

Objects of the people,
by the people, and for
the people

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This is a paradigm shift

- ⌚ Time
- ⌚ Reflection
- ⌚ Morality

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It's Been Done

Raoul Duke: "I respect the work here, so please don't take this quip as being too snarky, but... it kills me that it is as if functional programming never did and still doesn't exist! sheesh?!"

— Raoul Duke

"... it feels like dependency injection should give exactly the same benefits and be a simpler method"

— Petter Måhlén

I don't agree and
therefore you are wrong

"And, actually, your traits don't tell me anything about temporal constructs, which is a fundamental element of reactive systems and composing a realistic user's mental model."

— John Zabroski, 22 March 2007

I don't understand and
therefore you are wrong

"So I like DCI on the whole – but I still don't get the whole classes vs objects discussion and why it is such a great thing to do role injection."

— Petter Måhlén

I Invented It

"This is the NetBeans way to do DCI..."

"DCI confirmed what you were already doing"

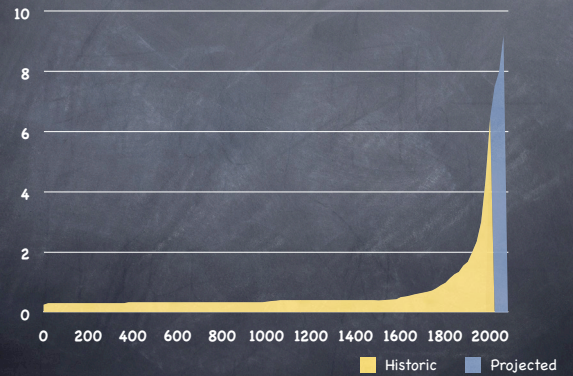
— Juroslav Tulach
(NetBeans API Architect), DZone video

Outline

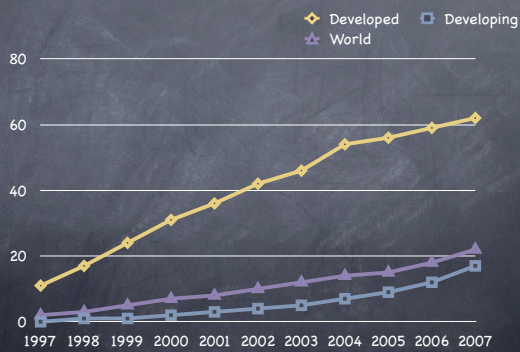
- Original objects — the Swarm
- Evolution of Communication
- Generativity and Intentionality: Creating Realities
- The Ghost in the Machine
- The Form of Function
- Homework and Goodbye

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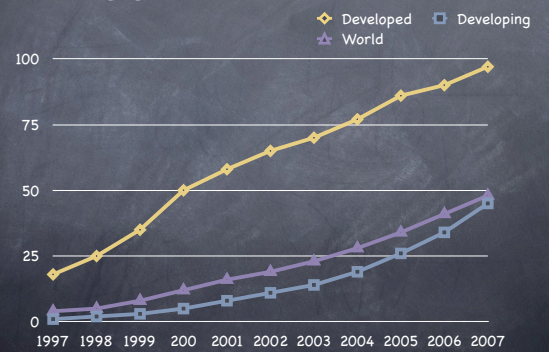
Living Human Brains



Internet Users / 100 Inhabitants



Mobile Phone Users / 100 Inhabitants



The vision

- A world computer
- Englebart's notion of computers as mental augmentation

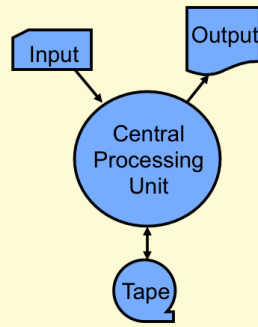
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The vision: A Swarm

- 80 billion cells in a human brain
- For C++ programmers, Smalltalk programmers, etc.

