DRC, LVS, OPC & other TLA's: Pattern Matching Examples in Design Automation

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A Flow Runs Through It

The Design Flow:

- A circuit is conceived...
- ...it doesn't exist until you write it down...
- ...lay it all out for me...
- ...making a list and checking it twice...
- ...what I meant, not what I said
Lay It All Out For Me

- Once we have a Schematic view of the design, need to translate to a layout view
- Translation to layout done by hand
- Layout must obey DESIGN RULES (a.k.a. ground rules) of the technology
- The layout is checked with a Design Rule Checking tool (DRC check)
Schematic View

Layout View
A few ground rules...
Making A List, Checking It Twice

- The hand layout must be checked against the original schematic view.
- A NETLIST (text form of schematic) is created from the schematic and compared to the layout.
- An LVS (layout vs. schematic) checker compares the netlist with the layout.
XM245  GND  IN  VDD  VDD  XPMOS  
Lw=1.2  Ww=15.0  M=1
What I Meant, Not What I Said

- A set of masks are made using the layout information supplied by the designer
- A photolithographic process is used to transfer the layout information from the mask to the silicon wafer
- Messy physics makes the transfer complicated (feature size $\sim=\lambda_{\text{light}}$)
- Use Optical Proximity Correction techniques to make up for messy physics
What I Designed

Design with OPC Features

OPC Thingies

Manufacturing

What Got Built

Finally!
Tell Me More

- Design Rule Checking
  - www.mosis.org
  - *Introduction to VLSI Systems*, (Mead & Conway), Chapters 2.6 & 4, Plates 9-14

- LVS
  - Couldn't find public examples - will have to look harder

- OPC
  - Search citeseer.nj.nec.com for "optical proximity correction" for a start