CMOS Delay-9 (H.0)
Interconnect Delay

20170118

References

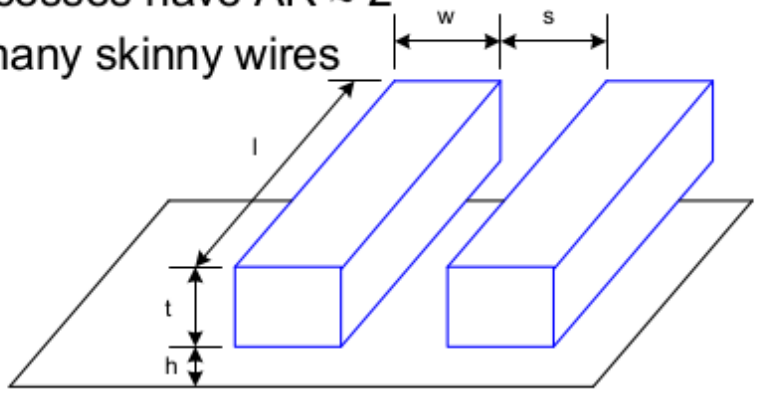
Some Figures from the following sites

[1] http://pages.hmc.edu/harris/cmosvlsi/4e/index.html
Weste & Harris Book Site

[2] en.wikipedia.org

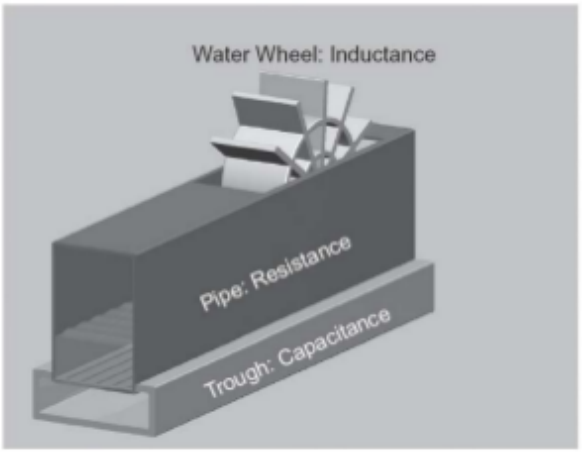
Wire Geometry

- Pitch = w + s
- Aspect ratio: AR = t/w
  - Old processes had AR << 1
  - Modern processes have AR ≈ 2
    - Pack in many skinny wires



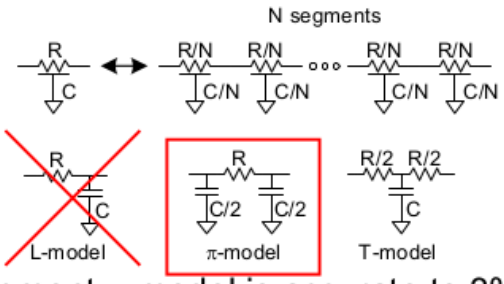
Interconnect Modeling

- Current in a wire is analogous to current in a pipe
  - Resistance: narrow size impedes flow
  - Capacitance: trough under the leaky pipe must fill first
  - Inductance: paddle wheel inertia opposes changes in flow rate
    - Negligible for most wires



Lumped Element Models

- Wires are a distributed system
  - Approximate with lumped element models



- 3-segment π-model is accurate to 3% in simulation
- L-model needs 100 segments for same accuracy!
- Use single segment π-model for Elmore delay

Wire Resistance

- ρ = *resistivity* (Ω*m)

$$R =$$

- $R_{\square}$ = *sheet resistance* (Ω/□)
  - □ is a dimensionless unit(!)
- Count number of squares
  - $R = R_{\square}$ * (# of squares)