

The Visual Harmonics Project.

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The Visual Harmonics Project, which at the moment is more a concept than a reality, will find expression on a website, that will in turn have links to sites that could carry merchandise for sale which is useful for those practicing visual harmonics. It's primary function is to carry a large selection of visual images in the form of tiling patterns which can be easily overlaid and blended with each other. Alternatively they could be triggered by musical events or signals generated by a midi input device to succeed each other in rapid sequence. A secondary purpose would be to provide software tools allowing anyone to transform any image they wish into a suitable tiling pattern whose format allowed instant harmonious blending with any other images formatted in this manner. Thus in a sense the project is like a grand central station where all and everything of a two dimensional nature can cross paths and explore how it can interact with any other two dimensional imagery.

At one point in its evolution the project seemed more like searching for a set of needles in a haystack. It began with wondering why we don't seem to have an art form for two dimensional imagery analogous to music, or if we do have one why it isn't in more widespread use. This led to an analysis of the ingredients for music, and the importance of scale in the selection of such ingredients. In effect the notes of music had to share something in common, like some of their overtones, or they were called "out of tune" and banished. We could be very particular about admitting participants and nevertheless be allowed by the laws of permutation and combination an endless supply of new music. If we restricted our ingredients to images that shared a certain measure of symmetry, they would be sharing reflections and rotational axes of symmetry. Periodic tilings possessed these properties and seemed an excellent place to begin. To further restrict our ingredients we could limit ourselves to periodic tilings made up only of regular polygons. Since there are still an infinite number of these, we could further limit ourselves to those with only a certain number of different vertices.

Some of the tilings of regular polygons have been known since the times of Plato and Archimedes, but until very recently we did not know how many even existed for more than three different kinds of vertex.. Then Brian Galebach invented an algorithm that helped him explore all possibilities up to 6 different kinds of vertex. He found there were 1248 possible tilings, and it is from examination of this set of tilings that visual harmonics has evolved. The first step was to separate them into one of the 17 possible symmetry systems, This in itself did not ensure their harmonious juxtaposition, unless they were centred on the same axes, and oriented so that the connections between the axes were in the same directions. Under these circumstances harmonious combinations could take place when the distance apart of the axes was the same in terms of edge lengths. If we expanded or shrunk the edge lengths so that the axes of rotation were superimposed, then we could enjoy harmonious juxtaposition with all the members of most of the symmetry groups. In the case of the two symmetry groups utilizing 6 fold symmetry it left 253 tilings that are currently being explored. The other symmetry groups can be expected to yield somewhat comparable results, but more important it was realized that two or more symmetry groups could be combined if we are prepared to make the necessary adjustments for some of their axes of symmetry to be superimposed. That still left out all the images that had no reflections or symmetry planes, but this too can be remedied so that all images can enjoy a comfortable meeting place. Each symmetry system has a certain fundamental region which contains the minimum information from which an unlimited tiling with axes of symmetry can be assembled. Once we have converted our image to such a fundamental region, (triangle, square, rectangle rhombus or parallelogram), it can be assembled with other copies of itself into tilings of the appropriate symmetry system. We can do this by selecting a sub-portion of our original image in the shape of the fundamental region desired, or by stretching and distorting the image into the shape of the fundamental region, Furthermore a six fold axis for example

will require that six fundamental regions meet at such an axis. Thus an image showing an object subject to gravity will now show that object in a tiling with six possible directions of gravity. In other words our original image may be jumbled up as part of an abstract pattern that no longer represents objective reality, but it has been incorporated into a larger tiling pattern. This might be considered as somewhat comparable to music incorporating some sounds of real life after transposing the frequencies so as to remain in tune.

Who, it might be asked, would want to make use of visual harmonics? The obvious answers are designers of fabrics, wallpapers, lampshades and innumerable everyday objects capable of incorporating a surface design. We should add mosaicists and designers of tiling patterns. These would require at a minimum the availability of triangular tiles in as well as the traditional squares. Additionally it would be nice to have available hexagons and dodecagons, though these can be made up from triangles and squares. Visual Harmonics would be helpful in identifying which tiling patterns could be combined seamlessly with each other, and many of the available tilings have never been seen before, and are beautiful in their own right. However if we wished to enjoy the superimpositions we would have to print them onto larger tiles or panels that could be mounted in traditional ways. Large scale panels could be printed up to four feet by eight feet, or made up in contrasting metals for outside usage that could be suitable for public art or roadside sound barriers.

The same images that combine well in juxtaposition could be expected to transition smoothly from one to the other in rapid succession. This could form the basis of a visual accompaniment to aural music, and could be accomplished in a number of different ways, involving varying degrees of prearranged mapping and automation all the way to live improvised music with one or more players being responsible for the creation of live imagery through the control of mixers and midi input devices. What these possibilities share in common is that they would allow a virtually unprecedented level of synchronization with the music, thus facilitating an optimally synaesthetic experience. The imagery could of course be enjoyed silently in its own right. One of the relatively unexploited advantages of the digital age is that once a medium like music is in digital form it can be mapped to a different medium at the same time that it is being restored to its original form. We are already half way to a synaesthetic medium, the only missing ingredient being the appropriate mapping. With the plethora of choices offered by Visual Harmonics we are in a position to feature precisely those characteristics of the music that we choose. Obvious choices would be allocation of color to pitches of the melody, or each musician being allocated a group of tilings in their own color. Such a mapping would be greatly facilitated by accessing the original midi tracks, or in the case of acoustic instruments vocoder signals generated from their microphone track on the original recording. Such data would add little to the data requirements for high fidelity reproduction, but might require slight modification of existing formats. In the mean time internet radio stations could lead the way with one or more visual options for all the music they were broadcasting.

A further group that might enjoy and benefit from Visual Harmonics could be educators. In reality our whole educational system is built upon pattern recognition, beginning with mothers pointing to eyes, ears and nose etcetera while speaking the corresponding word. Then for reading and writing the letters of the alphabet are mapped to their corresponding sounds, which are then matched up to the sounds of the words that have already been mapped to reality. But once we have learnt the alphabet and how to read, very little is done to enhance our powers of pattern recognition. We could extend our powers of pattern recognition to include manifestations of symmetry, which is one of the most basic properties of the universe. With the help of color we could start this process in the cradle before we learnt to speak by placing objects in the child's environment that systematically associated certain colors with specific axes of rotation that might otherwise escape our attention. Since the fundamental region of the six fold symmetry systems is a right angled triangle with 30 degree and 60 degree angles, we could assign a

primary color to each vertex, and then every point along the perimeter could have a unique hue assigned to it, and the interior points could be assigned unique tints or shades. The more frequently occurring of these could be given specific names which could be of objects that evoked the corresponding color, or with appropriate permission we could adopt the nomenclature of some already existing color terminology. The net result would be that we had obtained effectively the fruits of a coordinate system by utilizing a set of names that we were already familiar with. This color would then allow us to differentiate the positions of different polygons within the fundamental region of the more complicated tilings. As we became familiar with the tilings, a new possibility opens up of using them as a kind of dashboard for the display of data when we wanted to track multiple data simultaneously. This could work as a portrait of a fixed point in time, or as a continuously unfolding display. By acquiring recognition of a specific mapping between color and position we could enhance both the speed and accuracy of our perception. All this implies that we would have to learn new pattern recognition programs, but this might become almost effortless if we became familiar with the patterns because it was pleasurable to look at them while we listened to music.