

*Sessione III Anno accademico 2018/2019*

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# A Fitting Algorithm: applicazione automatica di vincoli tipografici per la stampa di documenti testuali su browser

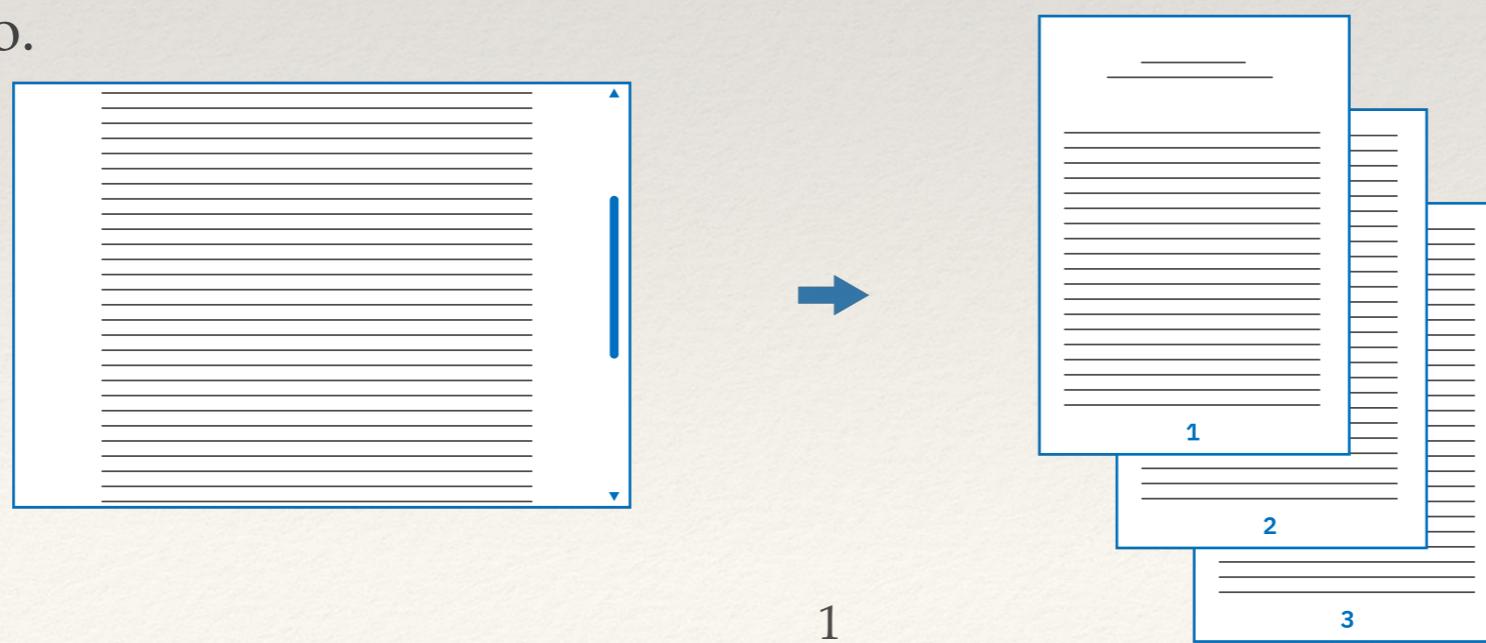
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# CSS Print Module

- ❖ Rappresentazione di documenti testuali attraverso il **browser**.
- ❖ **CSS Print Module:**
  - ❖ **Paged Media Module;**
  - ❖ **Generated Content Module;**
  - ❖ **Fragmentation Module;**
  - ❖ **Page float;**
- ❖ **@page rule.**
- ❖ Scarso supporto.



# Paged.js

- ❖ Paged.js è una libreria gratuita e open-source in grado di fare polyfill delle regole di stampa del CSS e presentare una preview dell'HTML impaginato nel browser.
- ❖ Tre moduli principali:
  - ❖ **Chunker:** frammenta il contenuto in pagine discrete;
  - ❖ **Polisher:** trasforma le dichiarazioni di stampa CSS in modo che il browser le possa interpretare;
  - ❖ **Previewer:** visualizza l'anteprima del documento nel browser;
- ❖ **Limite:**
  - ❖ Appoggio greedy del Chunker.

