Architecture and Mental Models

Dr. James O. Coplien, D. We.
Emergent Architecture: A Controversial Topic

- The events and forms of culture interact
- "Requirements" lead to adaptation
- Over time, archetypical forms arise
Uncle Bob weighs in

One of the more insidious and persistent myths of agile development is that up-front architecture and design are bad; that you should never spend time up front making architectural decisions. That instead you should evolve your architecture and design from nothing, one test-case at a time.

Pardon me, but that’s Horse Shit.

— The Scatology of Agile Architecture,
But though this method is precise, it cannot be used mechanically.

The fact is, that even when we have seen deep into the processes by which it is possible to make a building or a town alive, in the end, it turns out that this knowledge only brings us back to that part of ourselves which is forgotten.
But though this method is precise, it cannot be used mechanically.

The fact is, that even when we have seen deep into the processes by which it is possible to make a building or a town alive, in the end, it turns out that this knowledge only brings us back to that part of ourselves which is forgotten.

Architecture supports “what happens there” (operational models !!!)
But though this method is precise, it cannot be used mechanically.

The fact is, that even when we have seen deep into the processes by which it is possible to make a building or a town alive, in the end, it turns out that this knowledge only brings us back to that part of ourselves which is forgotten.
Events Generate Form in Design

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
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
Hi Cope

Can't recall last time we spoke or met but its been ages...

The confession....

Finally grok'ed "generative patterns" and piecemeal growth through a long tortuous route....
Largely through some interesting universal properties of software (scale-free and small-worldness)

A bit slow I am sometimes... but got there in the end...

The request... do you have soft copies of .... I found the IEEE Software web site - of which I am not a member...

Reevaluating the Architectural Metaphor Toward Piecemeal Growth, James O. Coplien
Tools and MVC-U

Model:
Business Logic and State
Tools and MVC-U

Tool: Presents and Edits Business Data

Model: Business Logic and State

Controller: Creates and Coordinates Views
Tools and MVC-U

**Tool:** Presents and Edits Business Data

**Model:** Business Logic and State

**View:** Gives user access to remote data

**Controller:** Creates and Coordinates Views

View:
- Gives user access to remote data

Controller:
- Creates and Coordinates Views

Model:
- Business Logic and State
We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own.

— Alan Kay, 1972
What is a Child?
Birth - 2 months:
living “in time”
Birth - 2 months: living “in time”

3 months old: 3D objects are cohesive as they move
3 months old:
3D objects are cohesive as they move

4 months old:
Surfaces move together if connected and separately otherwise

Birth - 2 months:
living "in time"
3 months old: 
3D objects are cohesive as they move

Gravity and inertia, 6 to 8 months

Birth - 2 months: 
living “in time”

4 months old: Surfaces move together if connected and separately otherwise
Birth - 2 months: living “in time”

4 months old: Surfaces move together if connected and separately otherwise

Causality develops starting at 6 months but is available at 12 months

3 months old: 3D objects are cohesive as they move

Gravity and inertia, 6 to 8 months
Two of Piaget's fundamental notions are attractive from a computer scientist's point of view.

The first is that knowledge, particularly in the young child, is retained as a series of operational models, each of which is somewhat ad hoc and need not be logically consistent with the others. (They are essentially algorithms and strategies rather than logical axioms, predicates and theorems.)
Two of Piaget's fundamental notions are attractive from a computer scientist's point of view.

The first is that knowledge, particularly in the young child, is retained as a series of operational models, each of which is somewhat ad hoc and need not be logically consistent with the others. (They are essentially algorithms and strategies rather than logical axioms, predicates and theorems.)
Two of Piaget's fundamental notions are attractive from a computer scientist's point of view.

The first is that knowledge, particularly in the young child, is retained as a series of operational models, each of which is somewhat ad hoc and need not be logically consistent with the others. (They are essentially algorithms and strategies rather than logical axioms, predicates and theorems.)

What is an operational model if not an algorithm, a procedure for accomplishing a goal?
Two of Piaget's fundamental notions are attractive from a computer scientist's point of view.

The first is that knowledge, particularly in the young child, is retained as a series of operational models, each of which is somewhat ad hoc and need not be logically consistent with the others. (They are essentially algorithms and strategies rather than logical axioms, predicates and theorems.)
Should the computer program the kid, or should the kid program the computer? — Papert (the father of LOGO)

If we teach kids programming, we’re back to the computer programming the kid.

We must re-design computers to fit the human mind.

We might find the primordial human mind in children.
Children Might have an Answer

- The tabla rasa human — a great problem-solver
- Most mental modes are shaped by culture, language, and grownups
- We confuse design with engineering
- There is a strong kernel of "nature"
We feel that a child is a "verb" rather than a "noun", an actor rather than an object; he is not a scaled-up pigeon or rat; he is trying to acquire a model of his surrounding environment in order to deal with it; his theories are "practical" notions of how to get from idea A to idea B rather than "consistent" branches of formal logic, etc. We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own. — Alan Kay, 1972
We feel that a child is a "verb" rather than a "noun", an actor rather than an object; he is not a scaled-up pigeon or rat; he is trying to acquire a model of his surrounding environment in order to deal with it; his theories are "practical" notions of how to get from idea A to idea B rather than "consistent" branches of formal logic, etc. We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own. – Alan Kay, 1972
We feel that a child is a “verb” rather than a “noun”, an actor rather than an object; he is not a scaled-up pigeon or rat; he is trying to acquire a model of his surrounding environment in order to deal with it; his theories are “practical” notions of how to get from idea A to idea B rather than “consistent” branches of formal logic, etc. We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own. — Alan Kay, 1972

However, “The Piagetian framework contained a hierarchical explanation of development with procedural memory emerging during the first five sensorimotor sub-stages and declarative memory beginning in the sixth and last sub-stage. Contemporary investigations of infant memory have clearly demonstrated that the infant-toddler has the capacity for declarative memory before their temporal system emerges in their language.” — Piaget, 1972
We feel that a child is a "verb" rather than a "noun", an actor rather than an object; he is not a scaled-up pigeon or rat; he is trying to acquire a model of his surrounding environment in order to deal with it; his theories are "practical" notions of how to get from idea A to idea B rather than "consistent" branches of formal logic, etc. We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own. — Alan Kay, 1972
We feel that a child is a "verb" rather than a "noun", an actor rather than an object; he is not a scaled-up pigeon or rat; he is trying to acquire a model of his surrounding environment in order to deal with it; his theories are "practical" notions of how to get from idea A to idea B rather than "consistent" branches of formal logic, etc. We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own. — Alan Kay, 1972

In particular, it has been suggested that children are not sensitive to the need for empirical and logical consistency in their representations of the world. The findings of the study presented here do not support this position.
We feel that a child is a "verb" rather than a "noun", an actor rather than an object; he is not a scaled-up pigeon or rat; he is trying to acquire a model of his surrounding environment in order to deal with it; his theories are "practical" notions of how to get from idea A to idea B rather than "consistent" branches of formal logic, etc. We would like to hook into his current modes of thought in order to influence him rather than just trying to replace his model with one of our own. – Alan Kay, 1972