



Context



Demonstration



Software Eng.



Experimentation



Future Work

Interactive and Real-Time Typesetting for Demonstration and Experimentation

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Context

- ▶ Digital Typesetting: a fascinating domain
 - ▶ Strong focus on beauty and aesthetics
 - ▶ Full of interesting technical challenges
- ▶ Motivation (double)
 - ▶ General interest for the application domain
 - ▶ Need to strengthen an existing lecture on typesetting
- ▶ Requirements (double): experimentation / demonstration platform
 - ▶ real-time
 - ▶ interactive
- ▶ State of the Art: none
 - ▶ WYSIWYG tools are of varying quality
 - ▶ T_EX is not *really* interactive
 - ▶ Neither have easily accessible internals (production systems)
- ▶ Conclusion: DIY!



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Demonstration (video & coffee breaks 😊)



Experimental Typesetting Algorithms Platform

Disposition

- Flush Left
- Centered
- Flush Right
- Justified

Disposition Options

- Overstretch
- Overshrink

Features

- Kerning
- Ligatures
- Hyphenation

Characters and Clues

- Characters
- Hyphenation Points
- Paragraph Box
- Line Boxes
- Character Boxes
- Baselines
- Over/Underfull Boxes
- Overshrunk/Stretched Boxes
- Properties Tooltips

Algorithms

Variant: Graph Dynamic

Fixed | Fit | Barnett | Duncan | Knuth Plass

Line Penalty: 10 Double Hyphen Demerits: 10000 Emergency Stretch: 0

Hyphen Penalty: 50 Final Hyphen Demerits: 5000 Looseness: 0

Explicit Hyphen Penalty: 50 Pre Tolerance: 100

Adjacent Demerits: 10000 Tolerance: 200

Source text (reset)

In olden times when wishing still helped one, there lived a king whose daughters were all beautiful; and the youngest was so beautiful that the sun itself, which has seen so much, was astonished whenever it shone in her face. Close by the king's castle lay a great dark forest, and under an old lime-tree in the forest was a well, and when the day was very warm, the king's child went out into the forest and sat down by the side of the cool fountain; and when she was bored she took a golden ball, and threw it up on high and caught it; and this ball was her favorite plaything.]]

Paragraph width: 280pt (9.84cm)

Paragraph zoom: 234%

Typeset paragraph

In olden times when wishing still helped one, there lived a king whose daughters were all beautiful; and the youngest was so beautiful that the sun itself, which has seen so much, was astonished whenever it shone in her face. Close by the king's castle lay a great dark forest, and under an old lime-tree in the forest was a well, and when the day was very warm, the king's child went out into the forest and sat down by the side of the cool fountain; and when she was bored she took a golden ball, and threw it up on high and caught it; and this ball was her favorite plaything.

Width: 286.8pt.
 Scale: 8.4759848
 Fitness class: decent.
 Badness: 18.71925.
 Demerits: 429.28732.

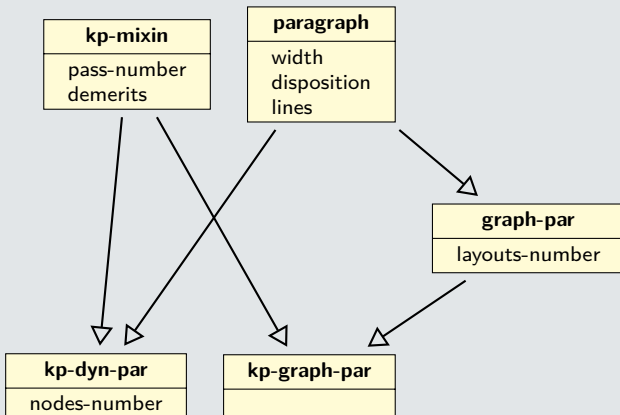
Software Engineering

The benefits of being multi-paradigm: concision

	LoC
GUI	800
Hyphenation	150
Lineup	500
Algorithms	150 – 450
Knuth-Plass	700 (total for the 2 variants)

