

Evolutionary Graphical Design

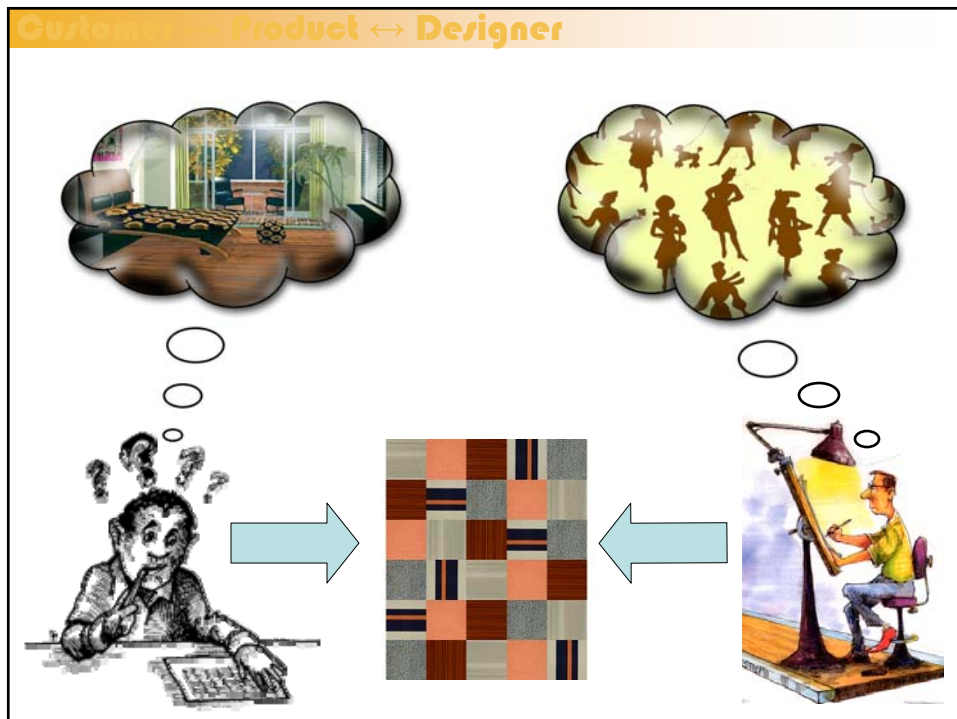
Carl Anderson

Daphna Buchsbaum

Jeff Potter

Eric Bonabeau

2005



Designer - tailored Tool

**What tools would
complement a designer's
aesthetic sense and skills?**



Objective



4-Square



Block Party



Day Dreaming



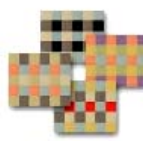
Mad for Plaid



Moving Up



Patchwork



Pillow Talk



Shift in Time



Striped Poodle



The "L"

**More specifically:
How can we aid
Interface's designers?**

Objective

from designer's perspective:

- *I have an idea in mind*
 - say, *Paul Smith* type stripes
 - palette, widths, swish etc
- *There are very many variants of the basic idea I have in my head*
- *I will know the perfect design when I see it*
- *I just need to explore some ideas*
 - by hand
 - **designer-guided automated search...**



Selective breeding



many generations



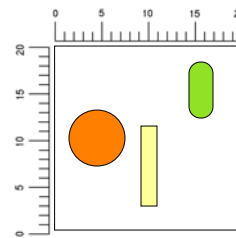
Key components:

- Selective agent: **man**
- Evolution: **heritable variation**
- Variation
 - Mutation: **generates diversity**
 - Recombination: **choose parents**

How does it work?

Genetic material

A **design**: vector of shapes or graphical elements:



$$= (\text{orange circle}, \text{yellow rectangle}, \dots, \text{green oval})$$

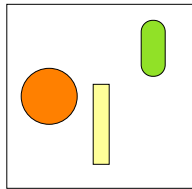
$$= (\{x, y, r, R, G, B\}, \{x_0, y_0, x_1, y_1, R, G, B\}, \dots, \{x_0, y_0, x_1, y_1, r, R, G, B\})$$

$$= (\{4, 10, 3, 255, 128, 0\}, \{9, 3, 11, 12, 225, 225, 153\}, \dots, \{14, 12, 16, 18, 145, 225, 39\})$$

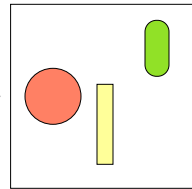
How does it work?

