

Evolutionary Art

No Institute Given

Abstract. <Text of the summary of your article>

1 Introduction

2 State of the art

Creative evolutionary systems are used to evolve aesthetically pleasing or innovative structures [5].

MAIN CHALLENGE -> HOW TO MEASURE AESTHETIC.

2.1 Aesthetic measures for evolutive art

Definition Two modes of aesthetics measures can be defined [6]:

1. *Aesthetics evaluations are expected to imulate, predict or cater to humans notions of beauty and taste.*
2. *Is an aspect of meta-aesthetic exploration and usually involves aesthetic standards created by software agents in artificial worlds.*

According to Galanter [6], computational aesthetics measures can be classified in the following categories:

- Based in Design Principles. Like the rule of thirds or theory of color (e.g., opposite colors) [3].
- Based in Neural Networks and Connective Models.
- Based in Evolutionary Systems:
 - Interactive Evolutionary Computation. The fitness of the individuals is determined by human agents.
 - Performance based goals. Certain properties of the art piece are evaluated and optimized based in performance measures (e.g., usable surface in furniture design generator).
 - Error relative to Exemplars. The individual fitness is measured using a real-world example (e.g., a photography or painting). [5]
 - Complexity measures. This type of measures is based in the idea the complexity is directly related to aesthetics [7].
 - Multi-objective. Given the multidimensional nature of aesthetics judgement, multi-objective EAs are a clear option in order to deal with this multidimensionality.
 - Extensions to EA (such as, coevolution, agent swarm behavior, etc.).
- Complexity Based Models

En [7], Li et al. proponen las siguiente métricas para el aprendizaje estético:

- Color ingredient.

- Image complexity.
- Image order.
- MC metric.
- BL Metric.

En [4], presenta una comparación de tres métricas estéticas:

- Benford Law.
- Global Contrast Factor.
- Information Theory.

En [1], presenta una comparación de cuatro métricas estéticas:

- Machado and Cardoso.
- Ross and Ralph.
- Fractal Dimension.
- A weighted Sum of the above mentioned metrics.

En [2] se presenta una aproximación multi-objetivo para arte evolutivo. Las tres funciones de fitness utilizadas son:

- Benford Law.
- Global Contrast Factor.
- Ross and Ralph (bell curve).

En [3] se presenta un AE para crear arte evolutiva a partir de imágenes vectorizadas. La función de fitness utilizada es la diferencia de tono entre distintas regiones de la imagen a distintas resoluciones.

References

1. E Den Heijer and A Eiben. Comparing aesthetic measures for evolutionary art. *Applications of Evolutionary Computation*, pages 311–320, 2010.
2. E Den Heijer and A Eiben. Evolving art using multiple aesthetic measures. *Applications of Evolutionary Computation*, pages 234–243, 2011.
3. E den Heijer and A Eiben. Evolving pop art using scalable vector graphics. *Evolutionary and Biologically Inspired Music, Sound, Art and Design*, pages 48–59, 2012.
4. E den Heijer and AE Eiben. Using aesthetic measures to evolve art. In *Evolutionary Computation (CEC), 2010 IEEE Congress on*, pages 1–8. IEEE, 2010.
5. Steve DiPaola and Liane Gabora. Incorporating characteristics of human creativity into an evolutionary art algorithm. *Genetic Programming and Evolvable Machines*, 10(2):97–110, 2009.
6. Philip Galanter. Computational aesthetic evaluation: past and future. In *Computers and Creativity*, pages 255–293. Springer, 2012.
7. Yang Li, Changjun Hu, Ming Chen, and Jingyuan Hu. Investigating aesthetic features to model human preference in evolutionary art. *Evolutionary and Biologically Inspired Music, Sound, Art and Design*, pages 153–164, 2012.