Object-Orientation

Inheritance & polymorphism: code reuse





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Functional



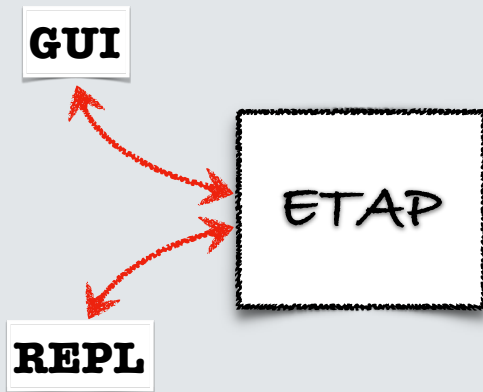
Higher-order functions: parametrization

```
;; Duncan
(make-graph lineup width) ;; default behavior

;; Knuth-Plass graph variant
(make-graph lineup width
 :next-boundaries #'kp-next-boundaries ;; KP-specific function...
 :threshold pre-tolerance)           ;; ... with specific arguments
```

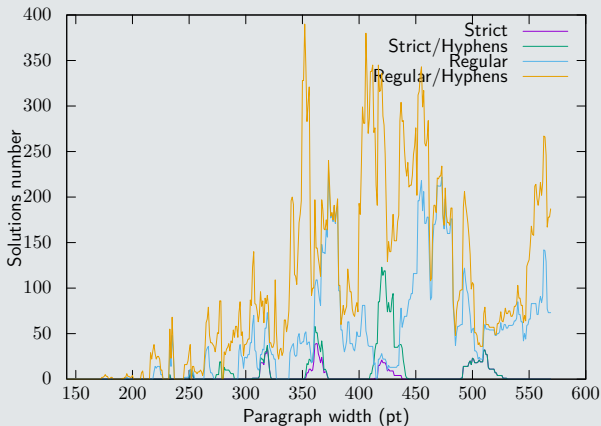
Dynamicity & Interaction

Real-time reflexive access to the *running* program



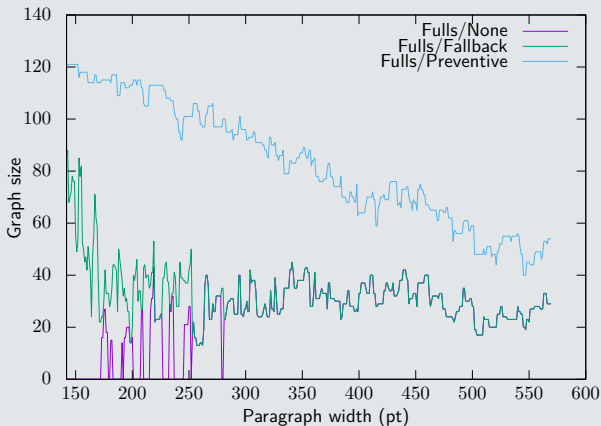
Graph-based Example #1

How many solutions per paragraph width? (20 LoC)



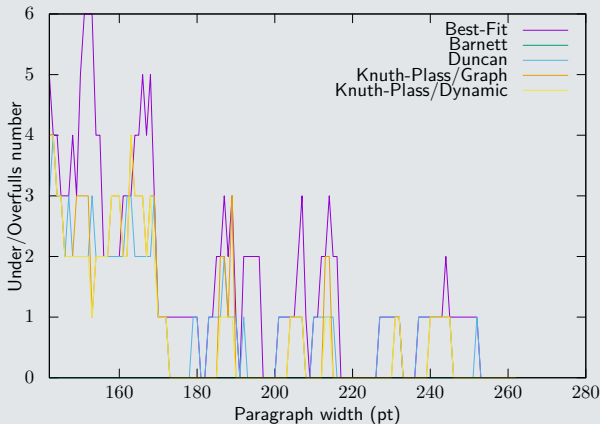
Graph-based Example #2

What about the graph sizes? (20 LoC)



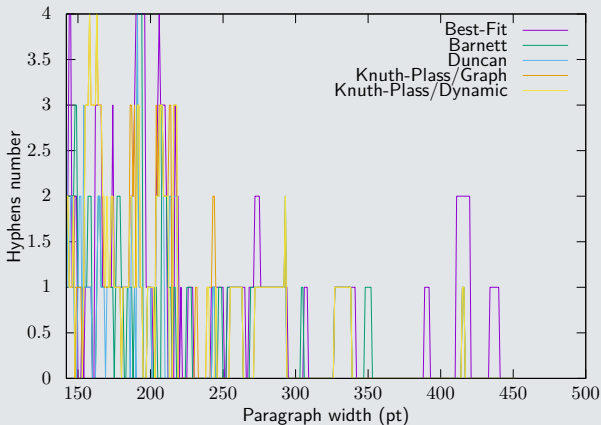
Comparative Example #1

How many fulls? (10 LoC)