Mutation

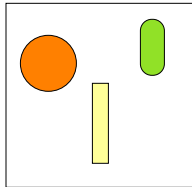
parent



offspring 1



Circle's B value: 0 → 100



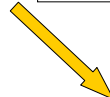
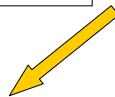
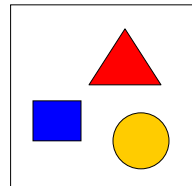
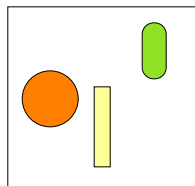
offspring 2

Circle's x coord: 4 → 10

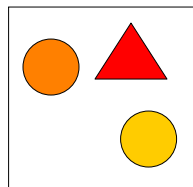
How does it work?

Recombination

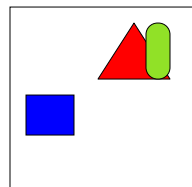
Designer-chosen parents

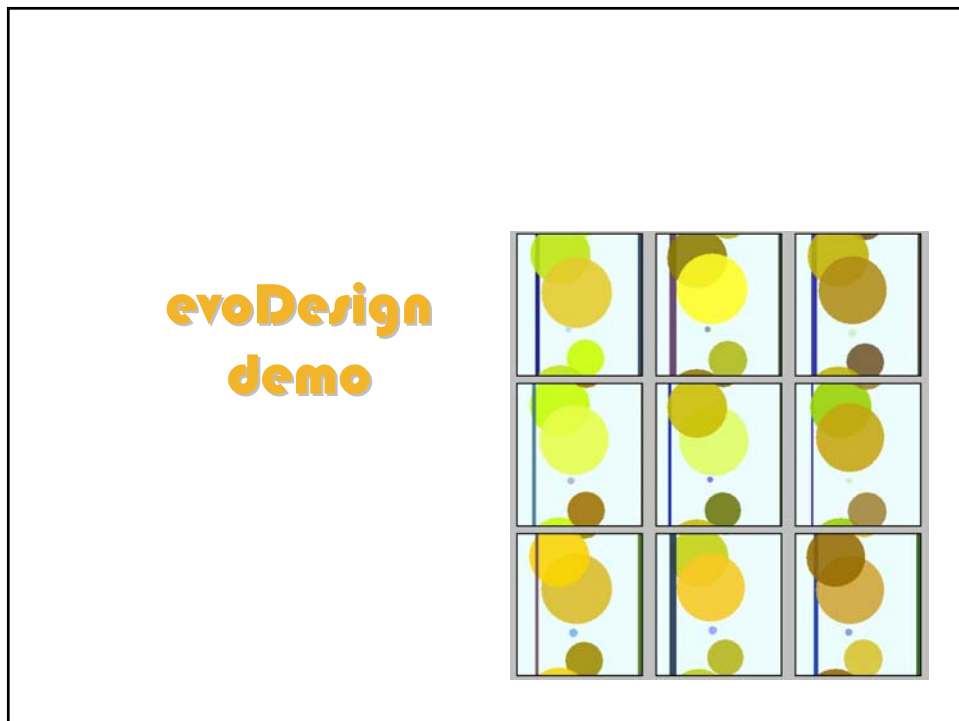
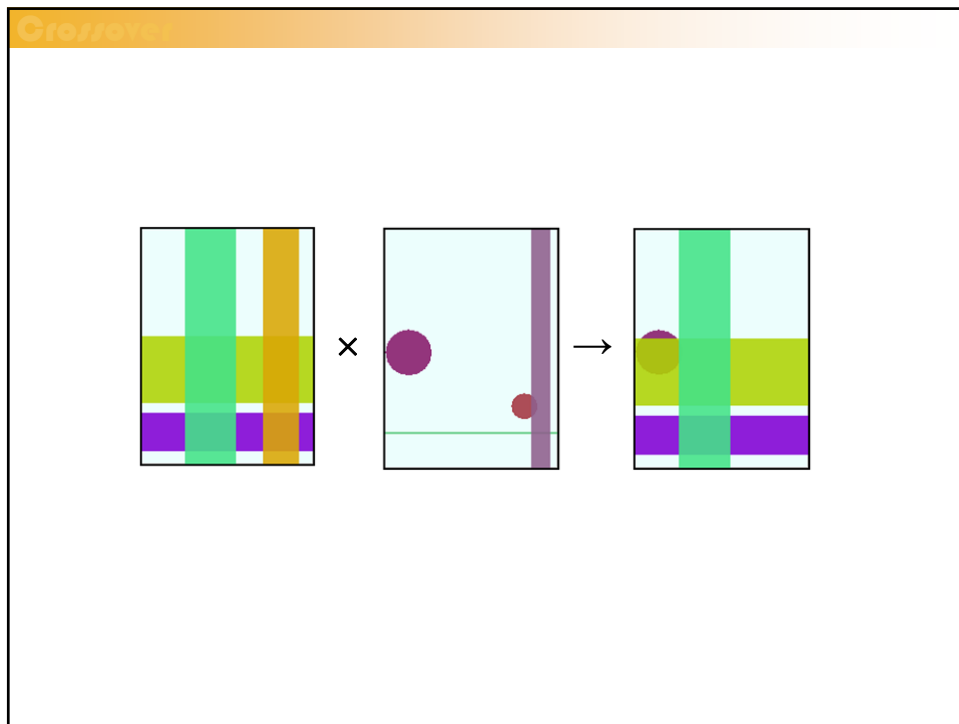


