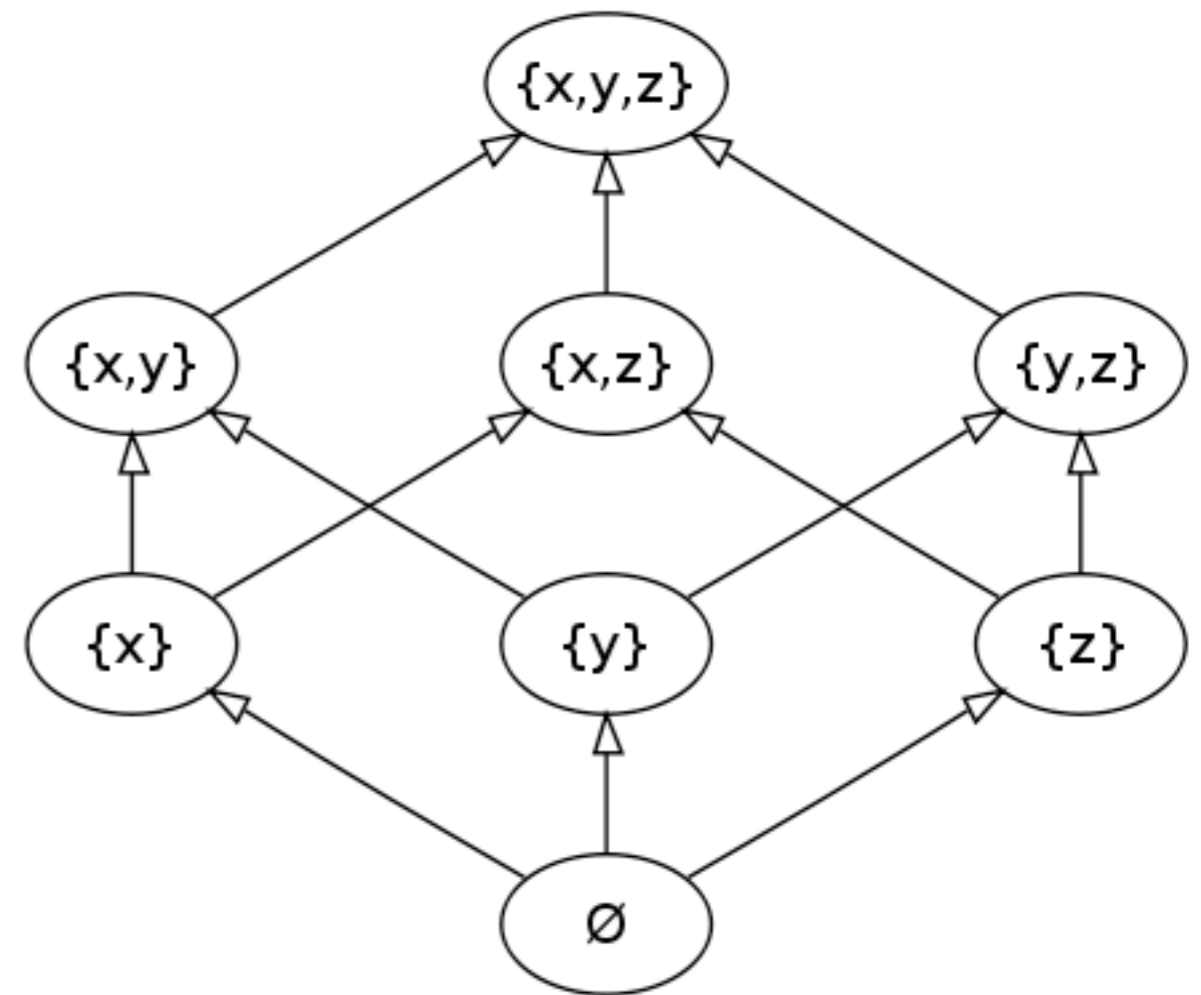# Which is better?