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CPU-Centered paradigm



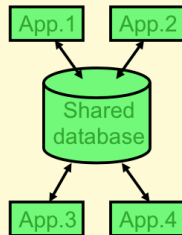
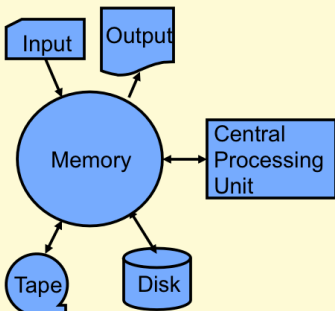
FORTRAN
Algol 60

Hardware

Software

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Storage-Centered paradigm

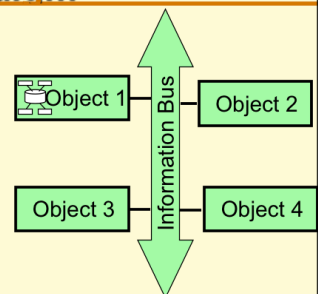
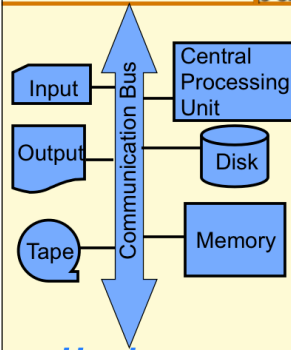


DB Schema language
e.g. Entity-Relation
e.g. NIAM
Software

Hardware

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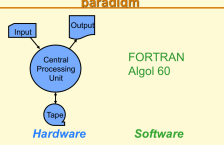
Communication-Centered paradigm



Composition tools.
Languages ?????
Software

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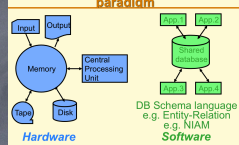
CPU-Centered paradigm



FORTRAN
Algol 60
Hardware Software

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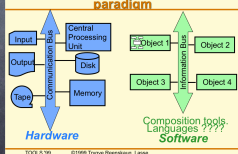
Storage-Centered paradigm



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Communication-Centered paradigm



Composition tools.
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Computational Models

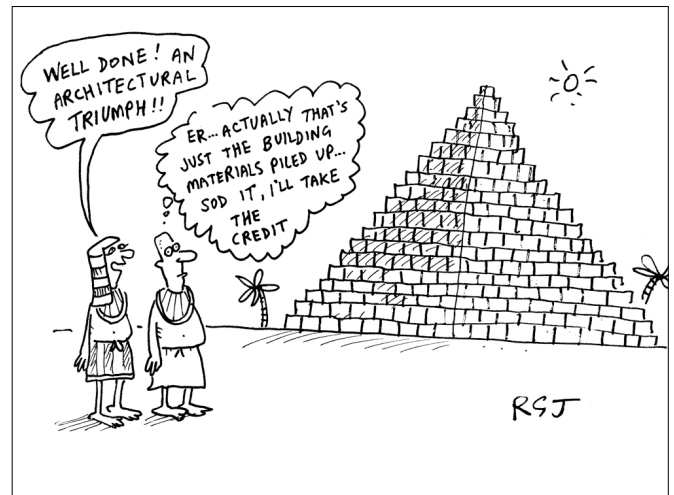
- Objects are the building blocks of the communication-centered paradigm
- Today's object is tomorrow's computer, from the perspective of scale (yesterday, a million objects—today, a million computers)
- Objects as a recursion on the concept of computer—Kay

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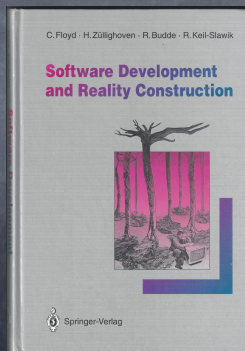
What is the right computational model for this world order?

- Original OO: If every object does its job right, all will be well
- Imperative command and control: Let a benevolent dictator control it
- These are beliefs. Someone said, "The biggest problem we have as human beings is that we confuse our beliefs with reality."
- Intentional problem solving begs something in between

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The biggest problem we have as human beings is that we confuse our beliefs with reality.