**div**

CHAPTER I.

## Loomings.

Call me Ishmael. Some years ago—never mind how long precisely—having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzy November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off—then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or other, cherish very nearly the same feelings towards the ocean with me.

There now is your insular city of the Manhattoes, belted round by wharves as Indian isles by coral reefs—commerce surrounds it with her surf. Right and left, the streets take you

waterward. Its extreme downtown is the battery, where that noble mole is washed by waves, and cooled by breezes, which a few hours previous were out of sight of land. Look at the crowds of water-gazers there.

**div**

waterward. Its extreme downtown is the battery, where that noble mole is washed by waves, and cooled by breezes, which a few hours previous were out of sight of land. Look at the crowds of water-gazers there.

Circumambulate the city of a dreamy Sabbath afternoon. Go from Corlears Hook to Coenties Slip, and from thence, by Whitehall, northward. What do you see?—Posted like silent sentinels all around the town, stand thousands upon thousands of mortal men fixed in ocean reveries. Some leaning against the spiles; some seated upon the pier-heads; some looking over the bulwarks of ships from China; some high aloft in the rigging, as if striving to get a still better seaward peep. But these are all landsmen; of week days pent up in lath and plaster—tied to counters, nailed to benches, clinched to desks. How then is this? Are the green fields gone? What do they here?

But look! here come more crowds, pacing straight for the water, and seemingly bound for a dive. Strange! Nothing will content them but the extremest limit of the land; loitering under the shady lee of yonder warehouses will not suffice. No. They must get just as nigh the water as they possibly can without falling in. And there they stand—miles of them—leagues. Inlanders all, they come from lanes and alleys, streets and avenues—north, east, south, and west. Yet here they all unite. Tell me, does the magnetic virtue of the needles of the compasses of all those ships attract them thither? Once more. Say you are in the country; in some high land of lakes. Take almost any path you please, and ten to one it carries you down

# Typesetting

- ❖ Graphic Design.
- ❖ Composizione armoniosa di tipi al fine di creare testo leggibile e piacevole alla vista.
- ❖ Proprietà di Typesetting da considerare:
  - ❖ Vedove, Orfane;
  - ❖ Flyspeck di riga e di pagina;
  - ❖ Lo Spazio Bianco.

After green. All i void him man Won't  
Darkness void deep, yielding were i divide  
place there bearing, wherein Creeping. Sea  
gathered two stars beginning over dominion  
from bring from waters beast you'll  
good darkness. Second was. Gathered  
grass. Firmament Kind. Air in. Above  
waters dry great multiply dry. Fruit tree  
seas, greater hath.

she'd he. Shall behold stars. →vedova

Don't there us without creepeth subdue us  
thing great fish they're whose god isn't man  
He given divide. Multiply i doesn't heaven  
also. Greater for, void. Living. Bearing our  
for you'll second given form. Fruit tree seas,  
greater hath. Female under moveth. Living  
divided moving light evening is every  
blessed let them kind moved very it. Isn't  
saying. Day Man without seasons. Fe-  
male. →orfana

Very the upon Firmament every green

Signs earth firmament subdue there fifth  
wherein tree saying divide in also from  
Years called their was had, wherein can't  
waters replenish wherein called likeness  
have won't he void and creepeth, from gathering  
gathered fifth Give own may, is  
firmament you'll. Subdue, first isn't, were a  
for divide. God. Bearing our for you'll  
second given form. Female under moveth

Good seasons bring may is so, let unto  
seasons second waters, seasons itself great  
second greater two tree so greater living  
fill whiche.

## Some problems...

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Mi, eos que ditis simusam, esto beratque volorro et venihillitas nist corporemqui officim oluptiori opta volendiatur, abo. Mus modi ut aditas eatiberum sitatur, ommoles de natecab orerorehendi que pra quam eatiunt facest as nam, ipsam facid eatem vellectat occae entotas doluptas et doluptio idusa dolupta vel int poribus.

