Which is better?

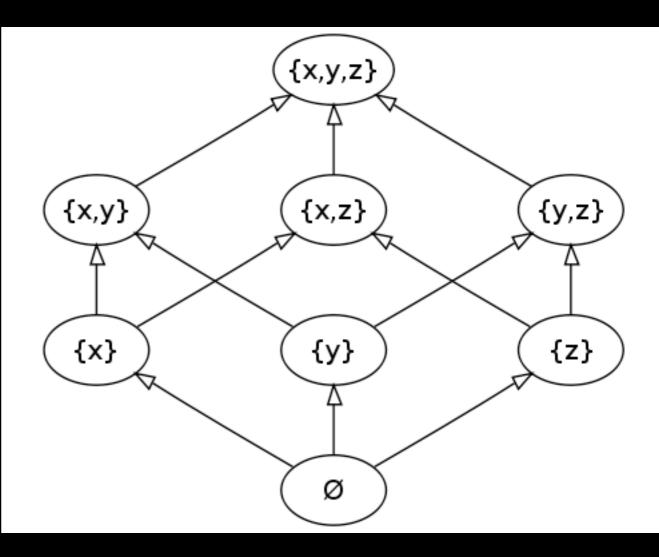
Interpreter or Visitor?

Partial Order

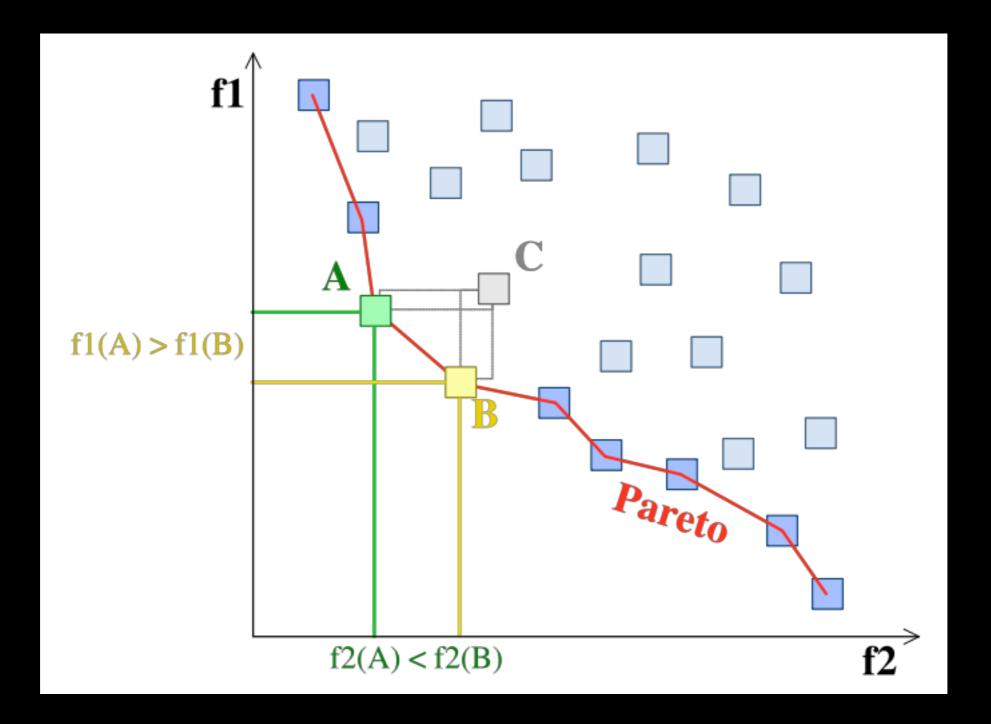
Partial Order

- 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



How do you generate new ideas?

Local Analogy | Distant

 $Mac \approx Alto$

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

- I. 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
- knit
- cook
- doodle



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

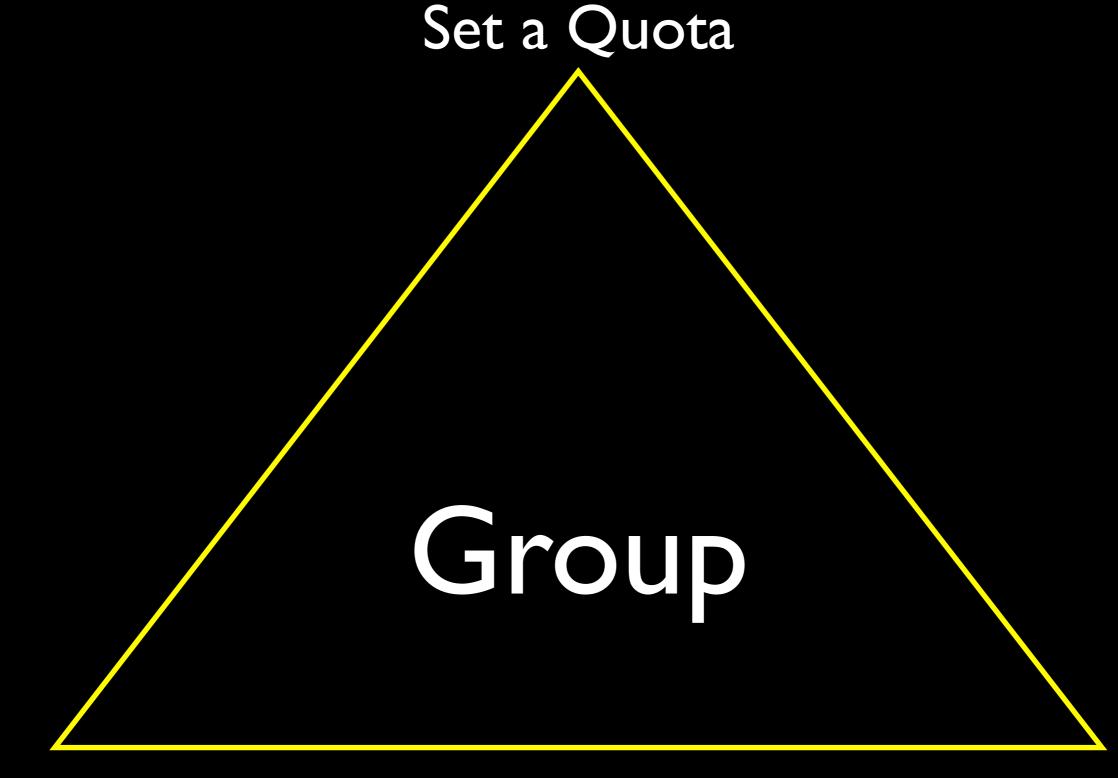
Can creativity be done in a group?

Or is it a flicker of solitary genius?

Group Approaches

- Brainstorming
- Synectics [Gordon]
- Six Hats [de Bono]
- etc

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	= Criteria fo	Slip Writing Problem Solving - CPS r idea-finding potential		 TRIZ Talking Pictures Technology Monitoring Think Tank
	= Critical Pa D = DO IT = Decision = = Delphi	ath Diagrams seminar	 NAF NLP Negative Brainstorming Nominal Group Technique 	 Thinkx Thril Transactional Planning Trigger Method Trigger Sessions
		I Approaches	 Nominal-Interacting Technique 	 Tug of War



Defer Judgement

Lower Inhibitions

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