Ricochet Compositions

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Abstract

This short paper describes the basic principles of an implementation of an algorithmic art generator. It is based on the principle of ricocheting lines drawn on a two dimensional canvas. The user of the generator is able to make some adjustments in terms of for instance coloring and the level of detail. An aim for the future is to reduce the human influence by inserting knowledge about aesthetics into the system.

1. Introduction

Our goal is to create an algorithmic art generator. Art pieces can be generated by a mouse click. All generated pieces will be distinct. Small adjustments to the pieces can be made by the user. Only a very few starting variables will be random, the rest is based on the algorithm we describe in this paper.

The way our art is generated is very much in the spirit of a movement called 'The Algorists' [1]. The name of this movement was proposed by Jean-Pierre Hébert around 1995. Their art is characterized by the use of mathematical algorithms to generate art. Other artists who are also considered to be the pioneers of this movement are Ken Musgrave and Roman Verostko. The artwork from the artist Manfred Mohr comes very close to the essence of our work.

2. Design Principle

Our canvas is a bounded rectangle or square. On each of the four edges one point and a starting angle is selected randomly or by the user as a starting point for a line. Now a straight line of a certain color is drawn starting from each point at the selected angle. Only one line is drawn at a time, so each point needs to await its turn. This results in lines of four different colors. When a line collides with another line or a canvas boundary it stops and gives the turn to the next point. This principle is illustrated in Figure 1. The numbers shown at each line represent the order in which the turns are taken.

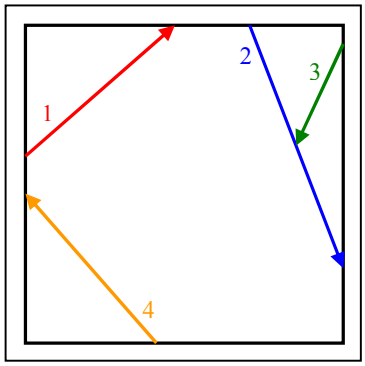

Figure 1: *Example after 1 turn for each point*

When a line collides with another line or a canvas boundary, the angle of impact is calculated. In the next turn, when a new line is drawn, the new angle is calculated to ricochet from the line it collided with. Figure 2 shows the next step of the example introduced in Figure 1. All incoming angles are equal to the outgoing angles. This principle is shown in Figure 3.

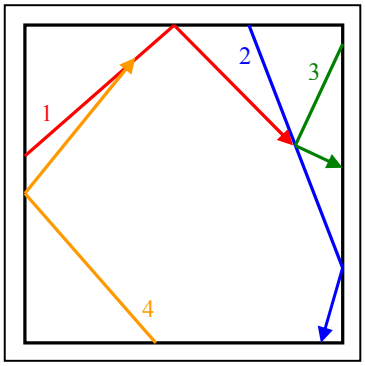

Figure 2: *Example after 2 turns for each point*

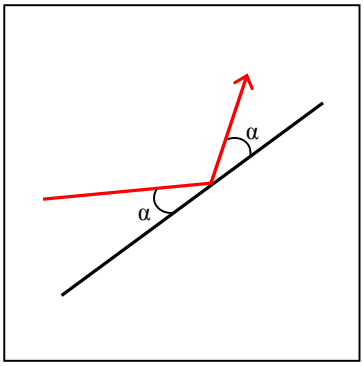

Figure 3: *Example for line collision*

The turn-based drawing of a line continues until the length of the new calculated line is smaller than a certain threshold. If so, the drawing of this particular color stops. The other colors will continue to draw until their new lines are shorter than a threshold length.

After all colors stopped drawing the canvas is divided into polygons by the colored lines. A second algorithm fills all polygons which are only bounded by lines of equal color. The polygons are filled with the same color as the lines it is bounded by. The other polygons are not colored. This results in compositions with five colors namely four line-polygon colors and a background color.

Figure 4 shows an example where all lines finished drawing. Figure 5 shows the same example, but with filled polygons. Two more examples are shown on the next page.