offspring



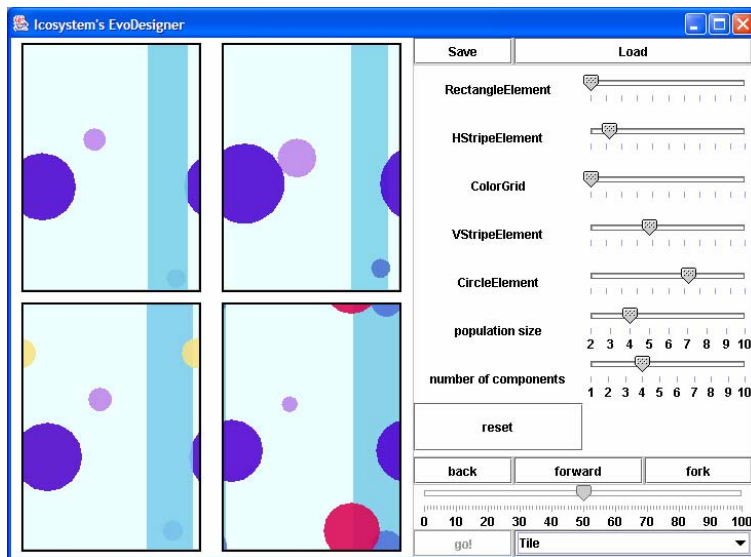
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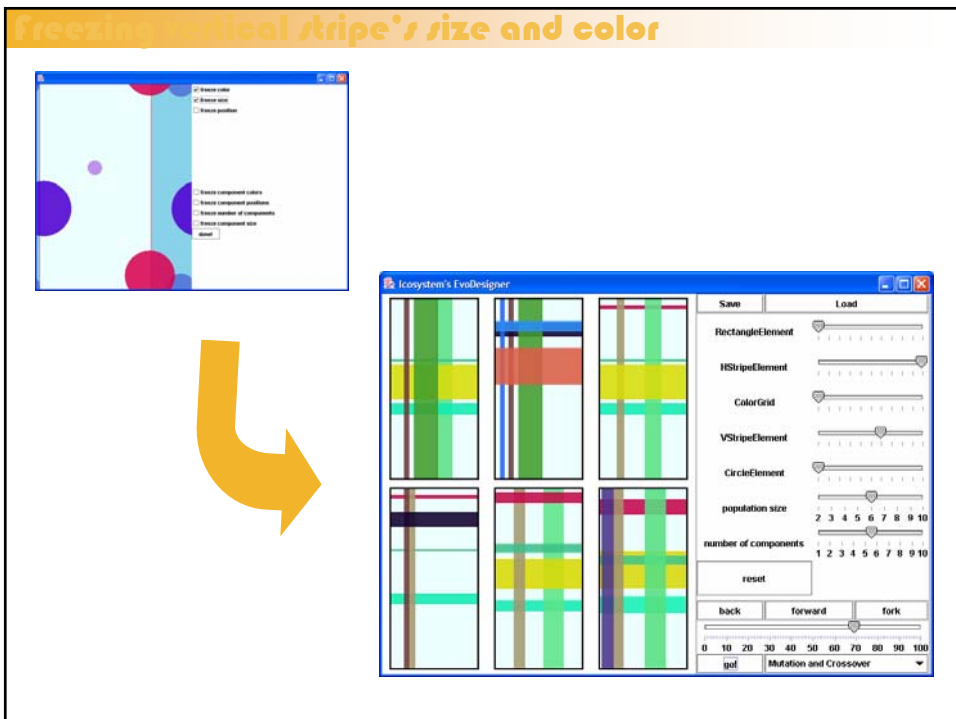
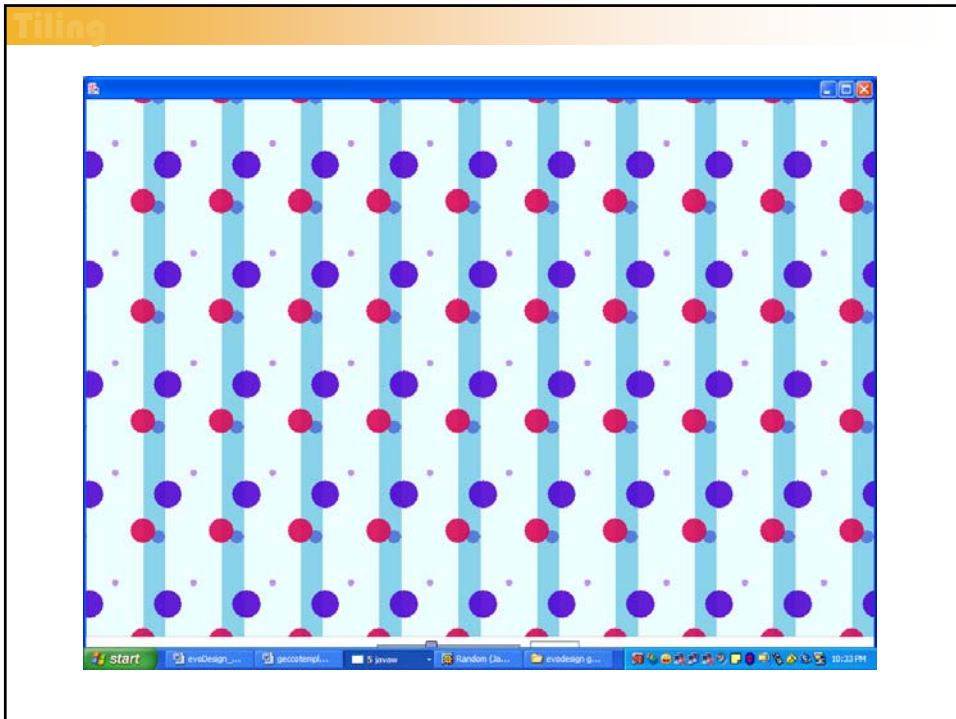




