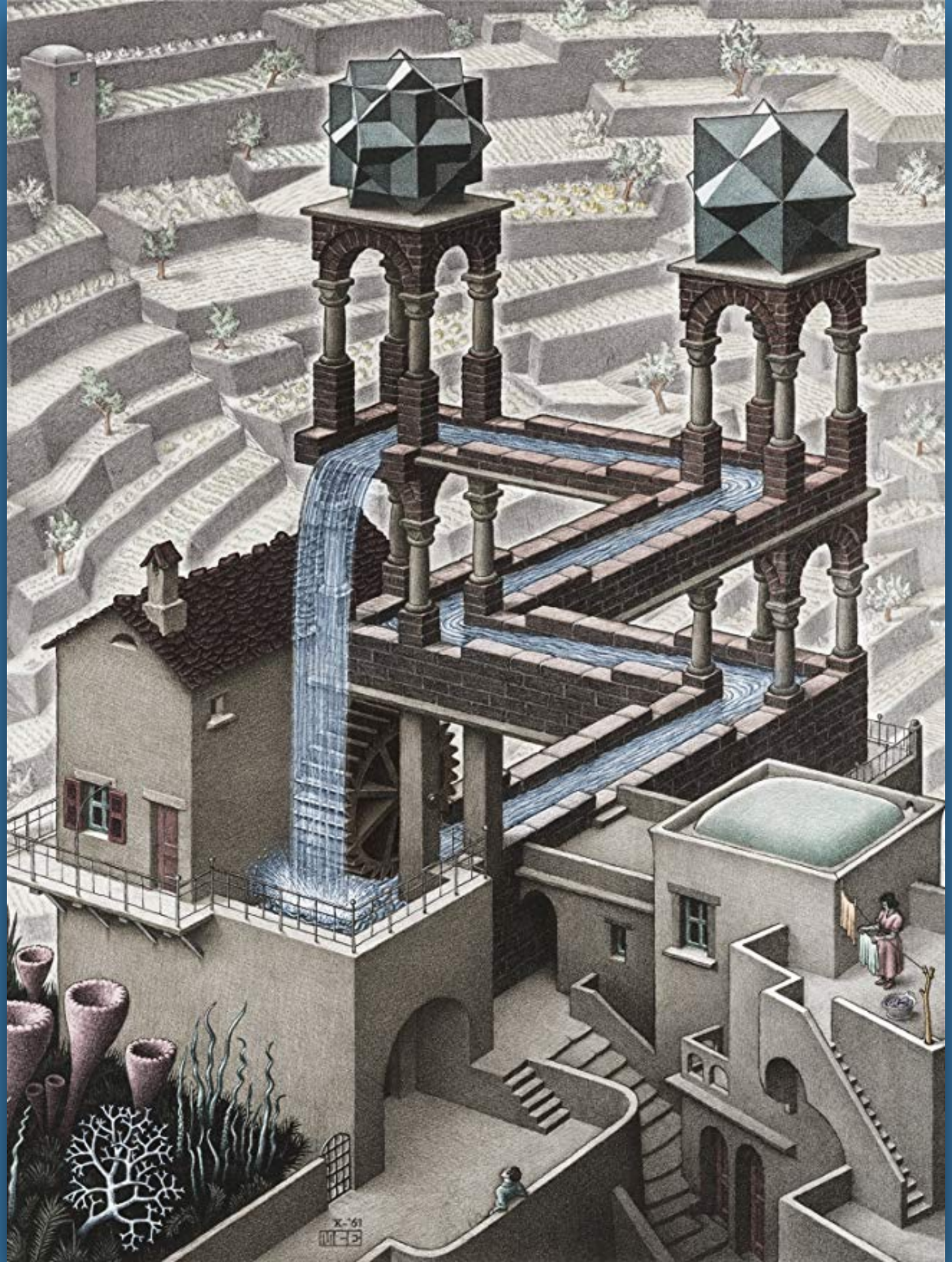
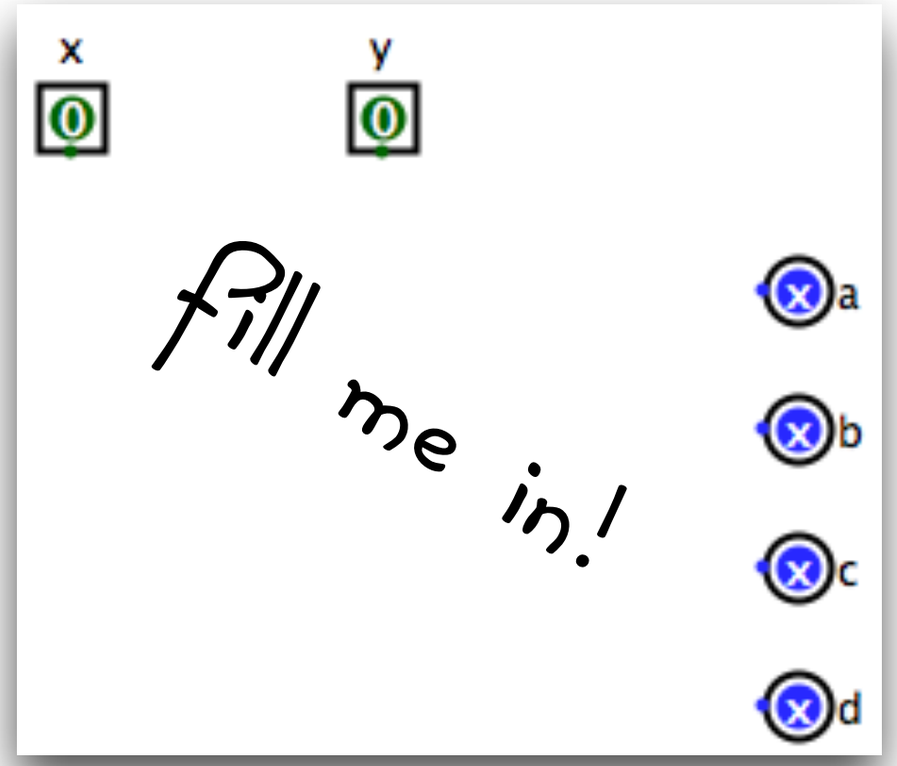


