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Lab 4 Report
ECE 2031 L02
19 February 2025
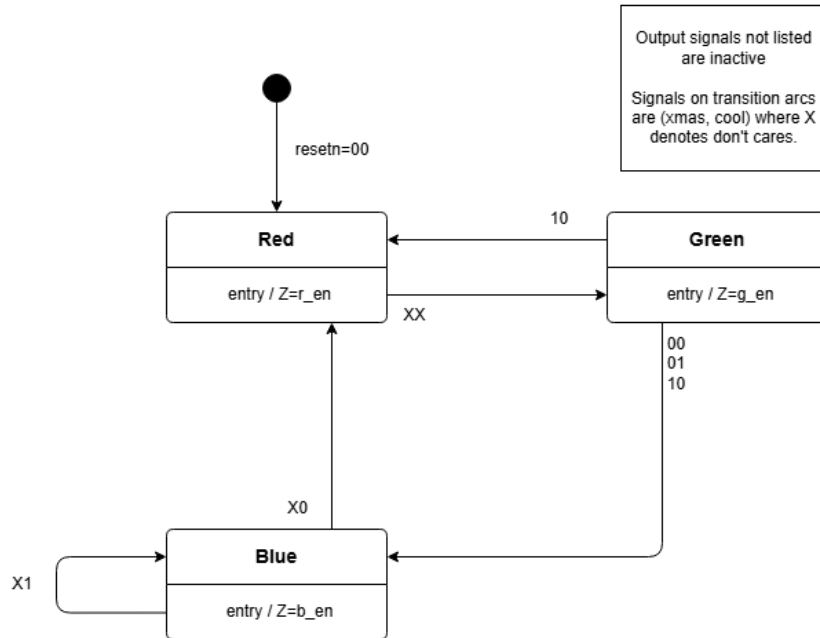
Figure 1. A state diagram that defines simplified input and output signals with a legend. The outputs are LED colors and the transition arcs define inputs as the pair 'xmas, cool'.

<div align="center">

TABLE 1

TABLE FOR THE STATE MACHINE $Q1+ = Q0 \cdot \backslash XMAS + Q0 \cdot COOL + Q1 \cdot COOL$
AND $Q0+ = \backslash Q1 \cdot \backslash Q0$ WITH OUTPUTS DETERMINED BY Q1 AND Q0

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| Current State	Q1	Q0	xmas	cool	Next State	Q1+	Q0+	r_en	g_en	b_en
Red	0	0	0	0	Green	0	1	1	0	0
Red	0	0	0	1	Green	0	1	1	0	0
Red	0	0	1	0	Green	0	1	1	0	0
Red	0	0	1	1	Green	0	1	1	0	0
Green	0	1	0	0	Blue	1	0	0	1	0
Green	0	1	0	1	Blue	1	0	0	1	0
Green	0	1	1	0	Red	0	0	0	1	0
Green	0	1	1	1	Blue	1	0	0	1	0
Blue	1	0	0	0	Red	0	0	0	0	1
Blue	1	0	0	1	Blue	1	0	0	0	1
Blue	1	0	1	0	Red	0	0	0	0	1
Blue	1	0	1	1	Blue	1	0	0	0	1
unused	1	1	0	0	x	x	x	x	x	x
unused	1	1	0	1	x	x	x	x	x	x
unused	1	1	1	0	x	x	x	x	x	x
unused	1	1	1	1	x	x	x	x	x	x
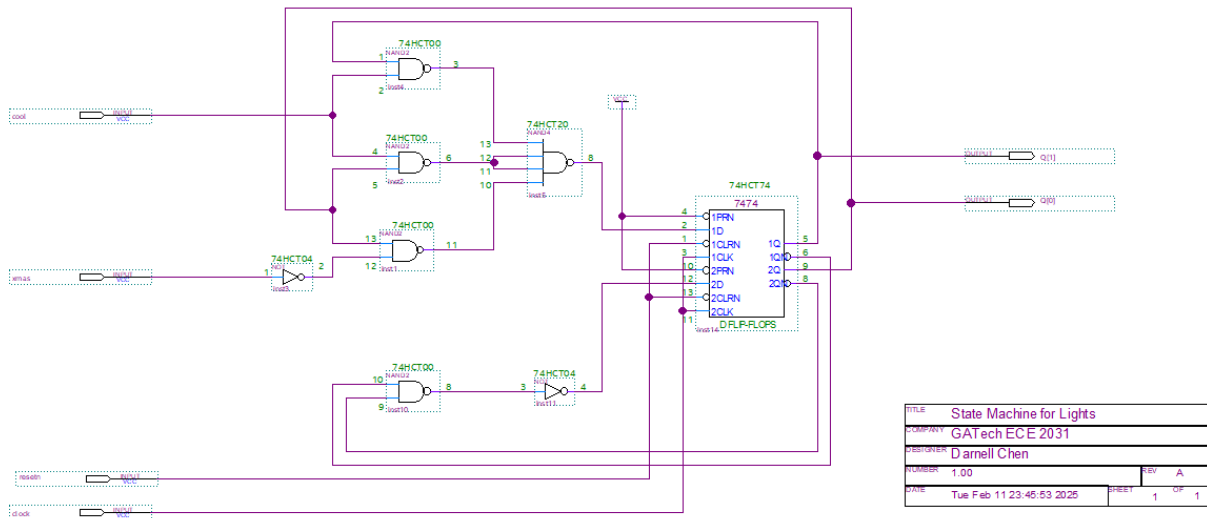
Figure 2. A 2-input circuit schematic that implements a Moore-output state machine using D Flip-Flops. The states for the circuit schematic follow the equations $Q1+ = Q0 \cdot \backslash xmas + Q0 \cdot cool + Q1 \cdot cool$ and $Q0+ = \backslash Q1 \cdot \backslash Q0$.
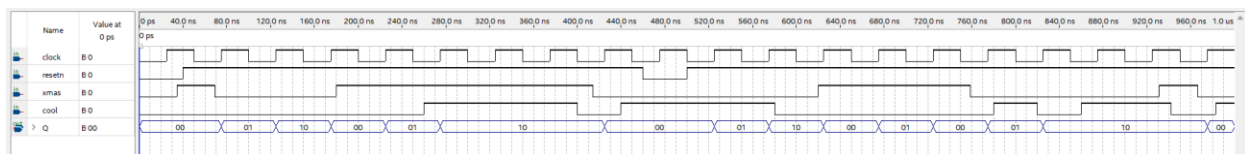