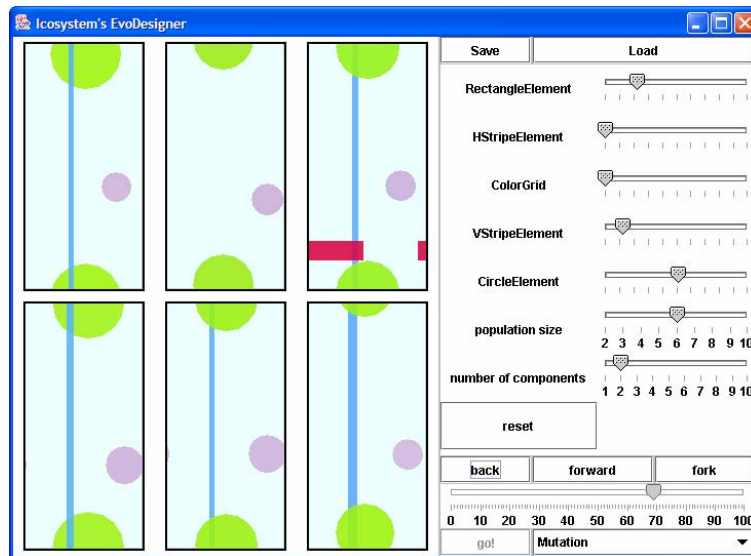
Ideal Interactive Evolution Tool...

