

Formal CSS Layout: FSM, Floats, and Inline Semantics

HTMLRules Formal Specification

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1 Introduction

This document formally specifies the CSS layout engine verified in Coq. It covers the Margin Collapsing FSM, the Floating Point model, and the Inline Formatting Context (IFC).

2 1. Margin Collapsing FSM

The vertical position of block boxes is governed by an accumulator machine dealing with adjacent margins M .

2.1 Collapse Function (CSS 2.1 §8.3.1)

For a set of margins $M = \{m_1, \dots, m_n\}$:

$$P = \{m \in M \mid m \geq 0\}, \quad N = \{m \in M \mid m < 0\}$$

$$\text{Collapse}(M) = \max(\{0\} \cup P) + \min(\{0\} \cup N)$$

3 2. Floating Point FSM

Floating elements reduce the available horizontal space for normal flow content.

3.1 State Definitions

Let \mathcal{L} and \mathcal{R} be sets of rectangles (floats). The available horizontal interval $[L(y, h), R(y, h)]$ for a box of height h at y is:

$$L(y, h) = \max\{r.x + r.w \mid r \in \mathcal{L} \wedge \text{overlap}_y(r, y, h)\} \cup \{0\}$$

$$R(y, h) = \min\{r.x \mid r \in \mathcal{R} \wedge \text{overlap}_y(r, y, h)\} \cup \{W_{\text{container}}\}$$

3.2 Placement Transition

To place a float of size (w, h) , we find the minimal $y' \geq y_{\text{current}}$ such that:

$$L(y', h) + w \leq R(y', h)$$

The new state adds the rectangle to \mathcal{L} or \mathcal{R} .

4 3. Inline Formatting Context (IFC)

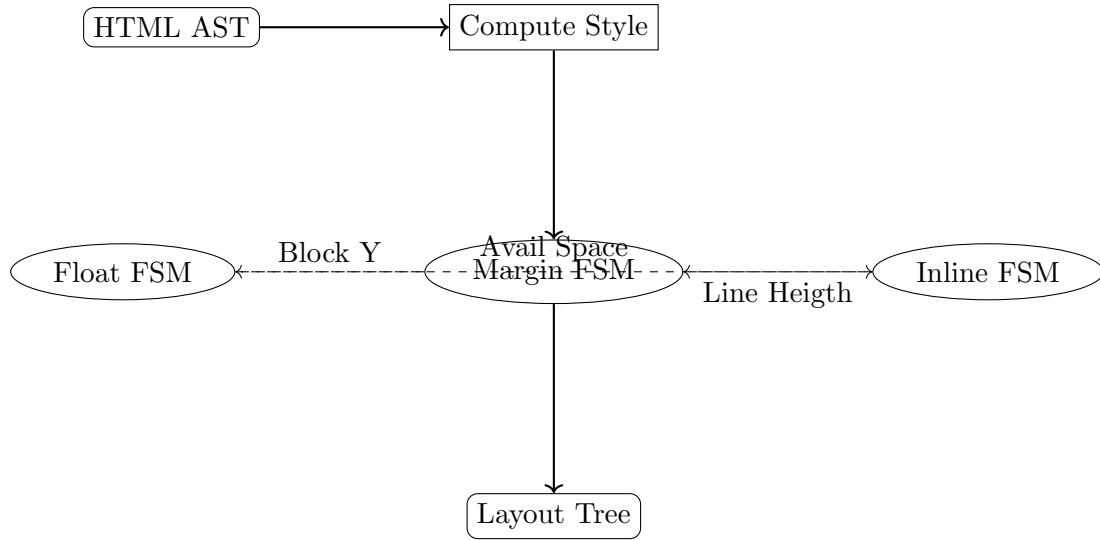
Content flows horizontally into "line boxes" defined by the Float FSM.

4.1 Line Wrapping Logic

Given current state (x, y) and next item b with width w_b :

1. **Check Fit:** Let range be $[l, r] = \text{Range}(y, h_{\text{line}})$.
2. **If** $x + w_b \leq r$: Place at x , $x_{\text{new}} = x + w_b$.
3. **Else:** New Line. $y_{\text{new}} = y + h_{\text{line}}$, $x_{\text{new}} = L(y_{\text{new}}, h_b)$.

5 System Diagram



6 Transition Diagram

