



Death by
Obesity

Didier Verna

Languages

Homoiconicity

Conclusion

Death by Obesity

Didier Verna

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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



Language complexity

Turing-madness vs. Human-wiseness

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Conclusion

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



Language Pyramids

Design vs. emergence

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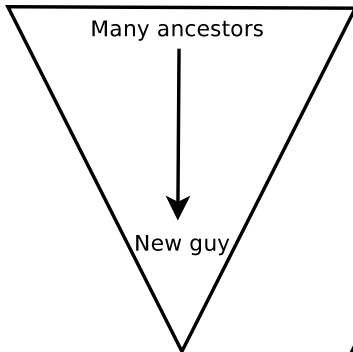
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Languages

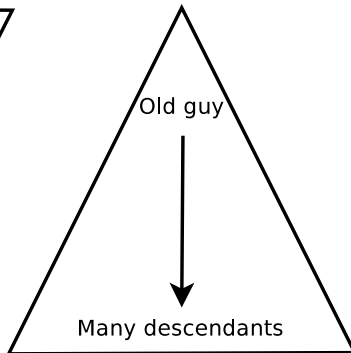
Homoiconicity

Conclusion

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 ?)



Occidental music notation

Relatively small language

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Printemptation

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Version 1.3 - Generic

$\text{♩} = 200$

E, -79 B, 7(13) E, -79

F-7 B, 7(13) E, -79 A, 7(13) D, -7(11) (9)

F#7(13) E-79 A7(13) DΔ

G79/13 D-79 G7(13) C-79 F713 B, -7



Occidental music notation is Tuning-complete!

Lots of expressive power

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

With pesto
Crescendo

Slippery
when wet

ACROBATIC GERMAN HAND PEDAL
Use the smooth side of Vietin

WET REED
SLIDE FOR TWO BARK

With much passion
through the ring

ACROBATIC GERMAN HAND PEDAL
Use the smooth side of Vietin

WET REED
SLIDE FOR TWO BARK

Like a rolling stone
penetrable to the ring

ACROBATIC GERMAN HAND PEDAL
Use the smooth side of Vietin

WET REED
SLIDE FOR TWO BARK

Like (or as) the Rolling Stones
penetrable to the ring

ACROBATIC GERMAN HAND PEDAL
Use the smooth side of Vietin

WET REED
SLIDE FOR TWO BARK

Cajun-style
penetrable to the ring

ACROBATIC GERMAN HAND PEDAL
Use the smooth side of Vietin

WET REED
SLIDE FOR TWO BARK

CODA
When with all the lock to the purple be hand-connated?

ACROBATIC GERMAN HAND PEDAL
Use the smooth side of Vietin

WET REED
SLIDE FOR TWO BARK

FINE



Occidental music notation

Even provides some DSLs

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Conclusion

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The LISP UFO (Unidentified Functional Object)

Syntactic anorexia

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Conclusion

■ Core syntax:

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

■ `(foo 1 2)`

■ `(defun foo (n1 n2) ...)`

■ `(defun foo (n1 n2)`
 `(declare (type fixnum n1 n2)) ...)`

■ `(lambda (n1 n2) ...)`

■ `(defstruct struct ...)`

■ `(defclass class ...)`

■ `(class-slot object)`

■ `(setf (class-slot object) value)`

■ ...



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
         #:LOOP-LIST-HEAD-859))))))
```



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)`



The LISP pyramid

Which one is it?

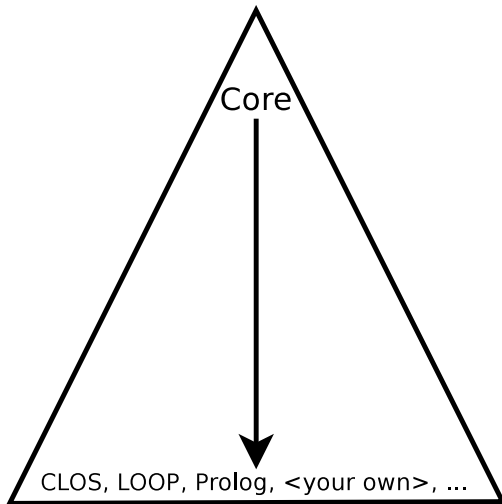
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SOS: the Syntactic Obesity Scale

How would you grade your favorite language ?

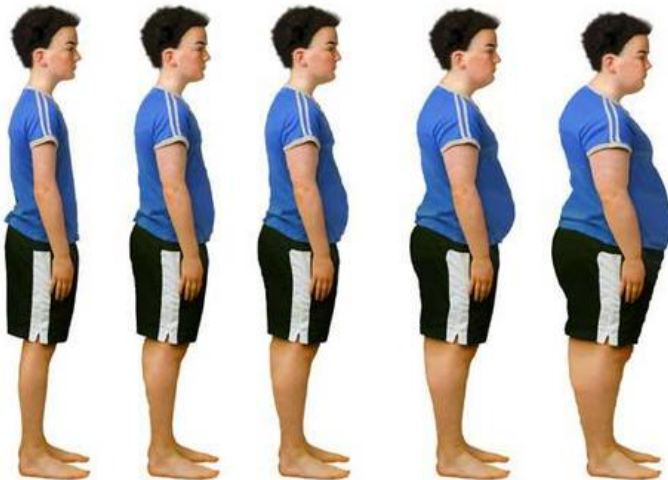
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Homoiconicity

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SOS: the Syntactic Obesity Scale

How would you grade your favorite language ?

Death by
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JTC1/SC22/WG21



SOS: the Syntactic Obesity Scale

How would you grade your favorite language ?

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Should you be worried?



The cure

Death by
Obesity

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Conclusion

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



and you should be fine...