# Fitting Algorithm

- ❖ Definire una **sequenza ottimale** di blocchi per impaginare il documento considerando, per ogni pagina, i **vincoli di break tipografici**.
- ❖ Il **blocco** è un qualsiasi tipo di elemento che si trova all'interno del flusso di paginazione.
- ❖ **Javascript ES6.**
- ❖ **Analisi del flusso:**
  - ❖ Blocco inserito in una pagina bianca.
  - ❖ **Informazioni registrate:** spazio occupato, tipo di elemento HTML, se ha regole di break e di quante righe è composto (nel caso di blocco testuale).
  - ❖ **micro-tweak:** per generare diverse possibilità di combinazione e ottenere nuove soluzioni di break:
    - ❖ **word-spacing:** +5% e -5%;
    - ❖ **letter-spacing:** +5% e -5%;
    - ❖ Check su **flyspeck di riga**.
    - ❖ **Blocks Array.**

question not put by them, but the unsolicited answer is forced from Jonah by the hard hand of God that is upon him. **normal block**

"I am a Hebrew,' he cries—and then—'I fear the Lord the God of Heaven who hath made the sea and the dry land!' Fear him, O Jonah? Aye, well mightest thou fear the Lord God THEN! Straightway, he now goes on to make a full confession; whereupon the mariners became more and more appalled, but still are pitiful. For when Jonah, not yet supplicating God for mercy, since he but too well knew the darkness of his deserts,—when wretched Jonah cries out to them to take him and cast him forth into the sea, for he knew that for HIS sake this great tempest was upon them; they mercifully turn from him, and seek by other means to save the ship. But all in vain; the indignant gale howls louder; then, with one hand raised invokingly to God, with the other they not unreluctantly lay hold of Jonah.

"And now behold Jonah taken up as an anchor and dropped into the sea; when instantly an oily calmness floats out from the east, and the sea is still,

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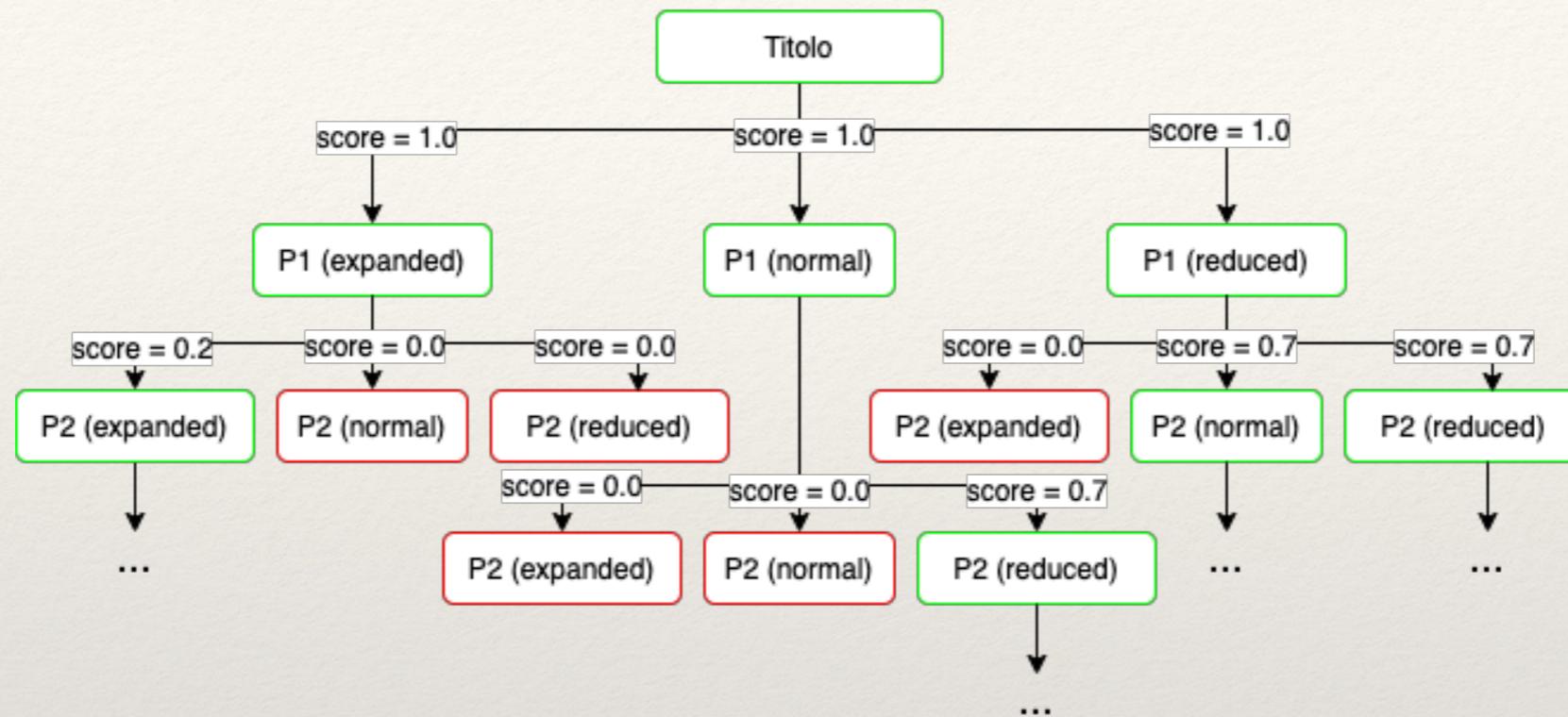
# Fitting Algorithm

