

Computers, math and art
KMT 2006 project topics
by Zsofia Ruttkay, zsofi@cs.utwente.nl

Computers and math may play different roles in the arts, such as:

- A: to analyze pieces of artworks
- B: to (re)generate traditional pieces of art
- C: to produce new 'algorithmic art', pieces which are inherently mathematical
- D: to produce interactive multimedia pieces, e.g. combining light and sound.

I propose for each category a theoretical and a couple of practical projects below.

A. Using computer techniques to analyze and correct paintings

Computer techniques can help to cast light on how a certain painting was made centuries ago.

In the early Renaissance, the big news was the discovery of using perspective in paintings. One of a celebrated example is The Arnolfini Portrait by the Dutch painter Jan van Eyck. But a closer look reveals that the perspective is not correct.

Could it be corrected by computer means? Would it be possible to analyze paintings from this point of view (semi)automatically, by image processing techniques?



AT: Write a survey about perspective in computer graphics and paintings. Find examples of using wrong and correct perspective in as early as possible paintings. Survey computer vision techniques (to be) used to do such analysis (semi) automatically.

AP1: Correct by PhotoShop or other digital tool the perspective in The Arnolfini Portrait.

AP2: Make a 3d computer model of the interior shown in The Arnolfini Portrait. Set the view which resembles the most to the painting. Mind the mirror too. You may want to make a truck of having the real world seen by a camera reflected.

Literature:

1. Antonio Criminisi, Martin Kemp and Andrew Zisserman: **Bringing Pictorial Space to Life: Computer Techniques for the Analysis of Paintings**
2. David G. Stork: Optics and Realism in Renaissance Art, Scientific American Dec. 2004. D. Stork's Web site <http://www-psych.stanford.edu/~stork/FAQs.html>
3. On perspective: <http://www.math.utah.edu/~treiberg/Perspect/Perspect.htm>

B. Generation and animation of op-art pieces

There are traditional paintings and animations which use geometric or easy to produce regular forms and strong coloring principles, such as many works by Victor Vasarely, or the not widely known but very exciting pioneering works of John Whitney which look like as a ballet of geometric forms.

What is the production principle behind these works? Could it be programmed, and thus new works produced? Could some aspects (color, form, position) of a known 2d or 3d still piece be animated?



BT: Write a survey about the work of John Whitney, with special attention to the principles behind the generation of the abstract animations. Make an on-line summary with illustrative segments of movies and generation principles. Trace the follow-up effect of his work.

BP1: Generate variants of selected Vasarely paintings, possibly with the help of some (own) interactive op-art drawing program.

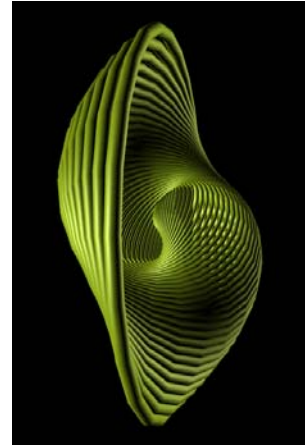
BP2: Make animations of selected Vasarely works. You may animate colors and forms in 2D, or take a piece of work and make the objects move in 3D.

Literature, to start with:

1. On John Whitney:
<http://www.siggraph.org/artdesign/profile/whitney/whitney.html>
<http://www.awn.com/mag/issue2.5/2.5pages/2.5moritzwhitney.html>
2. About works of Vasarely
<http://www.herakleidon-art.gr/index.cfm?get=exhibits&show=past&ItemID=63>

C: Algorithmic art

What is algorithmic art? Art which can be described by some algorithm. E.g. the different tilings in the Alhambra, or ones drawn by M. C. Escher can be described by symmetries and algorithms to generate them. However, in the framework of this project real algorithms, originating from mathematics and programming are to be considered as basis to generate art works by computers. The static or dynamic, 2d or 3d visualization of the deterministic or random algorithms may be considered as pieces of art. It is in itself interesting to explore the variety and more or less aesthetic beauty of the 'visualized' formulas. Interactivity to control the generation process is a special issue.



What makes some of them beautiful, the others not? How these works can be compared to the widely accepted masterpieces? What is the essential added value of the application of computers?

CT: Make a survey of the state of the art of 'algorithmic art'. Develop ontology from pragmatic and aesthetical point of view. Provide illustrative artists and pieces of works. You may want to give indications of the reputation of such works in professional circles.

CP1: Make some algorithmic art (generation environment) of your own.

Suggestions for themes (you may add your own):

- order- chaos, regular - irregular and in-between, merits of noise;
- variations on the Moebius band or another single-sided surface.

CP2: Make abstract animations based on a principle like:

- floating objects using flock of birds and other principles;
- never the same: generate ever changing, may be also interactive 'digital paintings'.

Literature:

1. The Bridges Virtual Museum: <http://www.sckans.edu/~bridges/Museum.html>
2. Matthias Weiss What is Computer Art? An attempt towards an answer and examples of interpretation http://www.medienkunstnetz.de/themes/generative-tools/computer_art/
3. DAM: Difital Art Museum, <http://www.dam.org/gallery/index.htm>
4. ArtMetic <http://www.artmetic.de/endix.html>

D: The color organ

The idea of creating lighting for music, particularly, the idea of the color organ, is much older than the computer. Today one may buy for tens of euros electronic devices to achieve some effect of this kind.



What are the devices and algorithms to generate color effects?

What are control parameters and aesthetical and affective principles for (music-related or stand alone) light pieces?

DT: Write a survey about the past, present and future of the color organ. Make an overview of the applied principles and typical applications, and suggest eventual new possibilities.

DP1: Create an interactive color organ of your own. You may use midi, audio and/or direct keyboard control to generate the light pieces.

Literature:

1. On the color organ:
http://en.wikipedia.org/wiki/Color_organ
<http://home.vicnet.net.au/~colmusic/welcome.htm>
<http://www.strandarchive.co.uk/history/colourmusic1.htm>
<http://www.awn.com/mag/issue2.1/articles/moritz2.1.html>
2. Jack Ox: The 21ST CENTURY VIRTUAL REALITY COLOR ORGAN
<http://www.bway.net/~jackox/colororgansite/index.html>