- Fully interactive
 - See value of every attribute
 - Edit / manipulate value of every attribute
 - Including all mutation rates
 - Including freezing components of choice
- See complete evolutionary history
 - Restart search from any point
 - Save / load any and every design

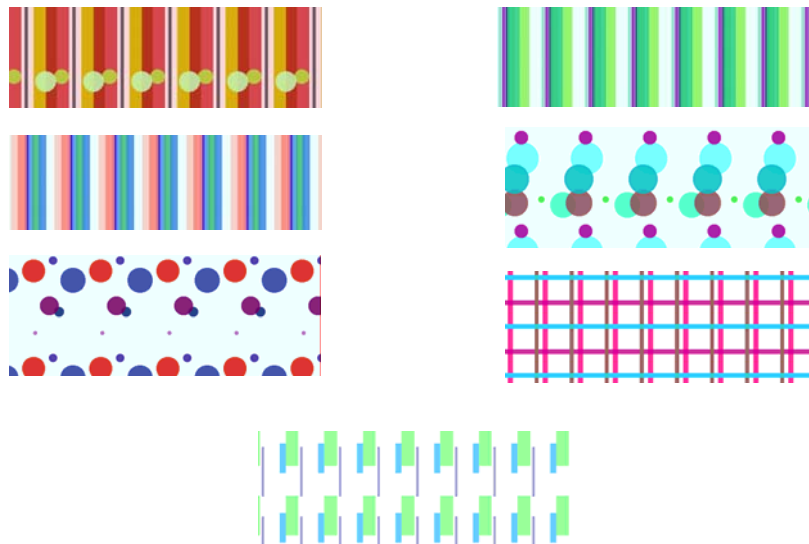




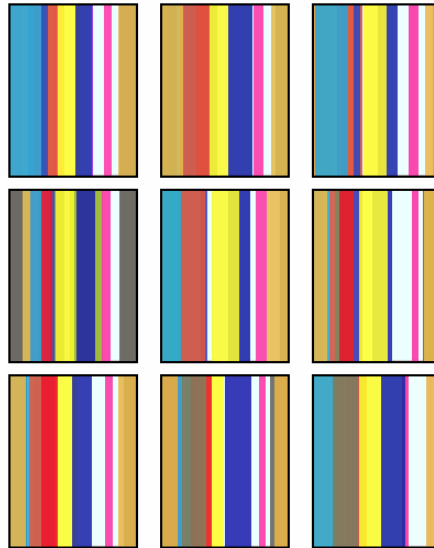
few lines, many circles: retro



11 samples of findings

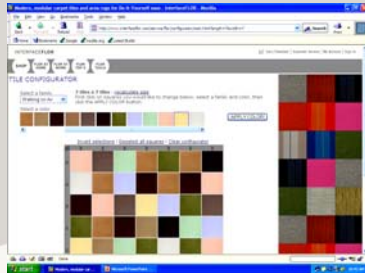


Oriented Search



Customer - tailored Tool

What tools would drive customer – designed bespoke floor covering sales?



Bespoke Coverings



"FLOR Rugs are not like any rug you've purchased before. It's interactive. We give you a professionally designed rug but since FLOR is modular you can change your mind and rearrange your rug your own design! The possibilities are endless."