Translate this table to a circuit

input		output			
x	y	a	b	c	d
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

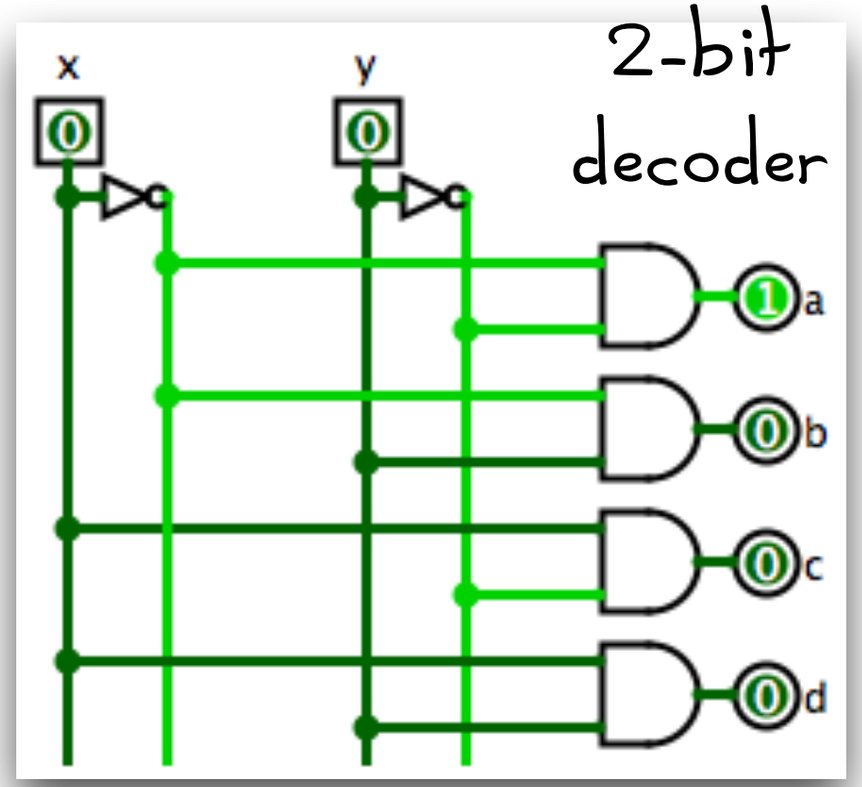


Full name

Th. 9/20

Translate this table to a circuit

input		output			
x	y	a	b	c	d
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1



Full name

Th. 9/20

Levels of abstraction

Stored-program computers

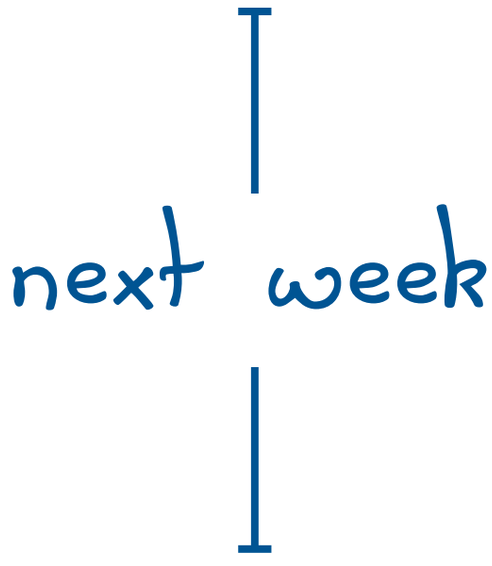
Random-access memory (RAM)

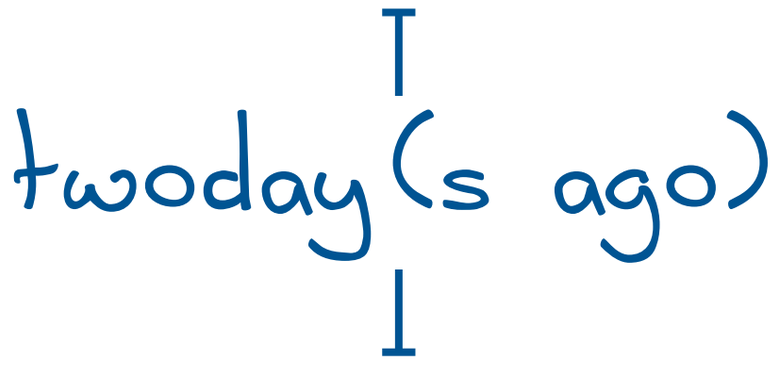
Registers

1-bit memory: latches

Logic gates

Transistors / switches





What counts as a problem?