Systems thinking comes to computer

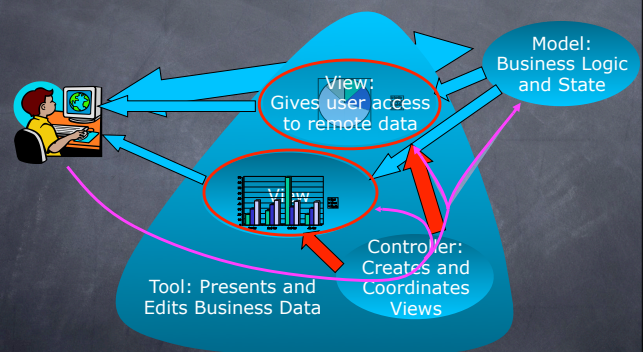
- Design has intent; systems thinking has system intent
- The maturing of the architectural metaphor
- Started with Brooks & Weinberg
- A more familiar phenomenon: Patterns

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The end user mental model

- On the other hand, people need a chance to identify with the part of the environment in which they live and work; they want some sense of ownership, some sense of territory. The most vital question about the various places in any community is always this: Do the people who use them own them psychologically? Do they feel that they can do with them as they wish; do they feel that the place is theirs; are they free to make the place their own? — Christopher Alexander

The Ghost in the Machine



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Crosscutting?

- ⦿ Objects cut across classes
- ⦿ Edit units cut across methods
- ⦿ Methods cut across member data declarations
- ⦿ Exceptions cut across objects
- ⦿ Political (AOP): "Advice should be reserved for the cases where you cannot get the function changed (user level) or do not want to change the function in production code (debugging)."

A link to patterns?

And finally, of course, I want to paint a picture which allows me to understand the patterns of events which keep on happening in the thing whose structure I seek. In other words, I hope to find a picture, or a structure, which will, in some rather obvious and simple sense, account for the outward properties, for the pattern of events of the thing which I am studying.

— Christopher Alexander, *The Timeless Way of Building*, Chapter 5, 1979

Reflecting a Bit

- ⦿ The CS community has usually become enamored with statics rather than dynamics
- ⦿ In patterns we picked up the structural part—but that's just a means to behavior
- ⦿ We did the same with objects—focusing on individual objects doesn't yield insight on the real issue: the system behavior
- ⦿ Class-oriented thinking has exacerbated this

The Form of Time

- ⦿ The "other side" of human endeavor
- ⦿ Closely tied to our analytical processes of design and to reason: think Kant and objects

What is the form of function?



```
0145234427
0142366281
0283346255
0347212938
0324426292
0264274547
0374616737
0164571836
0173646282
0324426292
0145234427
0264274547
```

Each class method prints the object ID

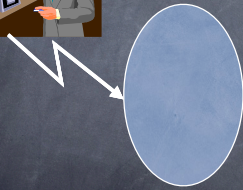
What is the form of function?



```
SavingsAccount
CheckingAccount
Euro
SavingsAccount
SavingsAccount
Krone
InvestAccount
SavingsAccount
Shekel
CheckingAccount
PhoneBill
Euro
```

Each class method prints the class name

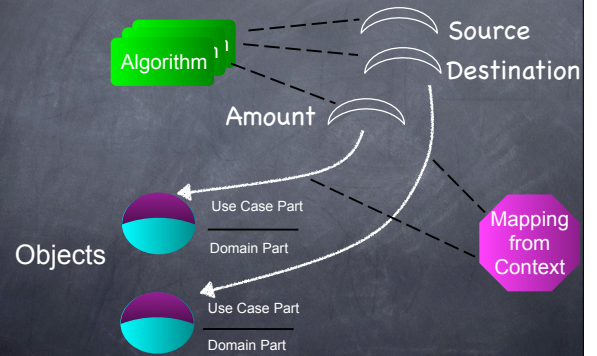
What is the form of function?