<http://www.interfaceflor.com/service/flor/shop.html>

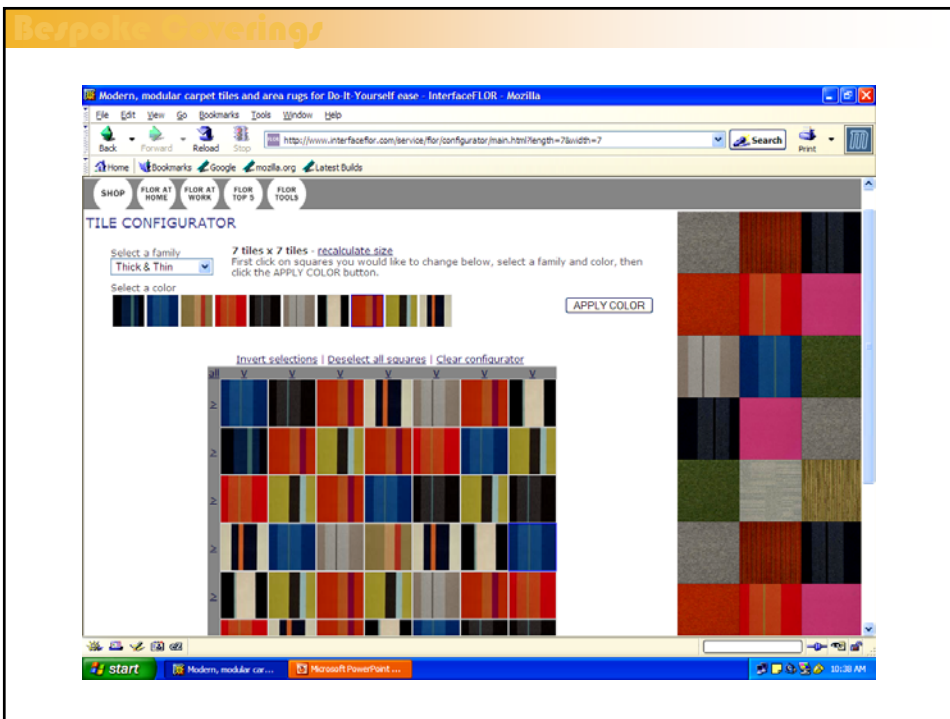
Bespoke Coverings



“FLOR Rugs are not like any rug you’ve purchased before. [It's interactive](#). We give you a professionally designed rug but since FLOR is modular you can change your mind and rearrange your rug your own design! The possibilities are endless.”

We want to make it even more interactive!

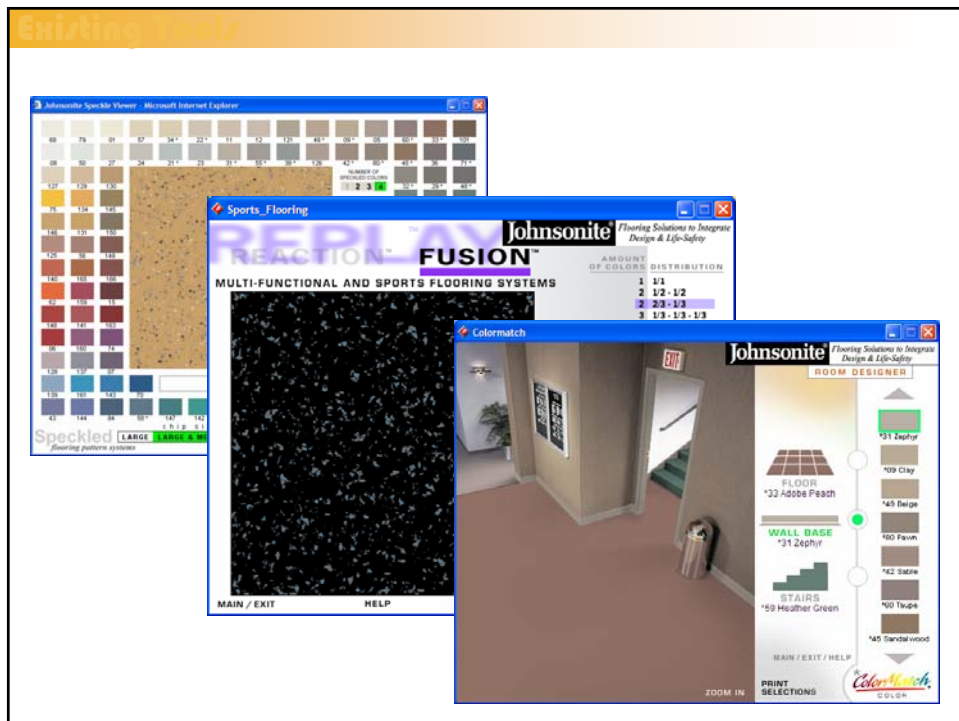
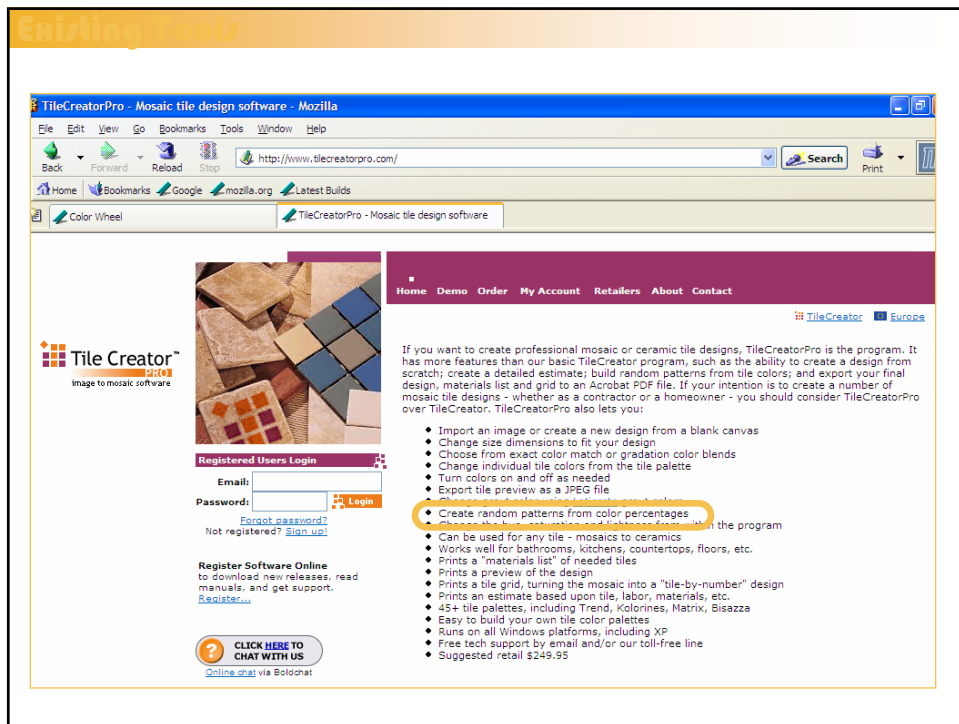
<http://www.interfaceflor.com/service/flor/shop.html>