Decision problems on finite, bitstring inputs.

What kinds of **problems** can **computers** solve?

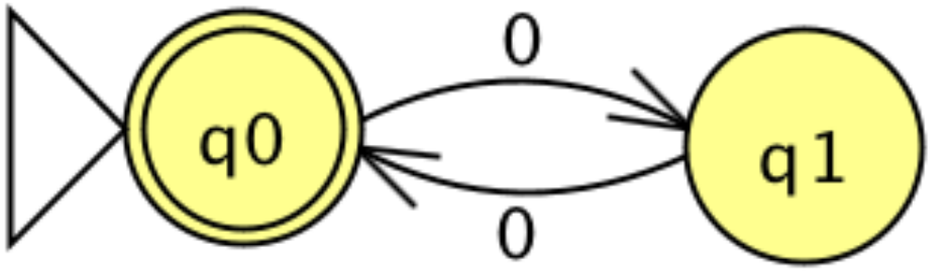
Can combinational logic solve all the problems that a DFA can? How about a Turing Machine?

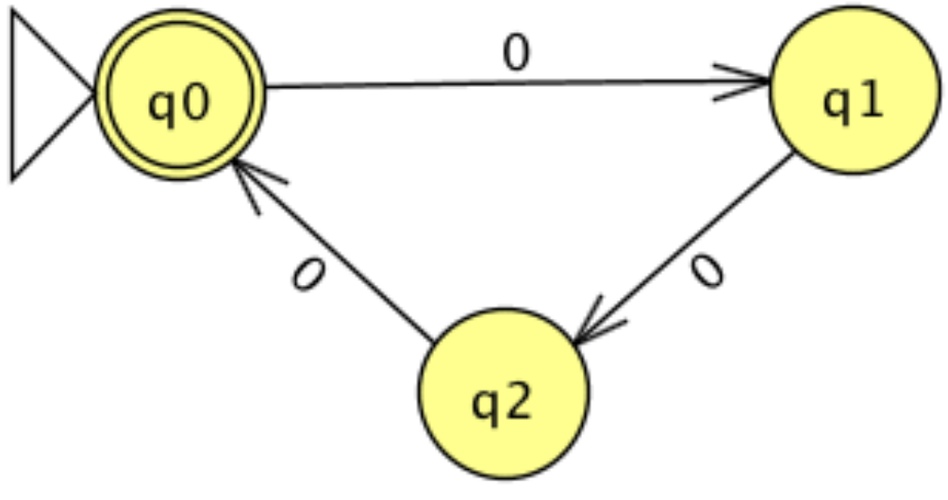
What counts as a computer?

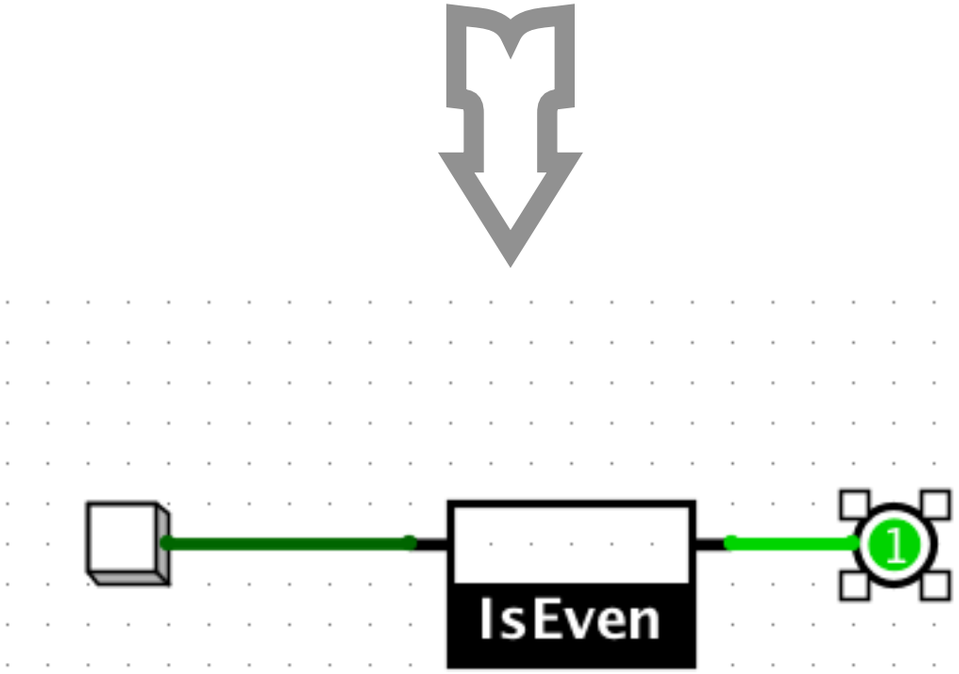
Can we do this?

