Sentinels
Sculptures Inspired by the Native Americans' Culture

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Abstract

This article explores the mathematics and science behind a series of sculptures by Professor Jim Paulsen. The goal is to show how the social and cultural elements surrounding an abstract sculptor, in this case Paulsen, shape the resultant artworks. Abstraction in creating sculpture, very similar to music, may separate the final created art from its very first idea of creation in a way that the two ends of the spectrum seem to be two unrelated matters, especially if the works are partly based on emotions or events only known to the artist. Nevertheless, some gestures by the artist may reveal the hidden idea in the piece, which brings in the joy of discovery to the observer.

Introduction

Figure 1: (L) *The six-legged Sentinel standing in Bristol, England;* (R) *A Sentinel at Towson University*

Jim Paulsen was born in Iowa and grew up in Illinois. He is currently head of the sculpture program at Towson University and has been a full professor since 1987. Paulsen's artworks include jewelry, paintings, drawings, sculpture, and installations. He has exhibited and lectured widely in the United States, Europe and Asia. Paulsen's public sculptures can be seen in Maryland, Delaware, Illinois, Glasgow (Scotland) Bristol (England), Oldenburg (Germany) and Beijing (China). Paulsen not only makes heroic sized public sculptures but also exhibits drawings and smaller, intimate works made from cast paper and wood. He has been a Fulbright exchange professor at the University of the West of England, Bristol, England, during his stay there in the nineties.

Among many different types and styles of Paulsen's artworks, there is one series of sculptures that have some common elements in structure and in color that distinguish them from the others. Paulsen has chosen a common name for them: *Sentinels*. Figure 1 presents two of these works. Figure 1.L is a photograph taken in Bristol, England. The artwork is installed along the Sustrans bike path between Bristol and Bath. A smaller similar realization of this artwork has been exhibited at the 2002 Bridges Art Exhibition, Towson University. Figure 1.R presents another Sentinel that has been installed in front of the Center for the Fine Arts at Towson University.

The essence of form that has characterized the Sentinel series has its roots in Native American culture. The concept of shaman or guardian in this culture has formed the very first visual presentation of the Sentinel in the mind of the artist years ago. Most frequently a Sentinel rests on three legs. Nevertheless they have been created in four or more legs.

Figure 2: (L) *A statue made from the clay coming from the Mississippi River with its natural color;* (R) *An old drawing of an Indian man.*

As a young boy growing up in West Central Illinois along the Mississippi River, Paulsen was quite moved by his early memories of the native American cultures including the history and legends surrounding Chief Black Hawk of the Sauk-Fox Indians. As a frequent visitor of the Black Hawk Museum in Rock

Island, Illinois he was particularly impressed with their bold use of color and their many forms of ritual and costume.

Depending on the piece, the captured movements of the upper components, or the way that the piece is standing on its legs, may give us a feeling similar to observing a Native American of past centuries. An observer may see a warrior standing strong gazing at the horizon. In fact that was what came to the mind of Reza Sarhangi when for the first time he saw the sentinel piece in the 2002 Art Exhibition. Sarhangi possesses an Indian statue that is made from the clay of the Mississippi River (Figure 2.L). His feeling was that the qualities in the statue are related to the sentinel concept. Another image that exhibits a kind of relationship with the piece is from a book that was written during in the late 1800's to the very early 1900's [1] (Figure 2.R). Perhaps in this image, the feathers say the most in this connection. However, Professor Paulsen believes that the sentinels are gender neutral.

2. The General Structure

In general, the proportion of the lower part to the upper is two to one. However, when the sentinel is in heroic dimension, the upper units seem shorter to an observer who is looking at the sculpture from the ground level. Obviously, the same structure in a smaller size gives us a different feeling.

