had access to supercomputers. The limitations due to hardware constraints meant that average people were not exposed to computer generated art. Musgrave [Ebert et al. 2003] demonstrated that advances in computing had made genetic art accessible on personal computers. Genetic textures and genetic programming were used to create planets with plants, landscapes, and skies.

This poster presents an application that enables the creation of digital artwork on cell phones and other mobile devices. The power that was once only available in a supercomputer is now inside a handheld device that fits in a pocket. Users can view, create, and share artwork without any artistic or technical skill. Each person generates a unique genetic pool of images and can incorporate genetic artwork from friends and strangers to evolve additional images. The ability to share artwork enables a social network where people can collaborate to create artwork using the touch of a finger.

2 Approach

There are several different starting points for evolution. Both personal photos and evolved images can be used to create new images. A user can take a picture of a tree using a mobile device camera and evolve the photo. Or a user can select a set of previously evolved images and photos to use as parents for the evolution process. These images can be chosen from the users favorite collections, friend collections, or top rated collections from around the world. Any image can be used as a starting point for evolution and allow users to evolve new artwork at any point in time. For example, two different

users could generate images and then share the evolved images between the mobile devices to create complex images that the world has never seen. The ability to casually evolve, share, and collaborate on creating artwork will provide a unique experience in the creation of genetic art that has not been done before.

3 Implementation and Future Work

The application is built on a cross-platform library and runs on the iPhone and iPad. All of the computation is executed on the device to create images in near real time. In the current design all calculations are performed on the CPU, which can render an image within two to fifteen seconds. A future improvement will be to transfer the bulk of the calculations to the GPU where it can be processed in parallel. Additional image processing techniques can be added to the system in order to create more complex and visually stimulating artwork. Lastly, images created on a device could be shared on social networks in order to increase exposure to genetic art.
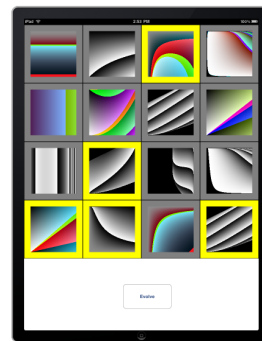

Figure 2: *Artwork Evolution application on the iPad*

References

EBERT, D. S., MUSGRAVE, F. K., PEACHEY, D., PERLIN, K., AND WORLEY, S. 2003. *Texturing and Modeling: A Procedural Approach*, third ed. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, ch. 19, 20, 546–615.

SIMS, K. 1991. Artificial evolution for computer graphics. In *SIGGRAPH '91: Proceedings of the 18th annual conference on Computer graphics and interactive techniques*, ACM, New York, NY, USA, 319–328.

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