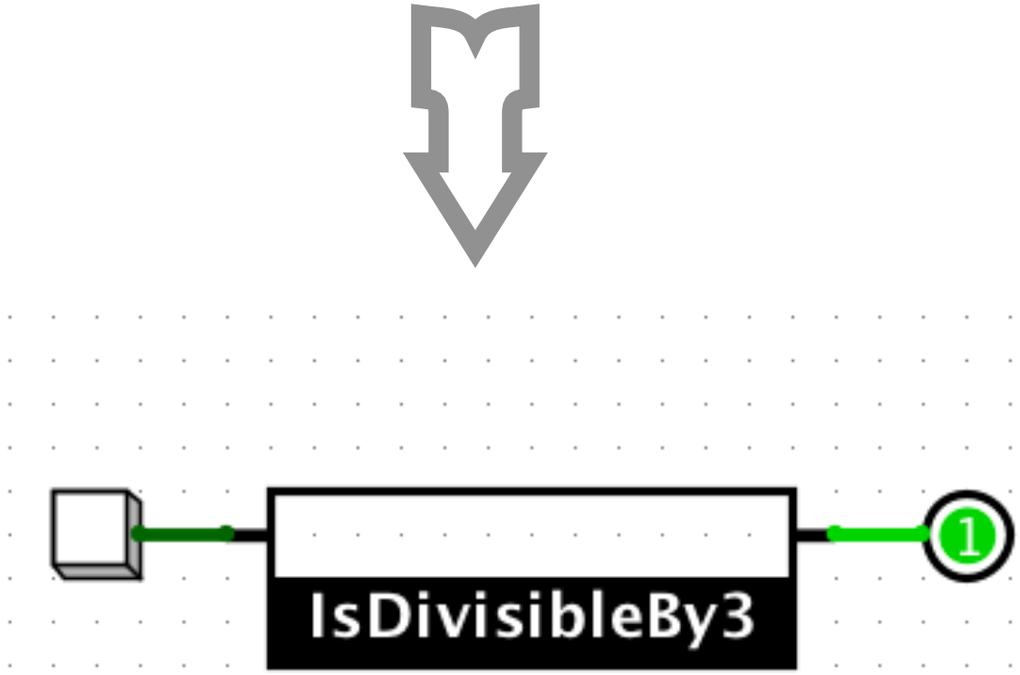
If we can't, then boolean functions aren't as powerful as DFAs.

$\Sigma = \{0\}$

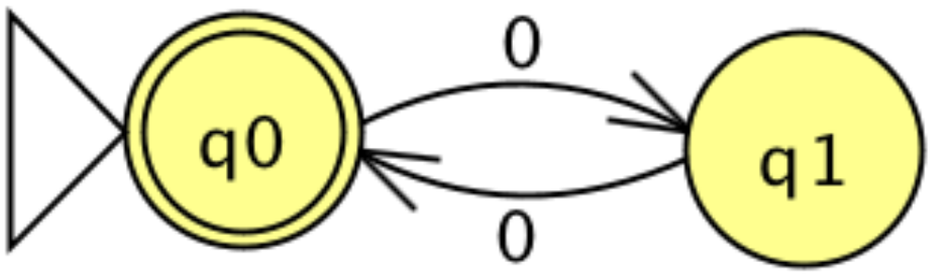








Use minterm expansion!



(1) Write down the truth table for this DFA.

The output of the function should be a 1 if it accepts; 0 if it rejects.

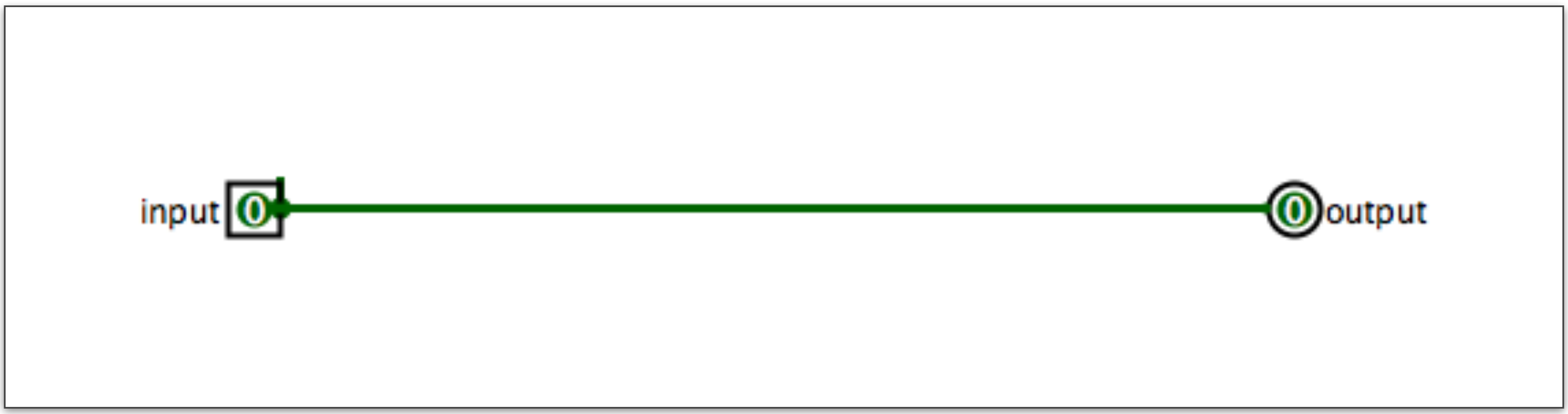
(2) Use minterm expansion to create the circuit from the table.