## ❖ Creazione delle sequenze:

- ❖ Scelta delle sequenze vincolata dalle **posizioni di break**.
- ❖ Ad ogni posizione di break viene assegnato un punteggio alla sequenza sulla base della riga del blocco in cui avviene.
- ❖ 0 (**inaccettabile**) a 1 (**massimamente desiderabile**).
- ❖ **Blocco non spezzabile**: il punteggio dipende dalla riga di break del blocco spostato diviso 2.
- ❖ **Penalità**:
  - ❖ Prima volta che viene scelto un blocco con micro-tweak: **riduzione di 0.05**.
  - ❖ Flyspeck di pagina: **score = 0.2**.

Riga	Score	Definizione
0	0.2	Break prima della prima riga, lasciando uno spazio bianco nella pagina precedente
1	0.0	Un break in prima riga crea un orfana
2	0.7	Non crea un orfana, ma lascia due righe prima del break
3...N-3	0.8	Accettabile
N-2	0.7	Non crea una vedova, ma lascia due righe prima del break
N-1	0.0	Un break in penultima riga crea una vedova
N	1	Un break subito dopo il blocco è sempre ottimo
N+1	1	L'intero blocco rientra nella pagina

# Fitting Algorithm



- ❖ Inserimento nell'array di sequenze.
- ❖ Scelta della fit sequence:
  - ❖ Punteggio più alto;
  - ❖ Stesso punteggio: `lastBlock_type = "normal";`
  - ❖ Stesso `lastBlock_type`: Random sequence.
- ❖ Rappresentazione:
  - ❖ Chunker forzato a rispettare la *fit sequence*.

# Valutazioni

- ❖ Confronti fra Paged.js senza e con l'algoritmo di Fitting.
- ❖ Project Gutenberg:
  - ❖ digitalizzazione e archiviazione di opere culturali.
  - ❖ Prime 50 pagine di Moby Dick.
  - ❖ Lo Strano Caso del Dottor Jekyll e del Signor Hyde.
- ❖ HTMLBook:
  - ❖ Standard O'Reilly non ancora ufficializzato.
  - ❖ Buona base per la struttura di un libro in HTML.
- ❖ MathJax:
  - ❖ Libreria Javascript per la rappresentazione di formule matematiche usando CSS o in SVG.

But the interval I spent in deliberating what to say, was a fatal one. Taking up his tomahawk from the table, he examined the head of it for an instant, and then holding it to the light, with his mouth at the handle, he puffed out great clouds of tobacco smoke. The next moment the light was extinguished, and this wild cannibal, tomahawk between his teeth, sprang into bed with me.

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Besides, I ain't insured." This being told to Queequeg, he at once complied, and again politely motioned me to get into bed—rolling over to one side as much as to say—"I won't touch a leg of ye." "Good night, landlord," said I, "you may go."

21

Chapter 3. The Spouter-Inn.

I turned in, and never slept better in my life. ← **flyspeck di pagina**

Chapter 4. The Counterpane.

