



Death by
Obesity

Didier Verna

Languages

Homoiconicity

Conclusion

Death by Obesity

Didier Verna

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Outline

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1 Languages

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3 Conclusion



Language diversity

Turing-completeness vs. Human-completeness

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- Many different shapes
 - ▶ C-like, Prolog, LISP, Forth. . .
 - ▶ Romance, English, German, Chinese, Japanese. . .
- Syntactic diversity
- Semantic diversity



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Language complexity

Turing-madness vs. Human-wiseness

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- Natural languages
 - ▶ All natural languages share a comparable level of *overall* complexity [Pinker]
- Programming languages
 - ▶ I don't think so...



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Language Pyramids

Design vs. emergence

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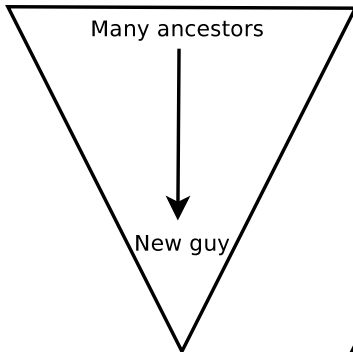
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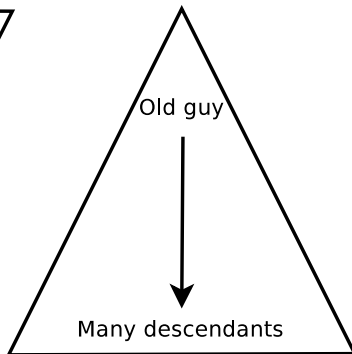
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Programming languages



Natural Languages





Language growth

By size vs. by complexity

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Conclusion

- Natural languages grow in size
 - ▶ by “vocabulibrary”
- Programming languages grow in complexity
 - ▶ by syntax
- **This is WRONG!** (maybe the only case ?)



Language growth

By size vs. by complexity

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Occidental music notation

Relatively small language

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Printemptation

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Version 1.3 - Generic

$\text{♩} = 200$

Chord symbols: $E\flat-7\ 9$, $B\flat 7(\sharp 13)$, $E\flat-7\ 9$, $F-7$, $B\flat 7(\sharp 13)$, $E\flat-7\ 9$, $A\flat 7(\sharp 13)$, $D\flat-7\ 11(9)$, $F\sharp 7(13)$, $E-7\ 9$, $A 7(13)$, $D\Delta$, $G 7\ 9/13$, $D-7\ 9$, $G 7(13)$, $C-7\ 9$, $F 7\ 13$, $B\flat-7$



Occidental music notation

Lots of expressive power

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AVOID LUMPING
Like a minuet
from the ring *mf* *4/4* *p*

Like a rolling stone
French arrangement
of a work "Secret" by
Philippe Lejeune

Like (or as) the Rolling Stones
Soprano, do not have
a sense of humor!
Cajun-style

CODA

Fine

D. S. al CODA



Occidental music notation is Tuning-complete!

Lots of expressive power

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AVOID LUMPING
Like a minuet
from the reg. *mf* *pp*

Like a rolling stone
Avoid Lumping!

CODA

Fine



Occidental music notation

Even provides some DSLs

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Lyrics:
D
A I T I T I T A I T A I T I T I T A I
A T I T A T I T A T I A T A I T I T I T A I
I T I T I T A I A T I T A T I T A T I A T I A I
A T I A T I A T I A T I A T I A T I A T
T A I A A I A T T T A I T A I T A T I T A T A
T I A T I A I A I A I T A T T (Tm) O' T A I T A

Moderate ♩ = 128



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The LISP UFO (Unidentified Functional Object)

Syntactic anorexia

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■ Core syntax:

- ▶ Atoms: `foo`, `45`, `"string"`, ...
- ▶ S-expressions: `(atom sexp sexp atom ...)`

■ `(foo 1 2)`

■ `(defun foo (n1 n2) ...)`

■ `(defun foo (n1 n2)`
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■ `(setf (class-slot object) value)`

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Having no syntax is impractical

$$\sqrt{x} \mid x \leftarrow (1..10)$$

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```
(BLOCK NIL
 (LET ((I 1))
  (DECLARE (TYPE (AND REAL NUMBER) I))
  (SB-LOOP::WITH-LOOP-LIST-COLLECTION-HEAD (:LOOP-
    #:LOOP-LIST-TAIL-860)
  (SB-LOOP::LOOP-BODY NIL
 (NIL NIL (WHEN (> I '10) (GO SB-LOOP::END-LOOP))
 NIL)
 ((SB-LOOP::LOOP-COLLECT-RPLACD
  (:LOOP-LIST-HEAD-859 #:LOOP-LIST-TAIL-860)
  (LIST (SQRT I))))
 (NIL (SB-LOOP::LOOP-REALLY-DESETQ I (1+ I))
 (WHEN (> I '10) (GO SB-LOOP::END-LOOP)) NIL)
 ((RETURN-FROM NIL
  (SB-LOOP::LOOP-COLLECT-ANSWER
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```




There *is* syntax!

But it is programmable

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Conclusion

■ Customizable syntax

- ▶ `'foo => (quote foo)`
- ▶ `#'foo => (function foo)`

■ Macros

- ▶ `(loop for i from 1 upto 10
collect (sqrt i))`

■ Homoiconicity

- ▶ Code: `(sqrt 2)`
- ▶ Data: `(sqrt 2)`



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The LISP pyramid

Which one is it?

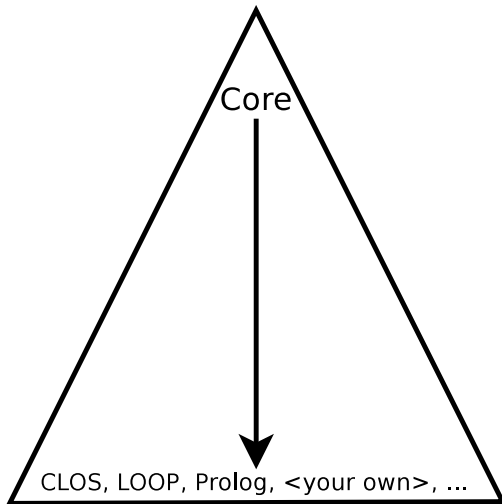
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SOS: the Syntactic Obesity Scale

How would you grade your favorite language ?

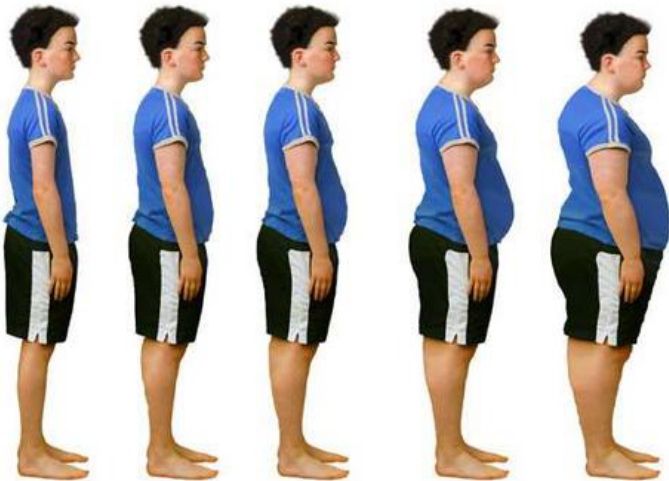
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SOS: the Syntactic Obesity Scale

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Should you be worried?



The cure

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One pill of Homoiconicitum every morning (for the next 10 years)



and you should be fine...