A Symbolic Analysis of Relay and Switching Circuits
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Problem Statement and Motivation
• In complex electrical systems it is often necessary to make intricate interconnections of relay contacts and switches
• Two problems are treated. (1) Analysis: determine the operating characteristics of a given circuit. (2) Synthesis: find a circuit incorporating certain given characteristics.

Main Result
• A calculus is developed for manipulating circuit equations that is analogous to the Calculus of Propositions used in the symbolic study of logic
• Analysis: circuit equations are interpreted in terms of the operating characteristics
• Synthesis: write desired characteristics as a system of equations, manipulate equations into simplest form, and draw circuit from equation

Conclusions and Future Work
• Our calculus can be used to design practical devices. Some illustrative examples are given: (1) a selective circuit with the fewest elements (2) an electric combination lock (3) a vote counting circuit (4) an electric adder to the base two (5) a Factor Table Machine that prints a table of prime factors of integers from 1 to 100,000,000.

Vote counting circuit: C is a control button and the symbols L₀, L₁, ..., L₁₂ represent lights