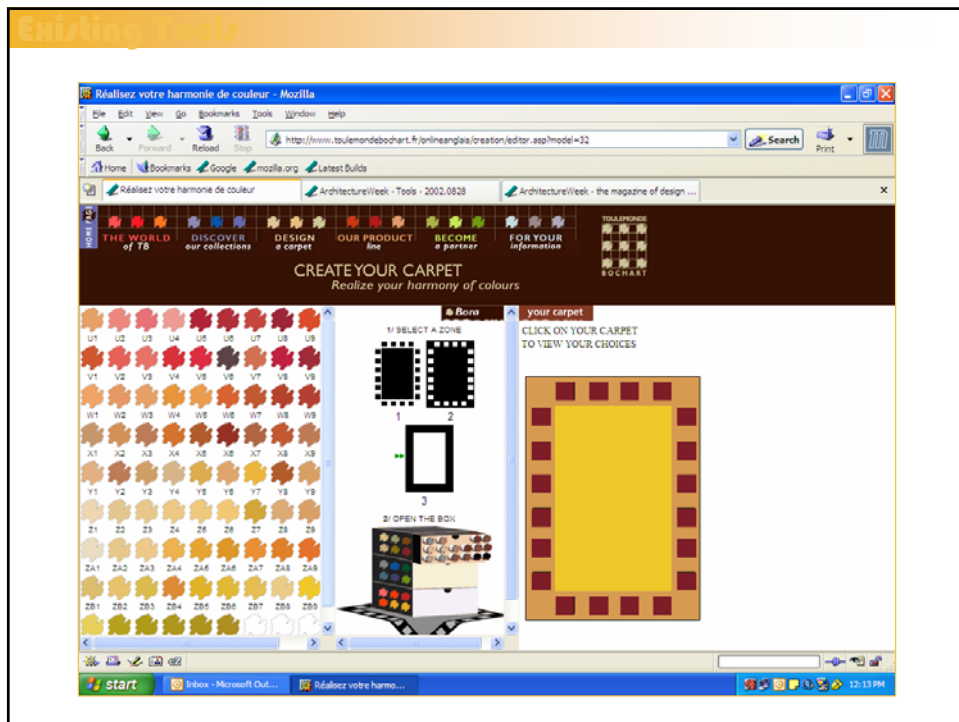


Tailored coverings...

