Software Simplicity Squelched for 45 years

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Excess complexity degrades every(?) dimension of quality

Reliability

Maintainability

Usability

Interoperability

Portability

Safety, Timeliness, AI(?),   Etc.

Security

Performance

Extensibility

Cost

Compatibility

Language is critical

Pressing limits of simplification

- Improves quality in many ways.
- It necessarily concludes somehow.

    The way it concludes clarifies the long range future of language semantics design.

Progress strongly depends on simplification.

It has been obstructed for 45 years.

Expression example

Using general purpose language implemented at DEC in 1982

count every state where populatn -- of some city of it > 1000000;

Who gets a passing grade for doing it simply 36 years later? Or for trying?

Defect: a False Dichotomy

- Most languages have

    - rich data structures but

    - poor plural expressions.

- A few languages (SQL, APL) have

    - many nested plural expressions but

    - only rigid data structures.

The advantages can be combined.

    -- quickly or after waiting 45 years, so far.

Resolving the dichotomy

- Done by 1973. First draft design at IBM.

- Implemented and used at DEC in 1980s. Not made public.

- Today, no visible aspiration to comparable simplicity.

- Not resolving has been profitable and devastating for quality and understanding.
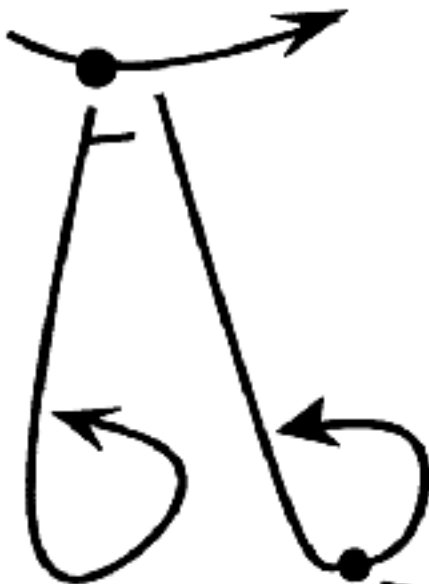
How resolved

- Needed: a common iteration process.
- Basic objects are flexible, connective
- An elementary data object can connect to:
  - A successor object. (A predecessor?)
  - A first member of a contained list.
  - A container object
  - A "linked to" object for relationships
  - A type.

A number representing the age of a person

A person peg   An age class

2 persons   an age peg   an age link   a number

Plural functions (~25)
Added all at once

- Subsetting by selection condition
- Subsetting by beginning, ending condition
- Set ops: union, intersection, difference
- Test sets for members, inclusion, overlap
- Apply a function over a set
- Sorting, closure, reduction, condense
- First order predicates,
- Include, Exclude, Select and remove, etc

Design boundaries narrowed

- Single composite structure for data atoms.
- Arrays are composite outer products.
    Key relations assure unique positions.
- In contrast, bits are efficient inside machines but not for conceptualization.
- Best structure chosen from few options.
- Stable design for deep language levels.

Irreducibility optima

- Eliminate vibration ➔ round wheels
- Eliminate distortion ➔   flat mirrors
- Eliminate sliding force ➔   parallel brick faces
- Eliminate extraneous complexity ➔

 hierarchically interconnected pointer objects?
 Sort of - - but geometrical clarity is lacking.
About 25 similar engineering optimizations.
Permanent, practical, a defect is eliminated.
Large, enduring economic and social value

Documents

- PROSE Specification, 1977, IBM
- Dawn language manual, 1982, DEC
- IEEE-USA position statement, Feb 2012
- Correspondence with Sen. Kerry and 9 federal agencies, 2000-2005
- ML textbook example, 1/3 the size
- Toward Perfect Information Microstructures, etc on web site

Disasters from over-complexity

- Software quality – esp safety and security
- Software Engineering -- more for less!
- Software leadership, pre-1975 seems OK?
- Software market malfunction -- 87% profits
- Scientific discourse – simplicity is taboo
- Art Intelligence –complexity compounded?
- Teaching computer sci -- badly expanding
- Professional ethics

Technical Education

Students everywhere are routinely taught how to arrange pieces of information by educators who are unaware of pieces of information designed to be easily arranged.

A larger scale disaster.

Serving the public interest

Need a community with experts and motivation to simplify.

- Does one exist? Where?

- Where might one emerge? Education, cyber security, transportation, AI, ASQ   ???

- Can we at least find leadership candor ?

- or make the truth public by questioning, such as getting translations for the above example or comparison with historic squelchings?

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Electromagnetic field in space-time