Similarity Problems in Paragraph Justification: an Extension to the Knuth-Plass Algorithm

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Conclusion

- An extension to the Knuth-Plass algorithm
- Addresses similarity problems in paragraph justification

Thank you!

Similarities

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.

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  - `\font \tenlmr=ec-lmr10`

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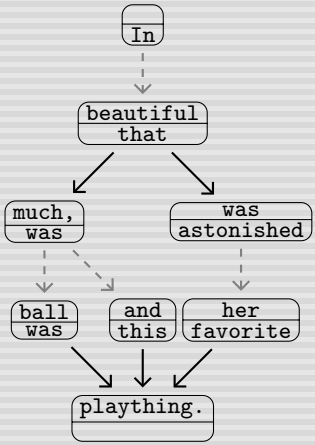
- Terminology
  - "Saut du même au même" (french)
  - Homeoarchy / homeoteleuton (rhetoric)
  - Character / word ladders ?

The Knuth-Plass in a Nutshell



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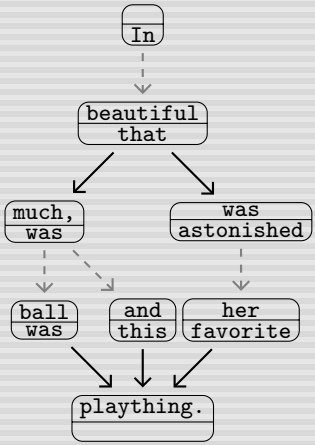

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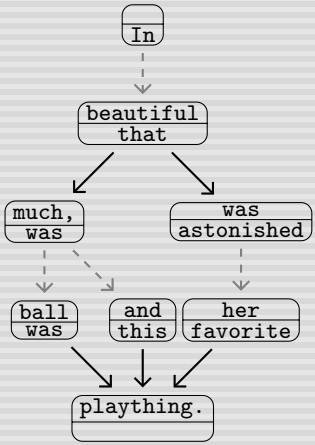

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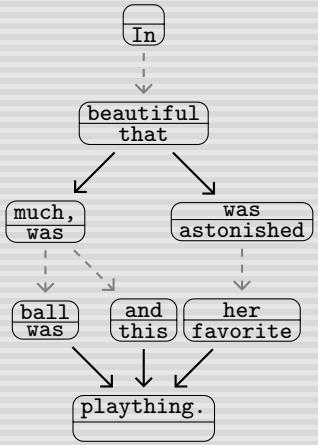

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  - Contextual demerits: line against line
    Hyphenation ladders, stretching / shrinking disparities, etc.
- Decision: $\min \sum(\textit{local} + \textit{contextual demerits})$

Knuth-Plass Extension

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  - Compare the beginning & end of consecutive lines
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Comparing two short sequences of characters

He who can do less can do more…

Demo

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`\similardemerits2800`

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`\similardemerits5230`

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- **Efficacy:** does this Knuth-Plass extension solve the problem?

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- **Pertinence:** is the problem frequent?
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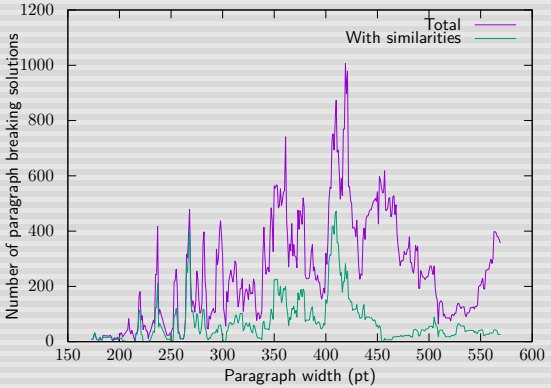
- **Two typesetting experiments:**
  - One paragraph at many different widths
  - Many paragraphs at a single width