Interpreter or Visitor?
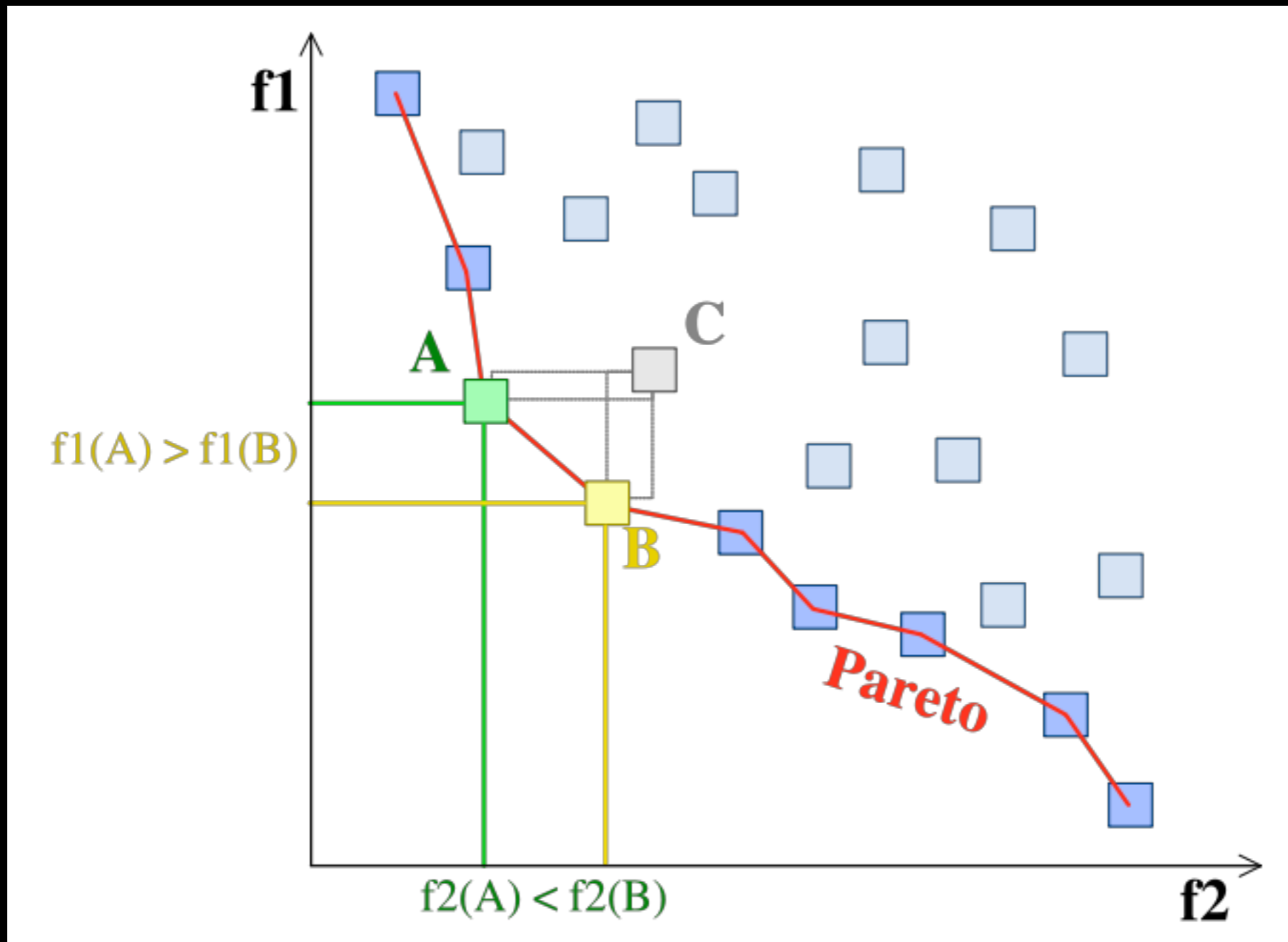
Partial Order

Partial Order

- reflexive

- anti-symmetric

- transitive

- is there necessarily a distinguished top?

Pareto Front

What are the core skills of a designer?

The Core Skills of a Designer

- To synthesize a solution from all of the relevant constraints

- To frame, or reframe, the problem and objective

- To create alternatives

- To select from those alternatives

- Prototyping

[Moggridge]

How do you generate new ideas?

