Visual Creativity

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Topics in Visual Creativity

- Images & Paintings
- Design: Graphical, Industrial
- Evolutionary Architecture
- Choreography
- …

Major ‘Concerns’ of Computer Visual Artists

- Representation
- Generation
- Intention
- Evaluation

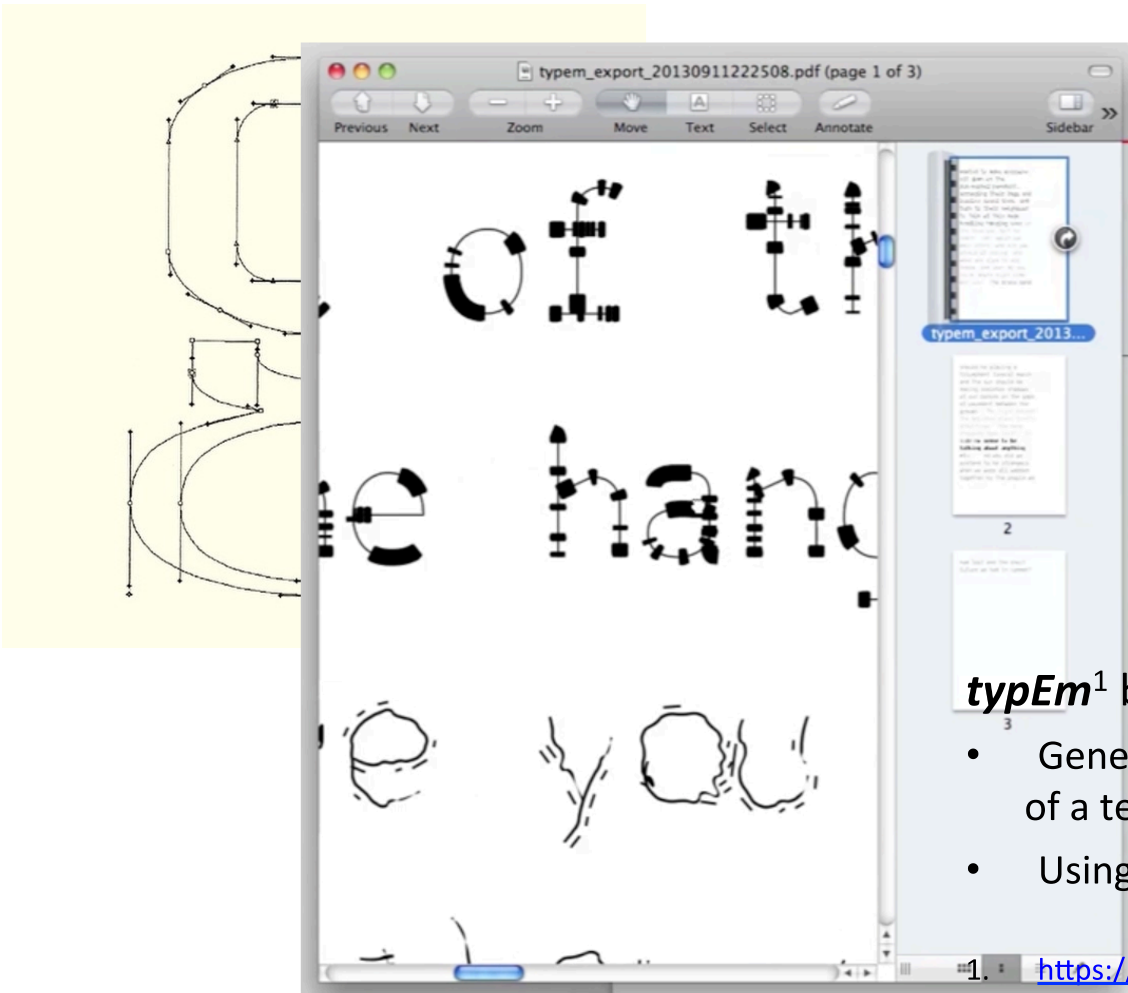
Images & Paintings: Representation

I. Descriptive:
  - Raster: a matrix of pixels, BMP, GIF, PNG, JPG, …
  - Vector Graphics: Bézier curve, …
  - Plan of composition

II. Procedural:
  - Mathematical function
  - Shape grammar
  - Commands for drawing robots

  … Any sequence of ‘operations’