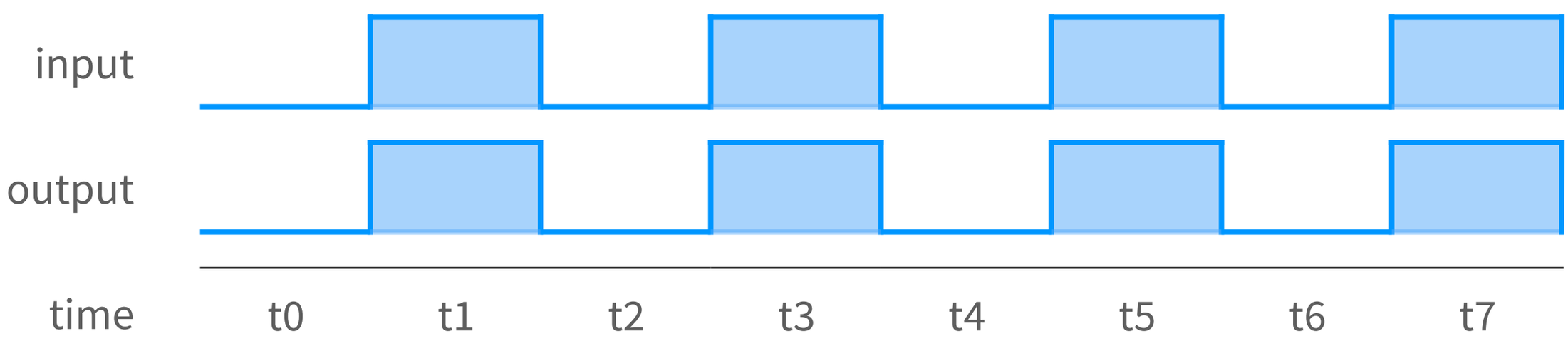
Impossible task!

we cannot build a circuit for this DFA

Pass-through

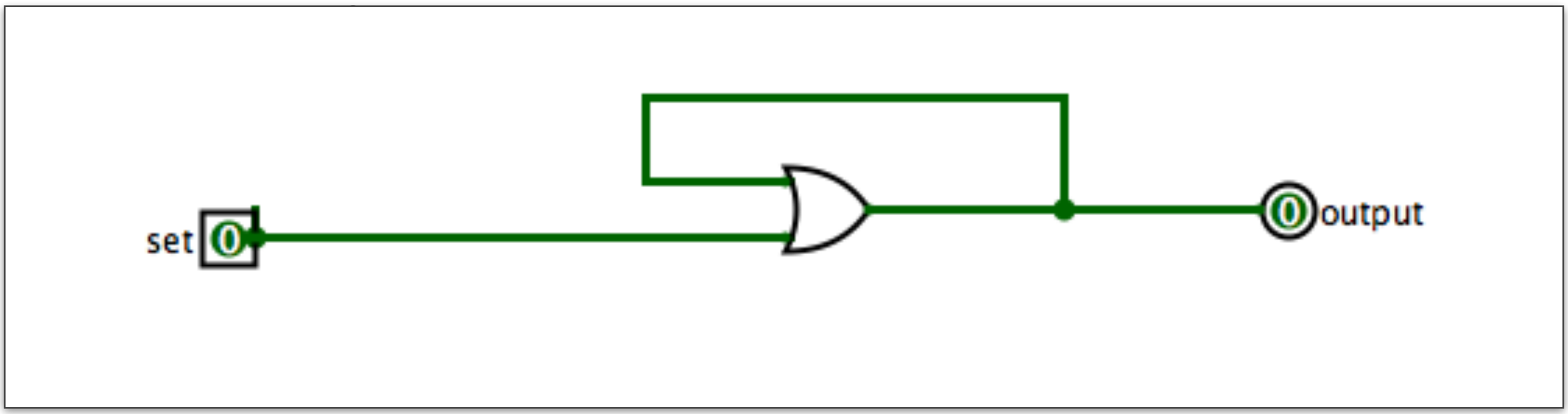
I’m (not) pressing the button right now.