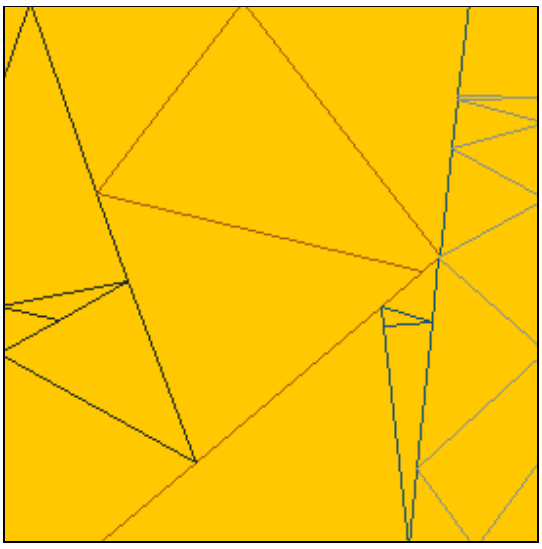

Figure 4: *Finished example*

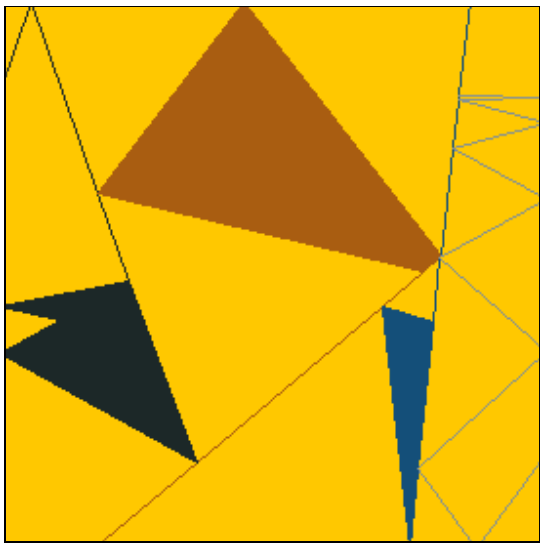

Figure 5: *Finished example with filled polygons*

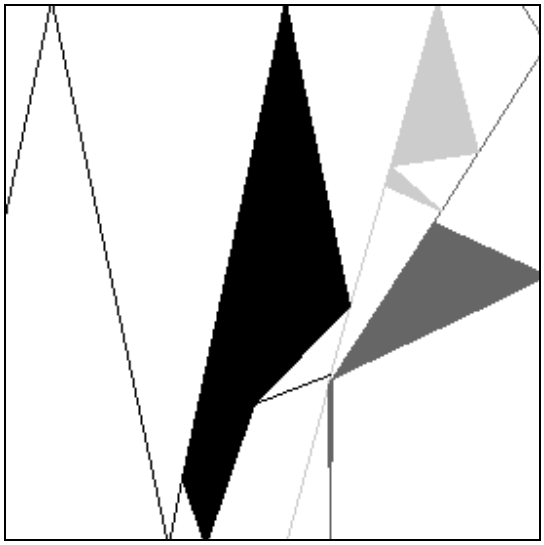

Figure 6: *Finished example*

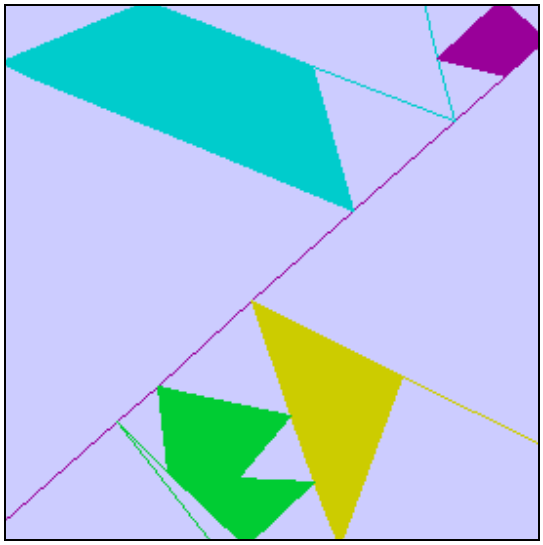

Figure 7: *Finished example*

3. Discussion

Our tool offers a fair balance between computer-generated art and human influence. The composition is based on the algorithm. The only human influence on the composition are the start positions and start angles of the lines, but even then it is bounded by the algorithm.

At this point one aspect the human user has complete control over is the colors. The selection of these colors is very important and is a deciding factor on the aesthetic value of the end result. The human influence is at this point necessary because the computer has no feeling for aesthetics and therefore is not able to select a matching set of colors.

We applied the principle of ricocheting lines on a rectangular canvas. We chose this shape to bound the scope of the project. It would however be interesting to see what the result of applying this principle to other shapes such as circles or triangles would look like.

A follow-up study could be the exploration of the possibilities to insert 'knowledge' about aesthetics of for instance colors or compositions into a computer program. Such knowledge could result in a completely autonomous version of our generation tool.

4. Conclusion

In our opinion the art generator is able to create some fine compositions. Its strength lies in the fact that it is easy to extract the algorithm from a result. In fact it is quite easy to draw a similar art piece by hand, based on the same principles as the automatically generated version. A very wide range of compositions can be generated. It is very unlikely that one particular composition is generated more than once.

The user influence is at this time larger than our ultimate aim, but at this time it makes it fun to experiment with it. The current generator will possibly be extended or updated in the near future. Extensions may lie in the field of graphical improvements or in limiting the necessary input by a user.

Acknowledgements

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References

[1] M. King, *Computers and Modern Art: Digital Art Museum*. Proceedings of the 4th Creativity and Cognition Conference, Loughborough University, New York: ACM Press 2002.