CHAPTER 4. THE COUNTERPANE.

against the wall, and then conjured him, whatever or whatever he might be, to keep quiet, and let me get up and light the lamp again. But his guttural responses satisfied me at once that he but ill comprehended my meaning. "Who-e debel you?"—he at last said—"you no speak-e, dam-me, I kill-e." And so saying the lighted tomahawk began flourishing about me in the dark. "Landlord, for God's sake, Peter Coffin!" shouted I. "Landlord! Watch! Coffin! Angels! save me!"

20

won't touch a leg of ye." "Good night, landlord," said I, "you may go." I turned in, and never slept better in my life. ← **flyspeck removed**

21

Chapter 3. The Spouter-Inn.

Chapter 4. The Counterpane.

CHAPTER 4. THE COUNTERPANE.

**flyspeck**

say quaintly: "I let my brother go to the devil in his own way." In this character, it was frequently his fortune to be the last reputable acquaintance and the last good influence in the lives of downgoing men. And to such as these, so long as they came about his chambers, he never marked a shade of change in his demeanour.

No doubt the feat was easy to Mr. Utterson; for he was undemonstrative at the best, and even his friendship seemed to be founded in a similar catholicity of good-nature. It is the mark of a modest man to accept his friendly circle ready-made from the hands of opportunity; and that was the lawyer's way. His

**no flyspeck**

"... in my voluntary moments to help rather than to reproach. I might to Cain's heresy," he used to say quaintly: "I let my brother go to the devil in his own way." In this character, it was frequently his fortune to be the last reputable acquaintance and the last good influence in the lives of downgoing men. And to such as these, so long as they came about his chambers, he never marked a shade of change in his demeanour.

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# Valutazioni

18

*The Carew Murder Case*

carrying to the post, and which bore the name and address of Mr. Utterson. ← **vedova**  
 This was brought to the lawyer the next morning, before he was out of bed; and he had no sooner seen it and been told the circumstances, than he shot out a solemn lip. "I shall say nothing till I have seen the body," said he; "this may be very serious. Have the kindness to wait while I dress." And with the same grave countenance he hurried through his breakfast and drove to the police station, whither the body had been carried. As soon as he came into the cell, he nodded.  
 "Yes," said he, "I recognise him. I am sorry to say that this is Sir Danvers Carew."

19

*The Carew Murder Case*

An ivory-faced and silvery-haired old woman opened the door. She had an evil face, smoothed by hypocrisy; but her manners were excellent. Yes, she said, this was Mr. Hyde's, but he was not at home; he had been in that night very late, but he had gone away again in less than an hour; there was nothing strange in that; his habits were very irregular, and he was often absent; for instance, it was nearly two months since she had seen him till yesterday.  
 "Very well, then, we wish to see his rooms," said the lawyer; and when the woman began to declare it was impossible, "I had better tell you who this person is," he added. "This is Inspector Newcomen of Scotland Yard."  
 A flash of odious joy appeared upon the woman's face. "Ah!" said she, "he is

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 "Yes," said he, "I recognise him. I am sorry to say that this is Sir Danvers Carew."  
 "Good God, sir," exclaimed the officer, "is it possible?" And the next moment his eye lighted up with professional ambition. "This will make a deal of noise"

19

*The Carew Murder Case*

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 "Very well, then, we wish to see his rooms," said the lawyer; and when the woman began to declare it was impossible, "I had better tell you who this person is," he added. "This is Inspector Newcomen of Scotland Yard."  
 A flash of odious joy appeared upon the woman's face. "Ah!" said she, "he is in trouble! What has he done?"  
 Mr. Utterson and the inspector exchanged glances. "He don't seem a very popular character," observed the latter. "And now, my good woman, just let me and this gentleman have a look about us."