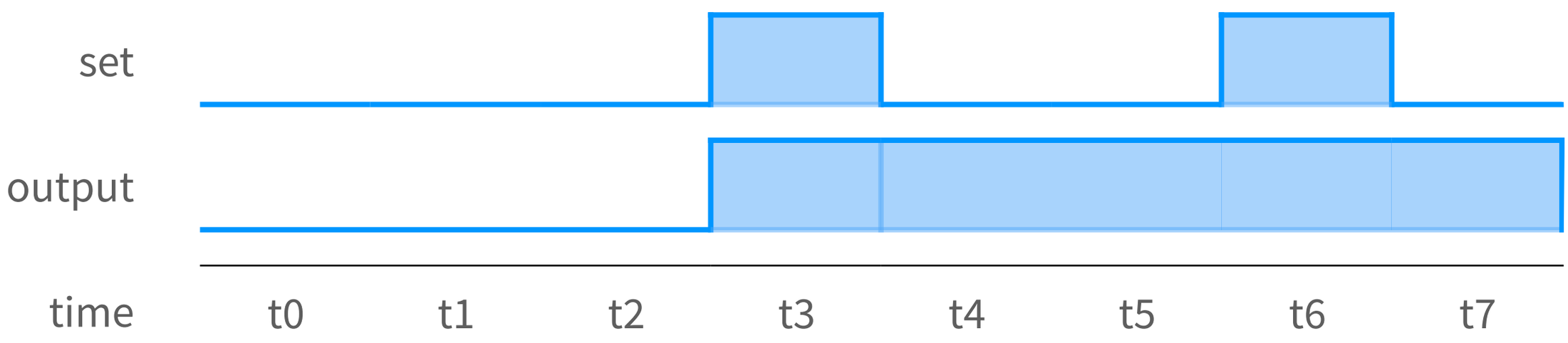




Phase behavior: set

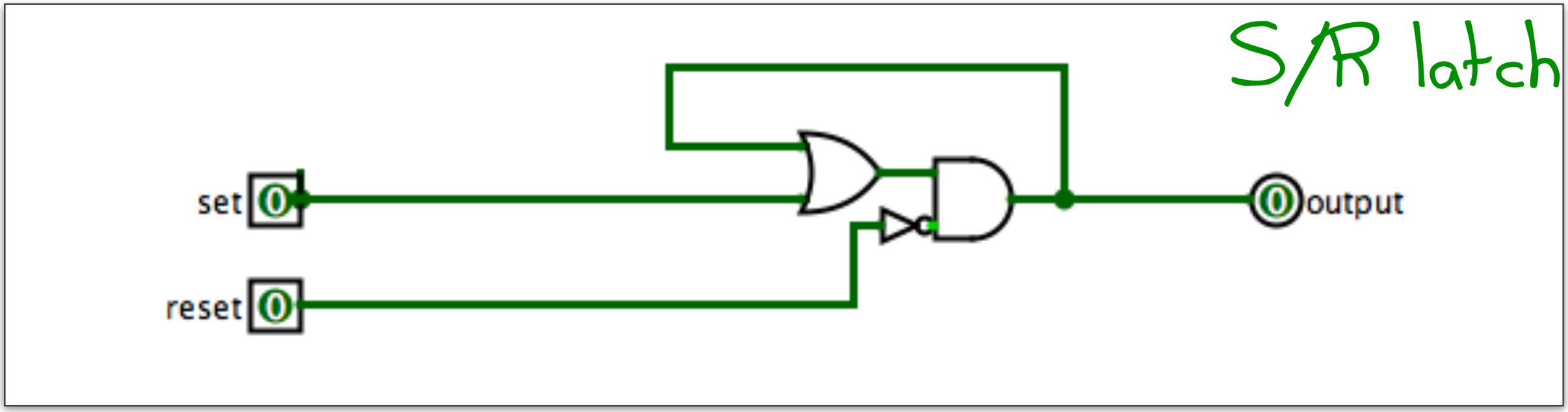
I (haven't yet) pressed the button. (toggle on)