Figure 3: (L) *The size and scale of the sentinels is very important to the overall concept. It is important that the viewer can walk under these works and be totally immersed within them. This work, just outside Glasgow, Scotland, is 25 feet in height and was originally designed to attract hikers and bikers on the Sustrans path to travel through the work;* (R) *This work is approximately 12 feet in height and is yet another variation of the sentinel concept having only two major vertical elements with bursts of energy at both top and bottom.*

Figure 4: (L) *This is a maquette for a sentinel that was created 12 feet in height. One unique aspect of this work was that the foot print of the work was contained within only 220 degrees rather than 360 as almost all others. It strongly patterns itself after a Native American head dress;* (R) *This work was a unique experience for Professor Paulsen in that he collaborated with a ceramic artist named Lars Westby, who made all of the ceramic elements inside the work.*

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Figure 5: (L) *This work was unique in that it is the only work where the sentinel elements were not organized into a regular pattern, rather their placement was totally random and intuitive;* (R) *This work more than any other probably addresses the issue of a Native American head dress. It was totally intuitive but Paulsen was excited by the way it turned out.*

A specification, which is true for most sentinels, is that cross sections of the elements are squares, the entire surface of the linear square elements has been carved with a chain saw, and most of the linear elements have been carved down to points using a chain saw, usually at one end. All of these elements are orchestrated and organized by a geometric configuration of steel boxes or sockets, which have been welded together. These steel boxes have two functions, they serve as articulation points and they structurally hold the entire sculpture together. As articulation points they are usually black in color, strong and dominant in their form and they serve to direct and orchestrate the colorful elements. The elements and their corresponding sockets usually move in a specific kind of pattern, sometimes to form a rhythmic motion. These works are always loaded with diagonals, thus generating considerable movement and energy.

4. The Sentinel for CEWE

This work was a commission for *CEWE Colour* in Oldenburg Germany, at the time the largest color film processer in Central Europe.

The sentinel for CEWE Colour involved creating a steel base painted in three primary colors of red, yellow, blue, representing rolls of film which start at the bottom and then move upward diagonally through an aperture, then they burst into a digital world of the entire color spectrum. The bottom colors are pigment primaries, and once they burst through the aperture they burst into the entire color spectrum or color wheel. The aperture is made of stainless steel, as it is in many photo applications.

Each of the upper elements has a blend of red and pink at the top that serves to unite the elements in this work as well as to other sentinel works made by Professor Paulsen. The burst of eight colors includes three primary colors, three secondary colors (green, orange, and violet), and only two intermediary colors. The two intermediary colors yellow-green and yellow-orange, were chosen to keep the burst of color on the light end of the value scale and to fit the geometry of the aperture.

Figure 6: *CEWE Sentinel*

Using all six intermediary colors would have necessitated a total of twelve elements and that would have been too crowded and cluttered.

The piece can be interpreted as an Indian chief standing with feathers on his head, but at the same time it can be thought of as the flash of a camera that captures the colors to send them up to the film. So an observer can see a metaphor exiting in this piece keeping him or her wondering between a cultural element and an industrial existence.

To an observer the work could be seen completely intuitively, not having any coordination between the components and colors. However, the piece is a total marvel of a very calculated structure all studied in advance in specific detail.

5. Some Possible Mathematical Formations for Future Sentinels

Proportions between elements in sentinels are frequently chosen to be two to one, bottom to top. Then all the upper components are considered to be equal in size. Nevertheless, there are other interesting proportions that may be used to create new sentinels.