Analogy {
Local   Mac ≈ Alto

Distant   Genetic Algorithms
Neural Networks
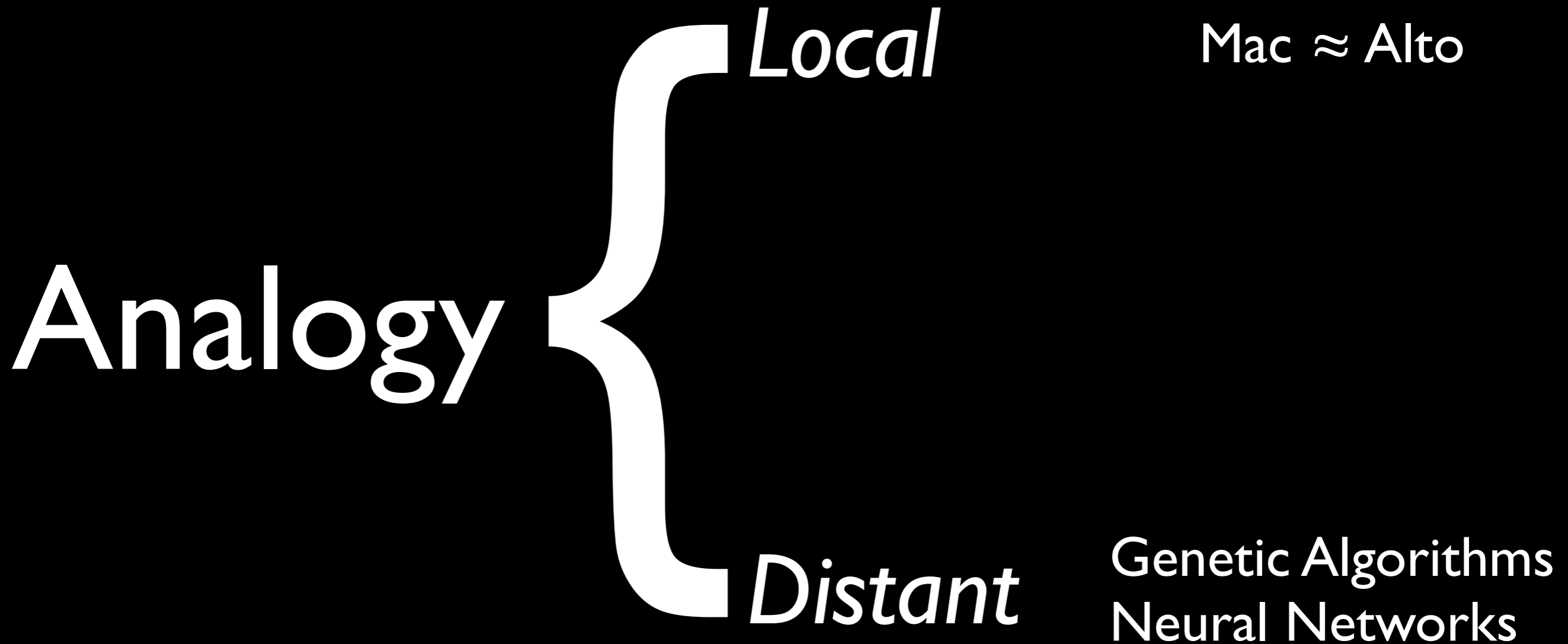
"We may say most aptly that the Analytical Engine weaves algebraic patterns just as the Jacquard loom weaves flowers and leaves." — Ada Lovelace

[Sanders & Thagard]

Intense Mode Creativity

- Whiteboard

- Paper

- Focus

[Sanders & Thagard]

Casual Mode Creativity

1. **Immersion in problem domain**
2. Absence of immediate pressure
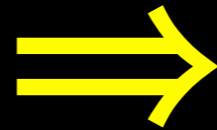3. Absence of distractions
4. Mental relaxation
5. Unstructured time
6. Solitude

[Sanders & Thagard]