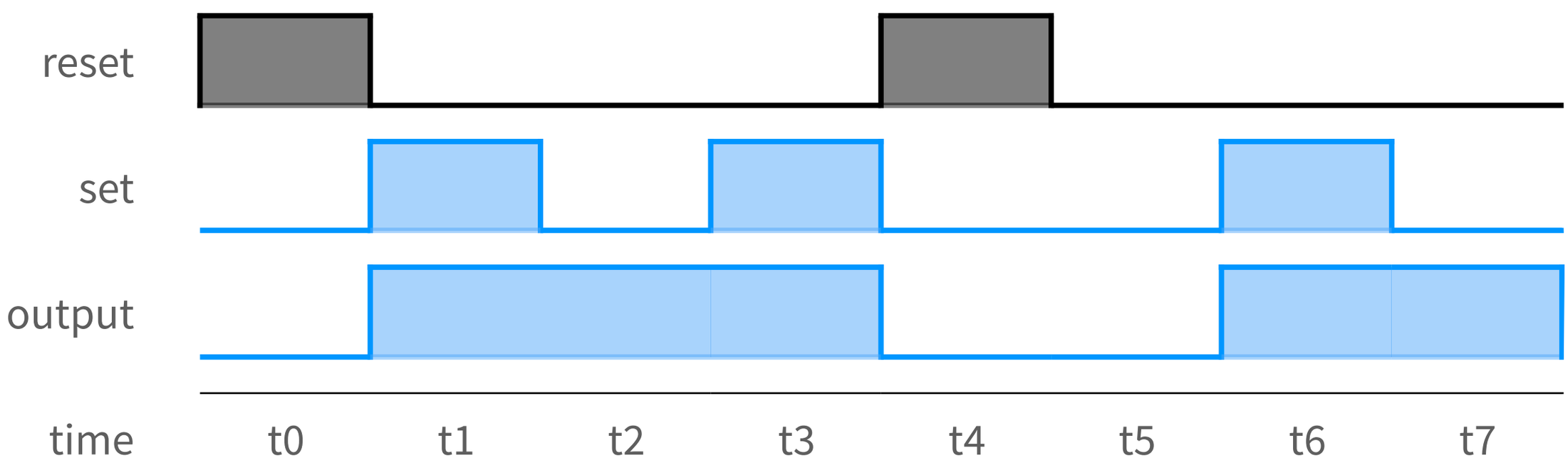




Phase behavior: set / reset

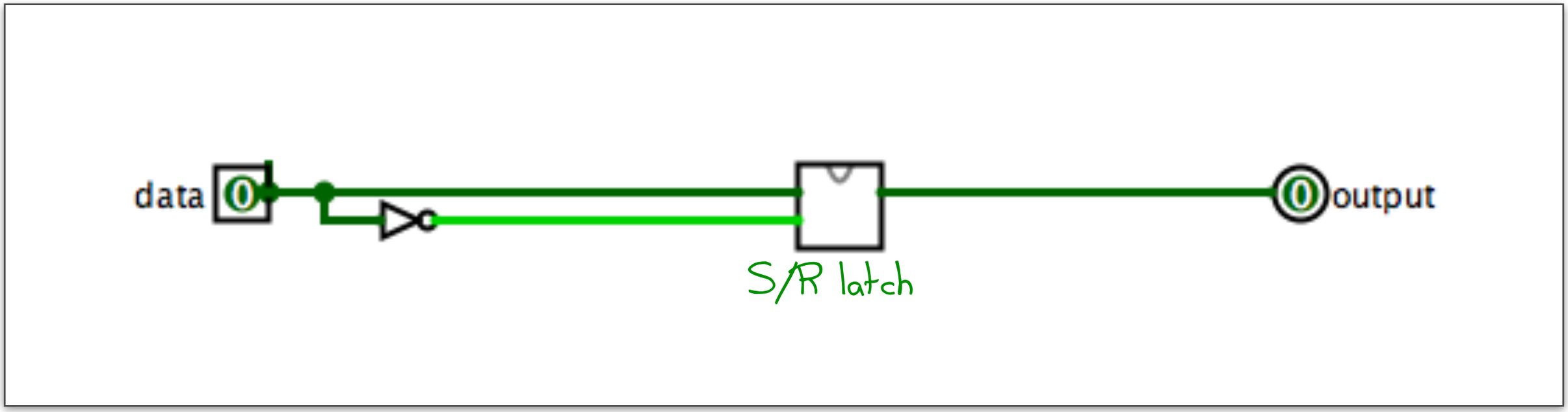
I can toggle the button on and off.