Example Representation: Bézier Curve



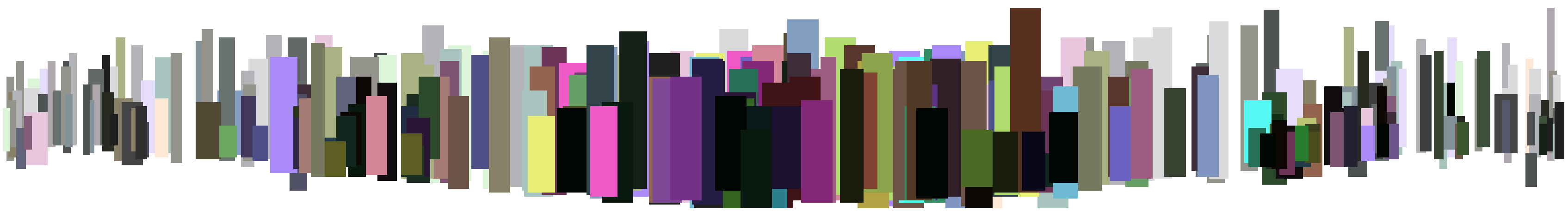
typEm[1] by Catarina Maçãs

- Generates fonts based on the emotion of a text
- Using Fontastic[2], a Processing library

1. https://vimeo.com/74389105
2. http://code.andreaskoller.com/libraries/fontastic/

Example Representation: Composition Plan

(Colton 2008)



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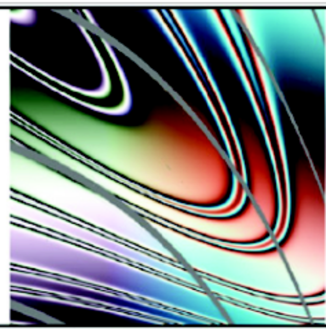
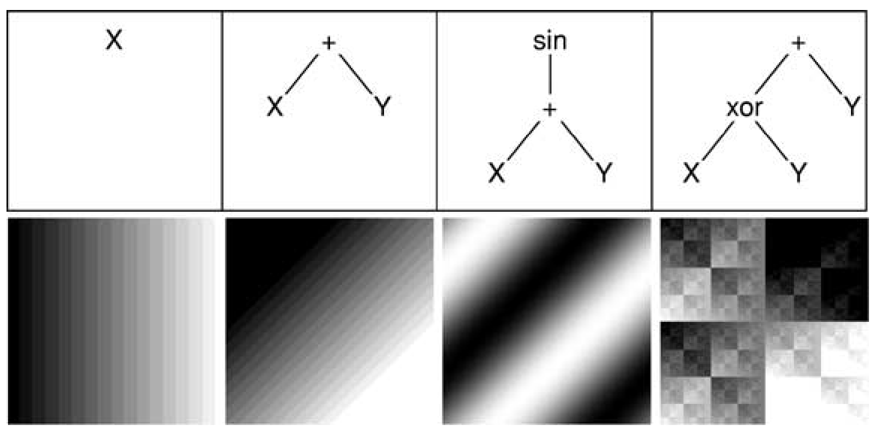
Example Representation: Mathematical Function

(Machado et al. 2007)



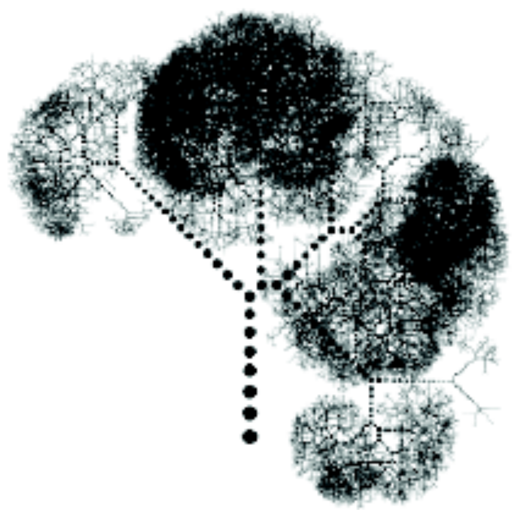
(round (blur (+ (EdgeDetect (+ (blur (cos (+ (- (- (expt Y) (HSVtoRGB (- (xor Y X) (cos X)))) (cos (+ (- (expt 0.426740) Y) (cos (- (expt (+ Y X)) Y))))) (EdgeDetect (+ (blur (cos (+ (- (- (expt Y) (HSVtoRGB (blur (cos (+ (- (- (/ (xor Y (- -0.404462 (sin Y))) Y) (HSVtoRGB Y)) (cos (+ Y (BWNoise (log X))))) (blur (dissolve X (HSVtoRGB (BWNoise (log X)))))))))) (cos (+ (expt 0.426740) (cos (- (expt (+ Y X)) Y))))) (blur (cos Y))))) (cos (+ Y Y))))))) (cos (+ Y Y)))) (round (cos X) 0.401654))) (cos 0.339457 0.120640 - 0.154088))