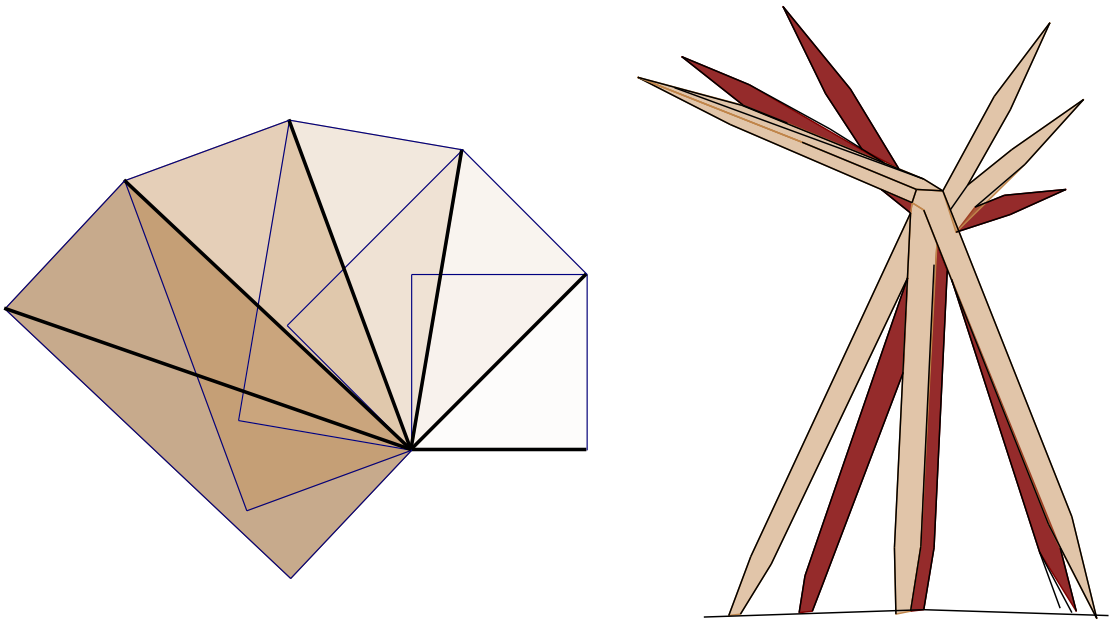

Figure 7: (L) *A sequence of length measures for the upper components for a sentinel, which are generated based on the dynamics of the square roots of natural numbers*; (R) *A sketch of a sentinel using this sequence. All the lower components have the same length measures. The third upper component is half of a lower component in its length measure. The relation among the length measures of the upper components, and the angle measure between each two consecutive upper components, have been found using the figure on the left.*

It is possible, rather than using the same size upper components, that the artist uses different sizes based on a dynamical relationship among these elements. One to mention is if we start with an upper

component with size 1 unit, then the size of the next upper unit could be the diagonal of the unit square, $\sqrt{2}$. The size of the next component would be the diagonal of a rectangle with dimensions 1 and $\sqrt{2}$, which is $\sqrt{3}$. Continue this process to find $\sqrt{4}$, $\sqrt{5}$, and $\sqrt{6}$ (Figure 7.L). The sketch on Figure 7.R illustrates a sentinel with upper components using the length measures of the diagonals of the rectangles shown in Figure 7.L. The angles between each two neighboring upper components are chosen in a way to approximate the corresponding angle in Figure 7.L.

The other dynamical relationship among the upper units could come either directly from the Fibonacci numbers, or the algorithmic spiral that is made from the quarter-circles using Fibonacci squares – the squares with Fibonacci numbers dimensions (Figure 8.L).

The sketch of a sentinel in Figure 8.R is based on this algorithmic spiral (The tips of the upper components are on this spiral).

The sentinel in Figure 8.R is in fact two dimensional. Perhaps it is more appropriate for a scene with an inaccessible background.

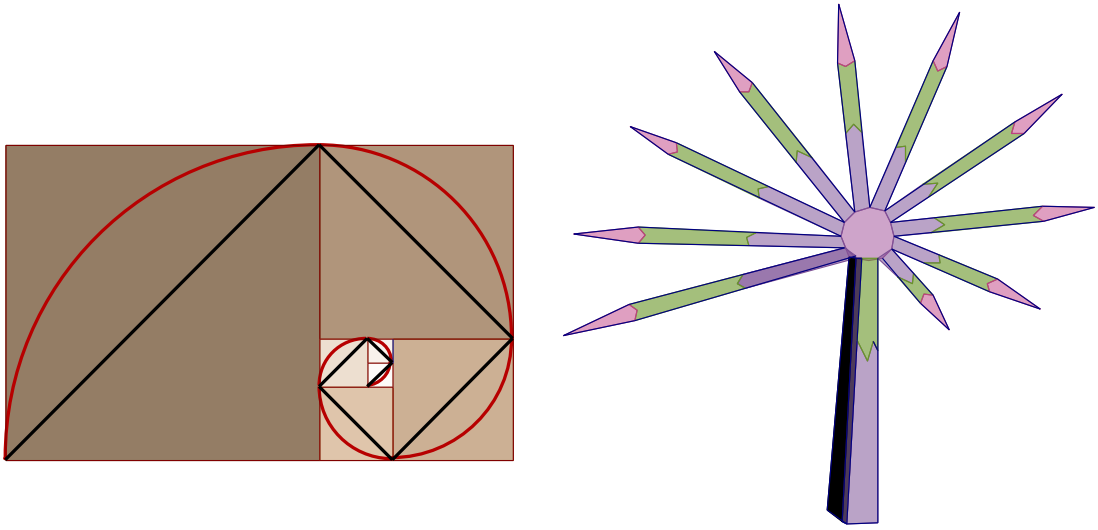

Figure 8: (L) The *Fibonacci squares and the algorithmic spiral*, (R) *A sketch of a sentinel with upper components based on the algorithmic spiral.*

An idea to explore when creating new sentinels is to experiment with the concept of duality, in both a mathematical and philosophical sense. Assume that two sentinels are placed close to each other. How can they be in a dual relationship with respect to each other? For their colors, it is not difficult to choose some opposite colors to paint them. For their structures to convey the duality concept we may come up with some interesting solutions.