- **Tile Configurator**
 - *Limited number of tiles [20x20]*
 - *Limited configuration [rectangle]*
 - *Limited to certain Interface tiles*
- **What if the use could evolve a grid of tiles?**
- **What if the user could specify their own room shape?**
- **What if the customer could evolve their own bespoke tile?**

Existing tools





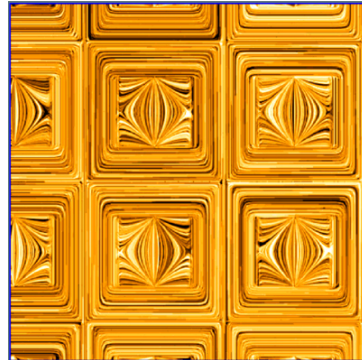
The next level

Truly organic forms

"genetic art"

$$g(x,y) = (\ln(\sin(x)))^3 \times \tan(y)$$

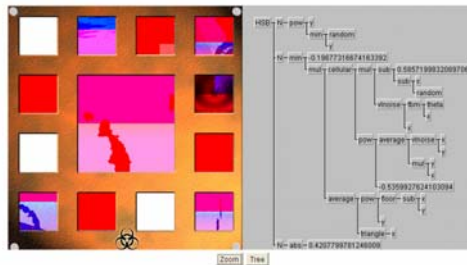
$$h(x,y) = (\ln(\cos(y)))^3 \times \tan(x)$$



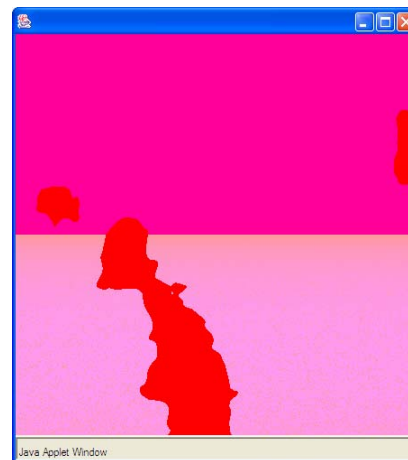
WIRED: 09/04, p. 76

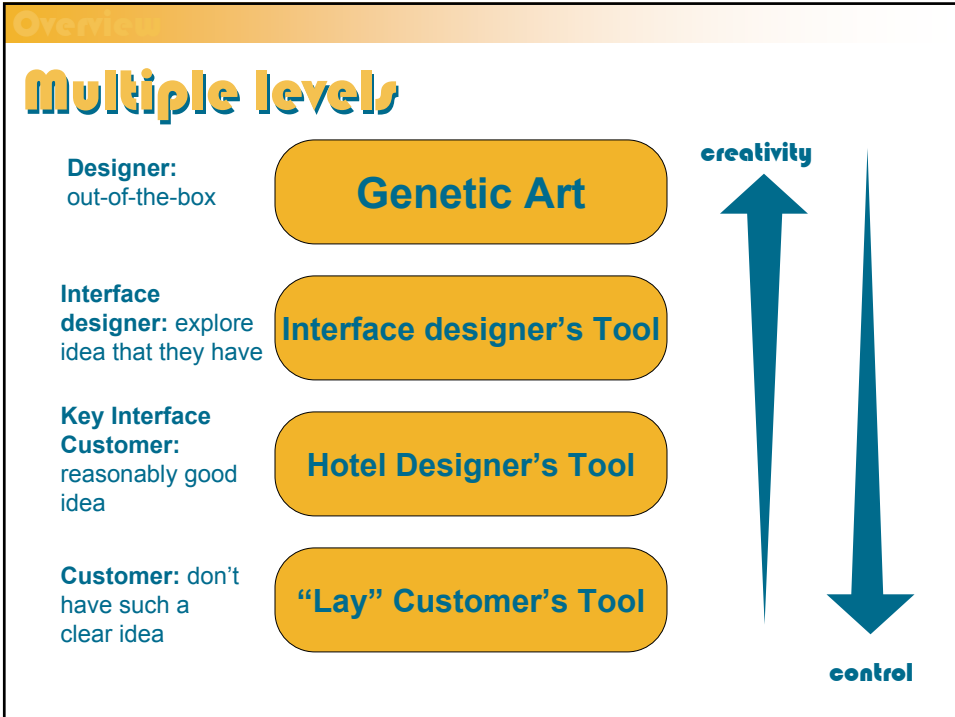


<http://www.jhllabs.com/java/art.html> http://kandid.sourceforge.net/gal_favorites_1.html



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Questions?

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