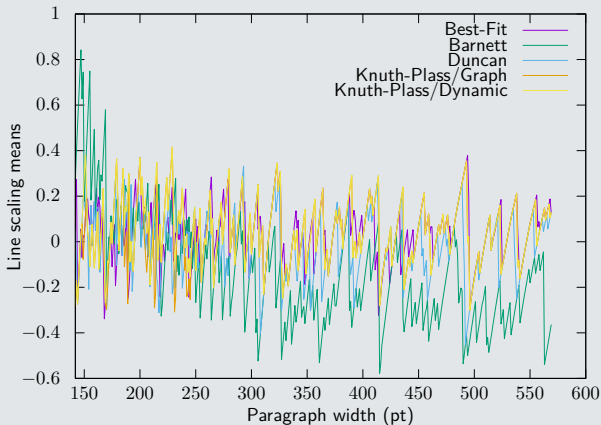
Comparative Example #2

How many hyphens? (6 LoC)



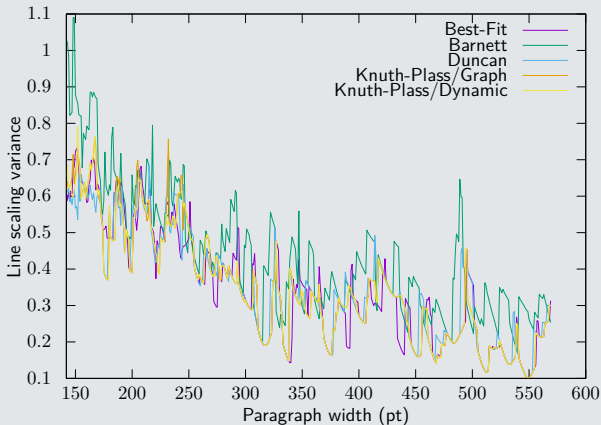
Comparative Example #3

What about the average scaling? (8 LoC)



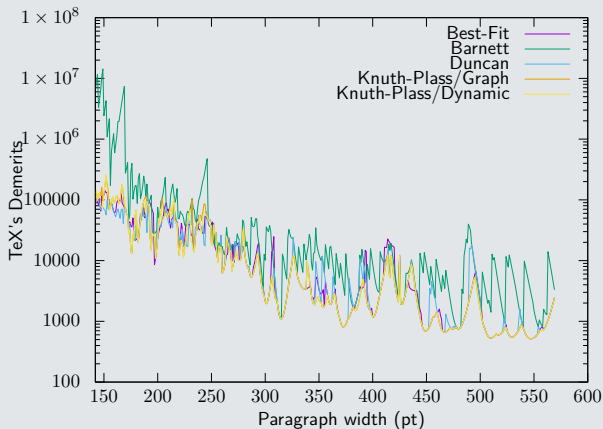
Comparative Example #4

And the scaling variance? (14 LoC)



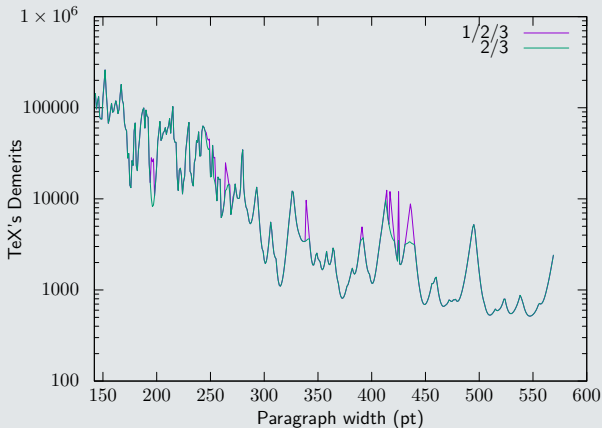
Comparative Example #5

TeX's view on the competition? (14 LoC)



Comparative Example #6

With or without pre-tolerance (1 LoC)





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▶ **Bibliography**

- ▶ Study more litterature
- ▶ HELP! Barnett / Duncan original papers wanted!

▶ **Research**

- ▶ Rivers detection
- ▶ Revisit Knuth-Plass
- ▶ New algorithms
- ▶ ...

▶ **Development**

- ▶ Tighter GUI / Internals integration
- ▶ ...

▶ **Many other things!**

Thank you!