Casual Mode Creativity

- take a shower

- go for a walk

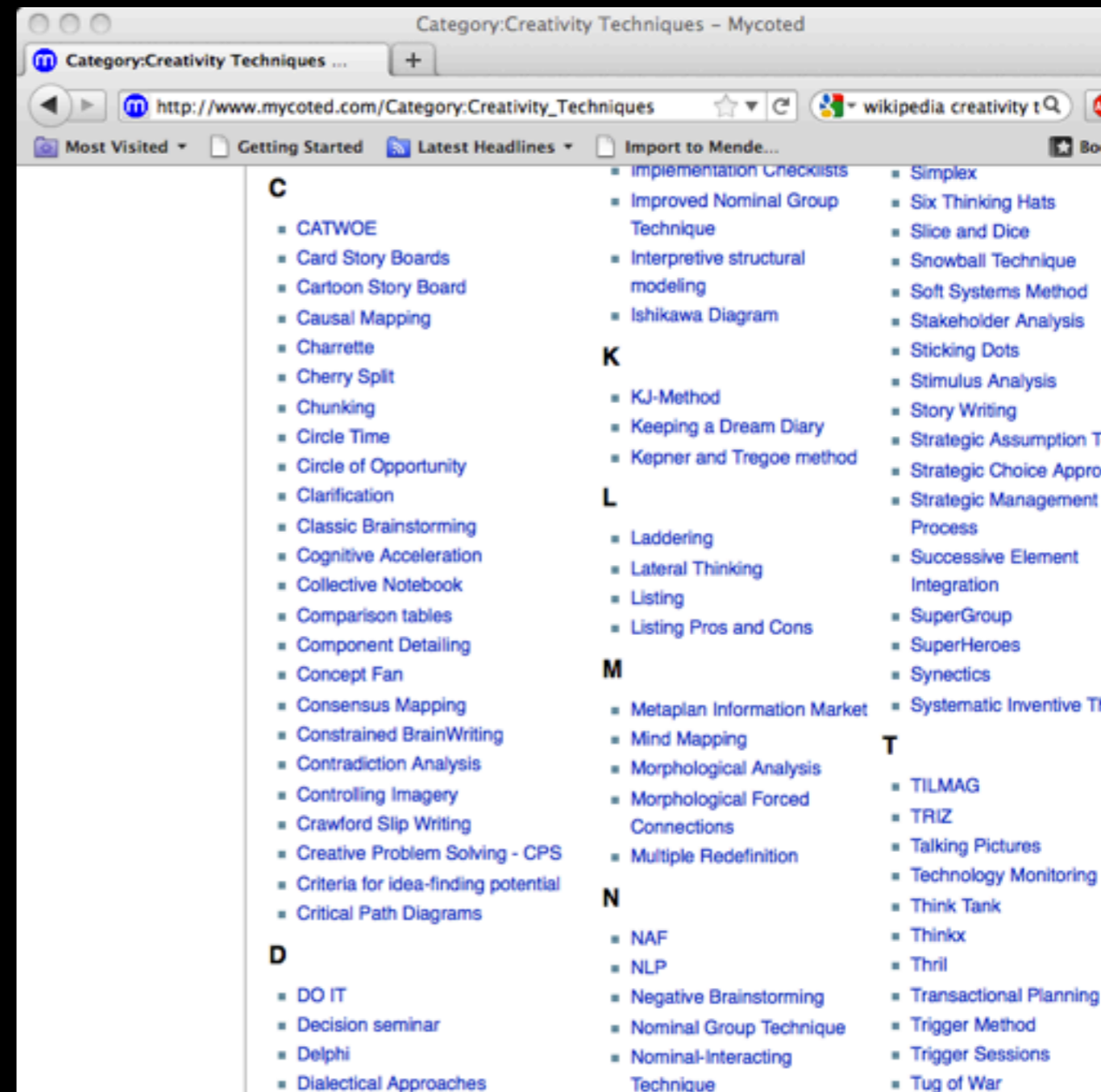- garden   ⟹   light physical activity that you are comfortable with and not distracted by

- knit

- cook

- doodle

Can creativity be done in a group?

Or is it a flicker of solitary genius?

Group Approaches

- Brainstorming

- Synectics [Gordon]

- Six Hats [de Bono]

- *etc*

Are there Systematic Approaches to finding new Ideas?

Systematic Approaches

- Morphological Analysis
- Relax a Constraint
- Find another Pareto point
- Try a different architectural style / pattern
- Change the technology
- Local analogy to normal programs
- Change the data schema
- What would Dijkstra do?

Morphological Analysis

- Identify components

- Compute all component combinations

- Evaluate each

- Find the Pareto Front

Relax a Constraint

- Restaurants:
  - have menus
  - serve food
  - charge money for food
- The kernel manages the file system

Another Pareto Point

- Your current design(s) represent different trade-offs in terms of the analytical criteria

- Pick a different trade-off and design for it

Different Pattern/Style

- Garlan & Shaw designed KWIC in four different architectural styles

    - they have additional (larger) case studies

- Lab #1 used two different patterns for a simple calculator

- Grab a catalog of patterns/styles and start browsing through it

Change the Technology

- *Weak Form:*

  - substitute an interchangeable component

- *Strong Form:*

  - change programming paradigms

  - Haskell? Prolog?

  - etc.

Local Analogy to *the* Normal Programs

- **OS**: monolithic, microkernel, hypervisor
- **DB**: hierarchical, relational row-store, relational column-store, object-oriented, time-series
- **Compilers**: ahead-of-time batch, ahead-of-time incremental, just-in-time, interpreter
- **Distributed systems**: centralized, p2p

Change the Data Schema

- BibTeX database

- Tournica

What would Dijkstra do?

- Simon Peyton-Jones

- Tony Hoare

- Rob Pike

- Joshua Bloch

- Michael Stonebreaker

- Ted Codd

- Linus Torvalds

- Larry Wall

- Donald Knuth

- David Parnas

- Fred Brooks

- Michael Jackson