Figure 3. The waveform simulation for a circuit that implements a Moore output state machine. The inputs xmas and cool are the primary inputs that determine the next state for the vector Q. All input-output combinations were captured.
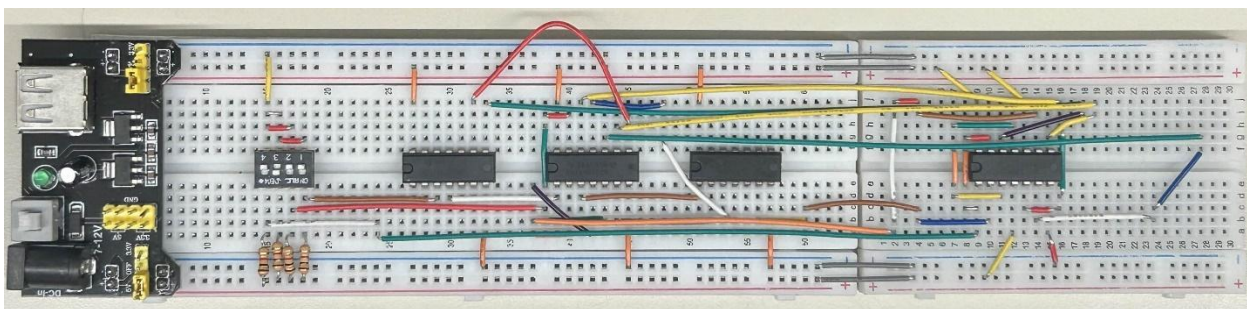

Figure 4. The hardware implementation of a state machine which follows the expressions $Q1+ = Q0 \cdot \backslash xmas + Q0 \cdot cool + Q1 \cdot cool$ and $Q0+ = \backslash Q1 \cdot \backslash Q0$.
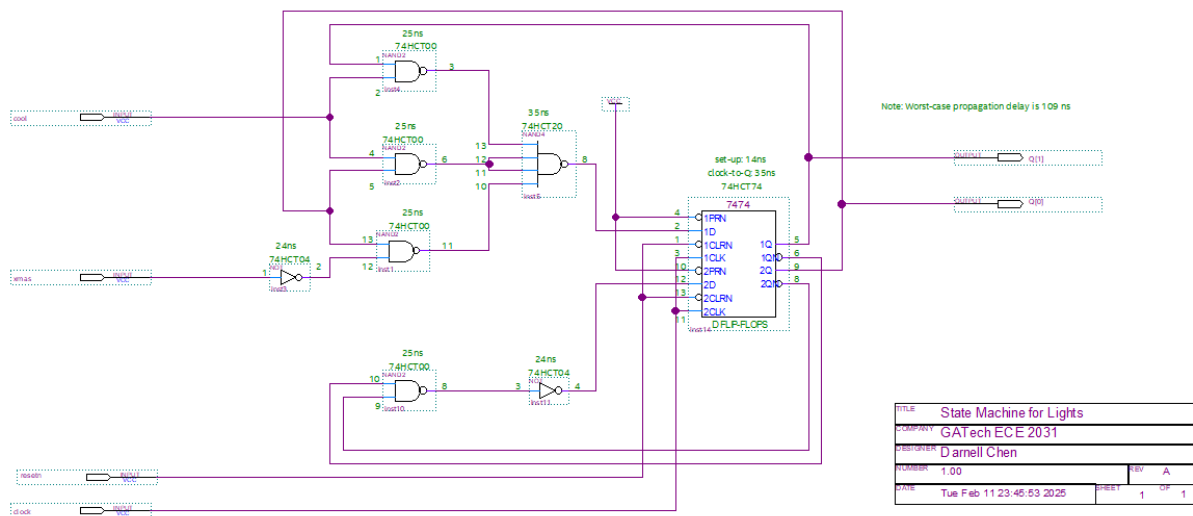
Figure 5. A circuit schematic for a Moore output state-machine with defined device labels, pin numbers, and delays for each device. The worst case propagation delay is noted to be 109 ns. The states for the circuit schematic follow the equations $Q1+ = Q0 \cdot \backslash xmas + Q0 \cdot cool + Q1 \cdot cool$ and $Q0+ = \backslash Q1 \cdot \backslash Q0$.