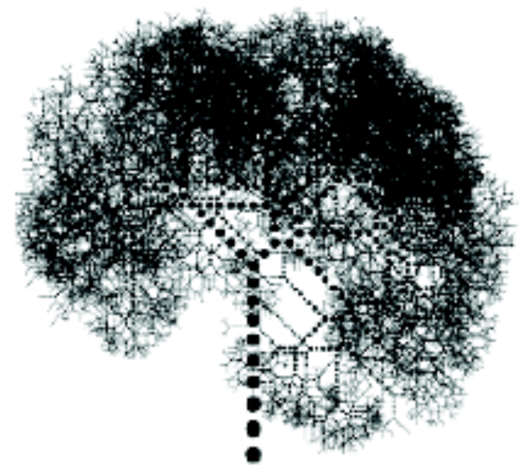


Example Representation: Shape Grammar

(Machado and Nunes 2010)

```
startshape TREE
rule TREE 0.80 {
     CIRCLE {}
     TREE {size 0.95 y 1.6}
}
rule TREE 0.20 {
     CIRCLE {}
     TREE {size 0.95 y 1.6
            rotate 45}
     TREE {size 0.95 y 1.6
            rotate -45}}
```



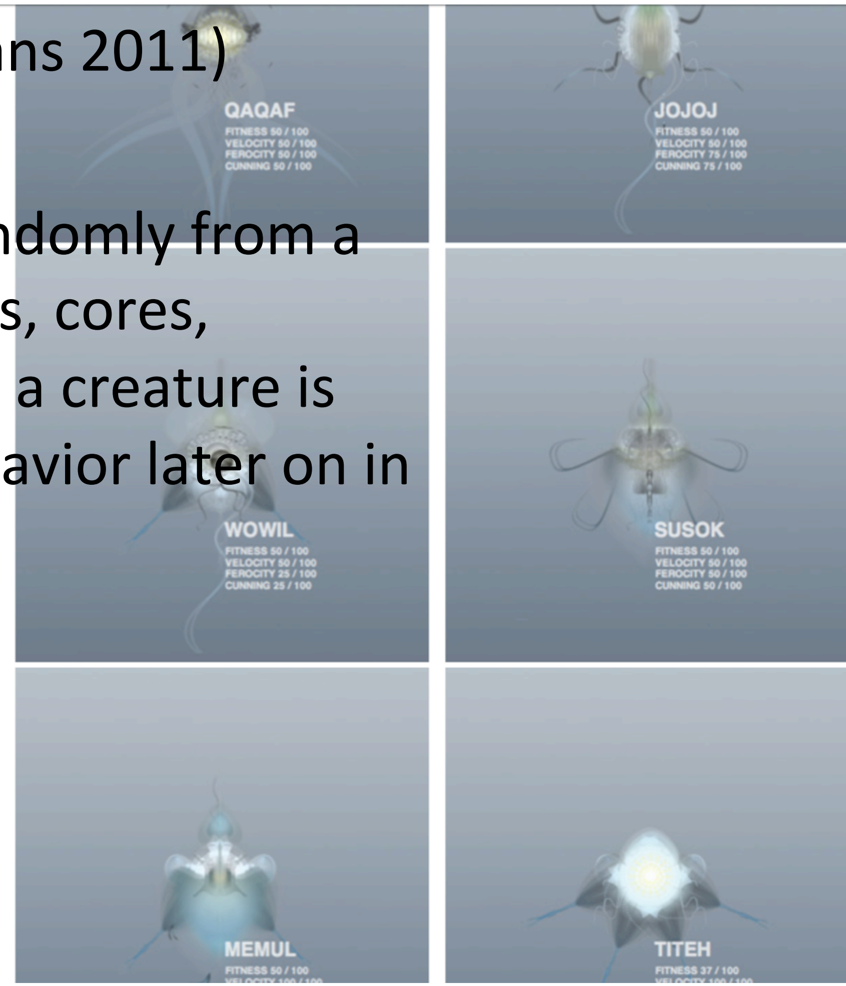


Made with Context Free (http://www.contextfreeart.org/)

Example Representation: Behavior of Artificial Life

(De Smedt, Lechat and Daelemans 2011)

Each creature is constructed randomly from a pool of components (heads, tails, cores, flippers and tentacles). The way a creature is constructed determines it's behavior later on in the survival game.