One solution would be to consider the number of the lower and upper components in opposite order. A 7 leg sentinel with 5 upper components is in a dual relation with a 5 leg sentinel with 7 upper components.

Another solution is illustrated in Figure 9.R, which is a self-dual yin-yang type sentinel. This structure has been created based on the mathematics of cone and conic sections. Figure 9.L exhibits two identical

oblique cones with a common apex. Each of them is the half-turn rotational image of the other. A sentinel can be built using the structure of these two cones. Figure 9.R presents a sentinel with 8 legs and 8 feathers along with the cone lines. With the choice of opposite colors for the two upper and lower halves of the sculpture the yin-yang sentinel will be completed.

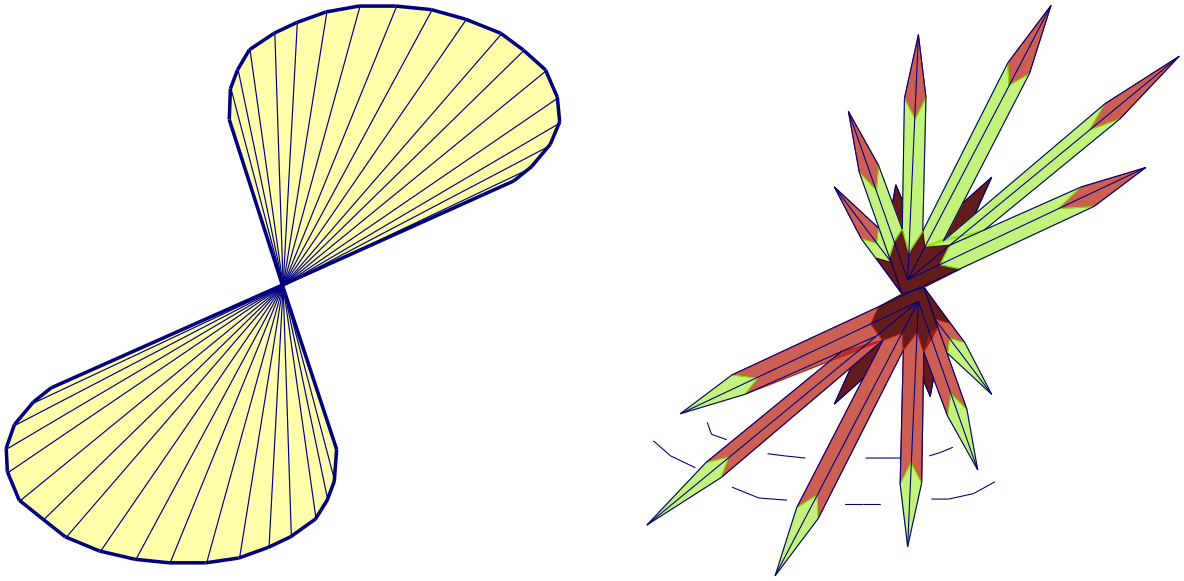

Figure 9: (L) *A conic structure*, (R) *A sentinel based on the conic structure*

6. Conclusion

The sentinels created by Professor Paulsen were a solution to a quest for sculpting attractive heroic size structures using very accessible materials (such as wood) in a limited time. In addition to the components' dimensions and their special locations, the choice of colors is crucial for helping the structure to convey the idea of a Native American sentinel. The mathematics of measuring sizes and angles and also finding proper locations for each part of a sculpture has been critical in the sculpting process for every sentinel. Nevertheless, the mathematical ideas of dynamical rectangles, mathematical duality, transformations, and fractals offer new horizons for the artist to explore when sculpting new sentinels in the future.

References

[1] http://karenswhimsy.com/native-americans.shtm