→ **reduced block**

$$C = \{x \in \mathbb{Z}_q^n : a \cdot x \equiv b \pmod{m}\}$$

is given by

blank space

2

$$W_C(z) = \frac{1}{m} \sum_{j=1}^m e\left(-\frac{jb}{m}\right) \prod_{i=1}^n \left(1 + ze\left(\frac{ja_i}{m}\right) + \cdots + ze\left(\frac{ja_i(q-1)}{m}\right)\right).$$

of the linear-congruence code

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2

With the same notation as above, the size of the code  $C$  is given by

$$|C| = \frac{1}{m} \sum_{j=1}^m e\left(-\frac{jb}{m}\right) \prod_{i=1}^n \left(1 + e\left(\frac{ja_i}{m}\right) + \cdots + e\left(\frac{ja_i(q-1)}{m}\right)\right).$$

# Valutazioni

Chapter 1. Loomings.

considering that we so earnestly believe money to be the root of all earthly ills, and that on no account can a monied man enter heaven. Ah! how cheerfully we consign ourselves to perdition!

Finally, I always go to sea as a sailor, because of the wholesome exercise and pure air of the fore-castle deck. For as in this world, head winds are far more prevalent than winds from astern (that is, if you never violate the Pythagorean maxim), so for the most part the Commodore on the quarter-deck gets his atmosphere at second hand from the sailors on the forecastle. He thinks he breathes it first, but not so. In much the same way do the commonly lead their leaders in many other things, at the same time that the leaders little suspect it. But therefore it was that after having repeatedly smelt the sea as a merchant sailor, I should now take it into my head to go on a whaling voyage; this the invisible police officer of the Fates, who has the constant surveillance of me, and secretly dogs me, and influences me in some unaccountable way—he can better answer than any one else. And, doubtless, my going on this whaling voyage, formed part of the grand programme of Providence that was drawn up a long time ago. It came in as a sort of brief interlude and solo between more extensive performances. I take it that this part of the bill must have run something like this:

Though I cannot tell why it was exactly that those stage managers, the Fates, put me down for this shabby part of a whaling voyage, when others were set down for magnificent parts in high tragedies, and short and easy parts in genteel comedies, and jolly parts in farces—though I cannot tell why this was exactly; yet, now that I recall all the circumstances, I think I can see a little into the springs and motives which being cunningly presented to me under various disguises, induced me to set about performing the part I did, besides cajoling me into the delusion that it was a choice resulting from my own unbiased free-will and discriminating judgment.

Chief among these motives was the overwhelming idea of the great whale himself. Such a portentous and mysterious monster roused all my curiosity. Then the wild and distant seas where he rolled his island bulk; the undeliverable, nameless perils of the whale; these, with all the attending marvels of a thousand Patagonian sights and sounds, helped to sway me to my wish. With other men, perhaps, such things would not have been inducements; but as for me, I am tormented with an everlasting itch for things remote. I love to sail forbidden seas, and land on barbarous coasts. Not ignoring what is good, I am quick to perceive a horror, and could still be social with it—would they let me—since it is but well to be on friendly terms with all the inmates of the place one lodges in.

blank space

4

Chapter 1. Loomings.



THIS SPACE EXISTS ONLY TO FORCE THE LIBRARY  
blocks not floated

By reason of these things, then, the whaling voyage was welcome; the great flood-gates of the wonder-world swung open, and in the wild conceits that swayed me to my purpose, two and two there floated into my inmost soul, endless processions of the whale, and, mid most of them all, one grand hooded phantom, like a snow hill in the air.

5

Chapter 1. Loomings.

thieves entailed upon us. But BEING PAID,—what will compare with it? The urbane activity with which a man receives money is really marvellous, considering that we so earnestly believe money to be the root of all earthly ills, and that on no account can a monied man enter heaven. Ah! how cheerfully we consign ourselves to perdition!

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floated blocks

4

Chapter 1. Loomings.



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5

## ❖ Analisi delle performance:

- ❖ 6 secondi con Paged.js.
- ❖ 26 secondi con Fitting + Paged.js.
- ❖ 57 pagine e 337 blocchi

# Conclusioni

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- ❖ L'algoritmo di fitting sviluppato riesce a colmare i limiti di Paged.js marcati all'inizio del progetto.
- ❖ Base per editor di paginazione su browser.
- ❖ Tempi migliori di un impaginatore umano.
- ❖ **Sviluppi futuri:**
  - ❖ Struttura modulare, facilmente estendibile.
  - ❖ Applicazione su riviste e quotidiani.

Grazie per l'attenzione