Example Representation: Behavior of Artificial Life

Made with NodeBox (https://www.nodebox.net/node/)

Images & Paintings: Representation

Use/devise a representation which helps you generate what you want!

Images & Paintings: Generation

- From scratch:
  - take the *x* and *y* coordinates of a pixel as input
  - Parameterize a curve or shape
  - Fill a composition plan

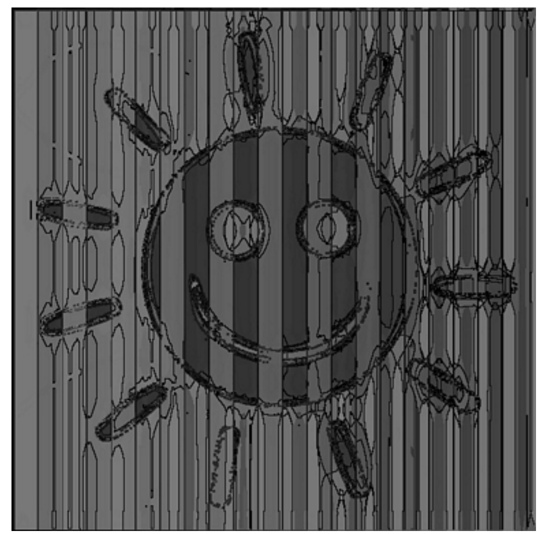
- From an input image:
  - Apply image filters
  - Apply paint strokes
  - Collage, Visual Operators (juxtaposition, fusion, replacement)

- Genetic Operators (in Genetic Algorithm & Genetic Programming)

Generation Example: Image Filters

DARCI (Digital Artist Communicating Intention) (Norton, Heath and Ventura 2011)

Source image



A ‘creepy’ version

Generation Example: Paint Strokes

The Painting Fool (Colton 2008)

Generation Example: Collage

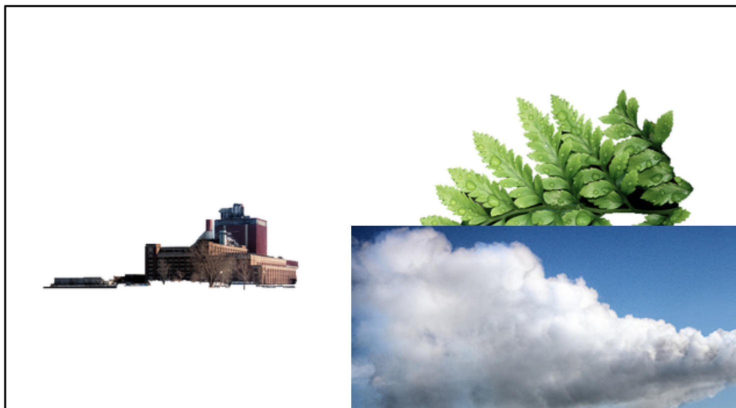
(Krzeczkowska et al. 2010)

Based on a news story about the war in Afghanistan

Generation Example: Visual Operators

(Xiao and Linkola 2015)

Original images for 'electricity' and 'green':



Juxta

Fusion

Replacement

Images & Paintings: Intention

- Levels of artistic intentions
- State of the art:
  - Detect and express emotions (via stroke styles)
  - Represent the point of view (of a news story)
  - Express specific meanings
- Communicating intention (Framing)

Images & Paintings: Evaluation

- Self-evaluation
  - 'General objective' aesthetic measures in math (Birkhoff 1933)
  - Fitness functions in Evolutionary Computing (EC)
  - Learned mapping between image features and meanings
- External evaluation
  - Human curation
  - Human judge
  - Public exhibition

References

- Colton, S. Automatic invention of fitness functions with application to scene generation. *Applications of Evolutionary Computing*. Springer Berlin Heidelberg, 2008. 381-391.

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- Birkhoff, G. D. *Aesthetic Measure*. Cambridge, Harvard University Press, 1933.

- Krzeczkowska, A., El-Hage, J., Colton, S. and Clark, S. Automated collage generation - with intent, *Proceedings of the 1st International Conference on Computational Creativity*. 2010.

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- Machado, P., Romero, J., Santos, A., Cardoso, A. and Pazos, A. On the development of evolutionary artificial artists. *Computers & Graphics*, 31(6):818–826, 2007.

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Thank You!