Each class method prints its role name

```
SourceAccount
DestinationAcct
Amount
SourceAccount
DestinationAcct
Amount
SourceAccount
DestinationAcct
Amount
SourceAccount
DestinationAcct
Amount
```

An Example: Bank Accounts



Form...

- ⌚ "... follows function" – Louis Sullivan
- ⌚ "... dissolves function"
- ⌚ "... follows failure" – Henry Petroski
- ⌚ "A well made ceramic form transcends the humbleness of function and becomes art."

The architectural form of time

The capacity and of physical space is always interlocked with its inherent geometric patterns in the space.

- Christopher Alexander, *The Timeless Way of Building*, p. x0

This is about Reflection

- ⌚ Kiczales' original dream, and AOP as a gauntlet to the non-Lisp community
- ⌚ The world Context changes the program
- ⌚ The program changes itself with programmer intent
- ⌚ The program changes the world around it

Open Questions

- ⌚ What is reflection on time?
- ⌚ AOSD popularized pseudo-reflection at compile time. Can we popularize reflection instead, and return to real objects?

Morality of Programming

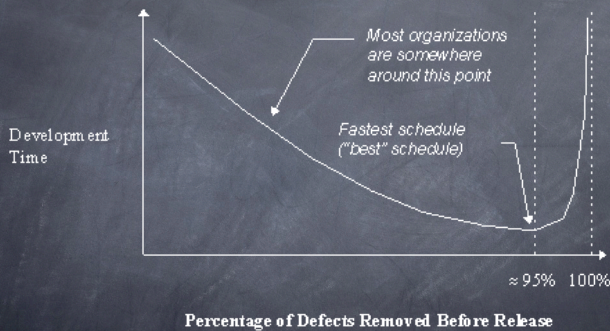
- ④ Conway's Law Redux and the Smalltalk vision: evolution at the hands of the users
- ④ Object autonomy is user empowerment
- ④ Design through Agile partnership: community control
- ④ Class-based design for later execution: disempowerment of programmers
 - ④ More Lisp, less Java
 - ④ Scala, F#, clojure.... it's coming....

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Morality of Programming

- ④ A major AOSD theme: handling complexity
- ④ In concert with Doug Englebart, computer augmentation of reasoning
- ④ "Not a wrong answer, but a different answer"
 - ④ Discourages processes of understanding and the discipline of technical perfection—the Lean mantra

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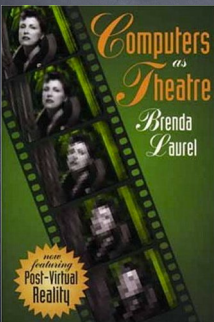
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Nine Fives of Reliability

- ④ DCI highlights:
 - ④ The importance of readable code
 - ④ The place of the user in habitable programs
 - ④ The place of domain expertise in class construction

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More theatrics



- ④ Human engagement in theatre...
- ④ 間
- ④ The vulgar of pragmatism
- ④ Punctuated events and steady rhythms
- ④ The catharsis of finality

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Solopgang

Sol efter sol efter sol gaar ned,
en glødende Diskos, som langsomt glider
en vældig Kaster af Hænde,
tager hver Gang en Smule af min Kraft med,
én Dag nærmere den sidste.
Og Sol paa Sol paa Sol staar op
i det graa, vækker Uro, en vag
Bevægelse opad i Vævene, Nerverne,
en bedragerisk Springflod i Blodet,
refleksagtigt Haab –
men Hjærtet svinger sig ikke mer med,
det bliver hernede,
bliver paa Stedet.
Gennemboret af Mursvælgædnesskrig,
Flugthvirvler, Kasteknive, som træfsikkert rammer,
sporer et her paa Bunden af Morgenens Skakt,
definitiv Skæbne, gjort Gerning, Varsel om Afslutning,
ubevægeligt.

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