Pertinence

Experimental conditions

- Grimm Brothers “Frog King” §1
- 142pt (≈ 5cm) → 569pt (≈ 20cm)
- 427 runs



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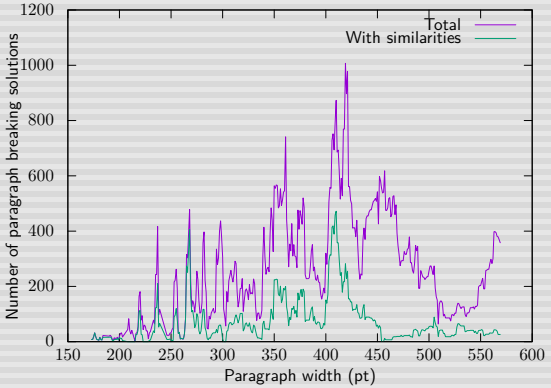
Expected results

- Chaotic shapes
- Close numbers for narrow paragraphs



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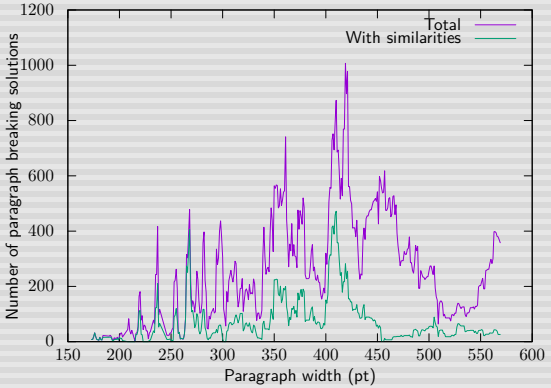
Findings

- Similarities are frequent
- So are similarity-free layouts



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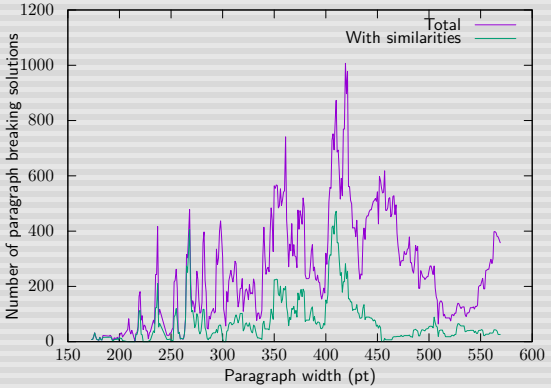
What about TEX?

- 4%: similarities unavoidable
- 21%: with similarities
- 26%: experiment 2



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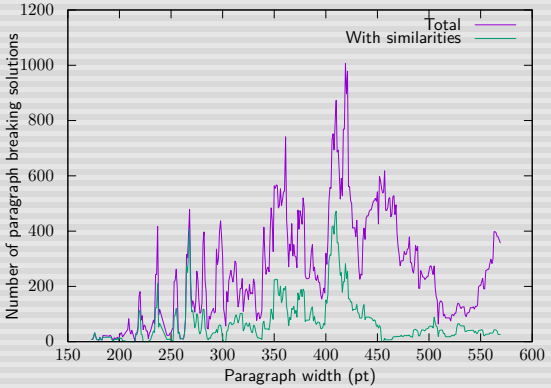
Conclusion

- 2 paragraphs out of 10 is a lot
- The problem is worth addressing



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Experimental conditions

- Herman Melville's Mobby Dick
- 1524 paragraphs @ 284pt ($\approx$ 10cm)
- $+$ experiment 1 $\rightarrow$ 1951 cases
- $x3 \rightarrow$ 5853 runs

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Corrected: 48% / 50% Improved: 50% / 63%	Corrected: 53% / 66% Improved: 57% / 73%

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Please note

- Those are extreme conditions!
- Similarity-free $\neq$ aesthetically better
- But we have some leeway...

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- Similarity handling for the Knuth-Plass
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Perspectives

- Study trade-off with other aesthetic criteria
- Similar demerits as $f(\textit{similarity})$ rather than just a constant
- Currently talking with Hans... 😉