The Visual Optimization of Circuitry

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The First Problem

- The Symbols do not carry an intuitive meaning.
The Second Problem

• Logic Diagrams (Circuits) are hard to read.
Solutions

• 1 – Create a new set of symbols that will be easily understood by someone who knows Boolean Algebra.
• 2 – Create an algorithm (a set of rules) on how to distinguish wires and gates within a logic diagram.
The Design Process

• Create the set of objectives your symbols will fulfill.
  – Appearance of Boolean Algebra
  – Appearance of Verilog Coding
  – Distinction of Symbols
  – Ease of Drawing
  – Segmentation of Diagram
Create Sets of Symbols

• Focus on each rule individually first.
Determine the Best

- Which symbols best fit all the rules?
for \( F \) in part (a) of the table. As expressed in Figure 2-4(b), the function is equal to 1 if \( X = 0 \) and \( Y = 1 \) or if \( X = 1 \) and \( Z = 1 \). This produces the same four 1s in part (b) of the table. Since both expressions produce the same truth table, they are equivalent. Therefore, the two circuits have the same output for all possible binary combinations of the three input variables. Each circuit implements the same function, but the one with fewer gates and/or fewer gate inputs is preferable because it requires fewer components.

When a Boolean equation is implemented with logic gates, each term requires a gate, and each variable within the term designates an input to the gate. We define a literal as a single variable within a term that may or may not be complemented. The expression for the function in Figure 2-4(a) has three terms and eight literals; the one in Figure 2-4(b) has two terms and four literals. By
How do we read a diagram?

• The wires connecting gates in a logic diagram can make it challenging to trace.

• Therefore we need to find a way to distinguish elements within the diagram from each other.

• Color is the solution.
Bibliography