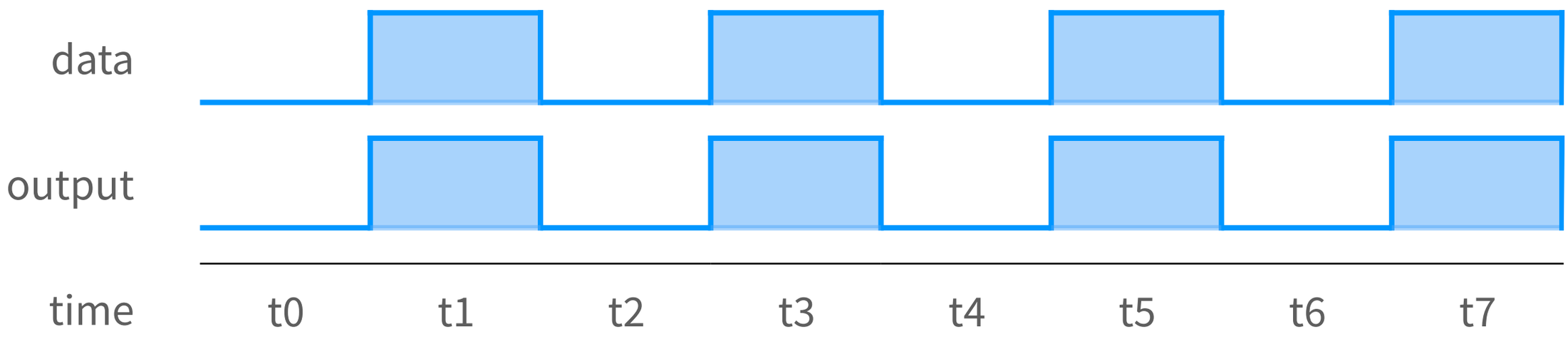




Pass-through via set / reset

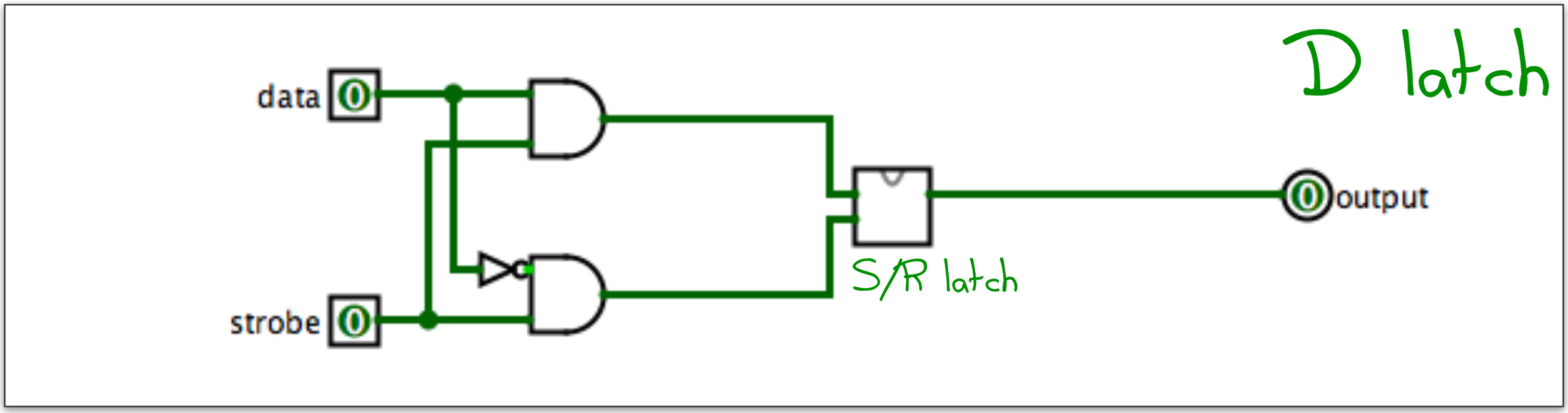
I’m (not) pressing the button right now.

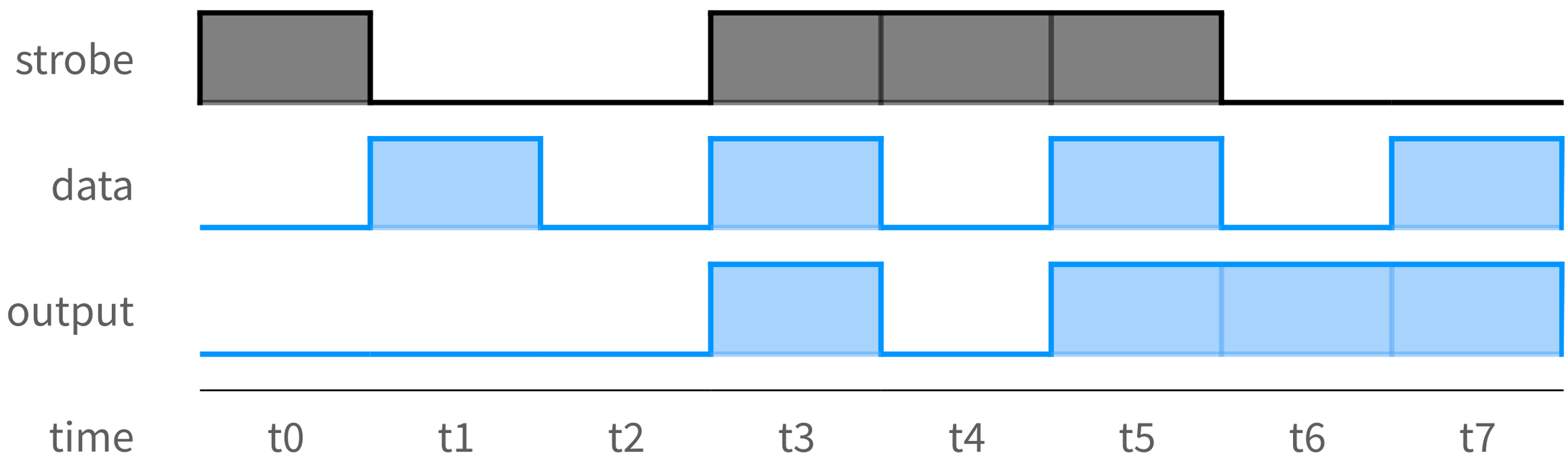




Pass-through *or* set / reset

I can toggle between pass-through and remembering the state from a moment in time.





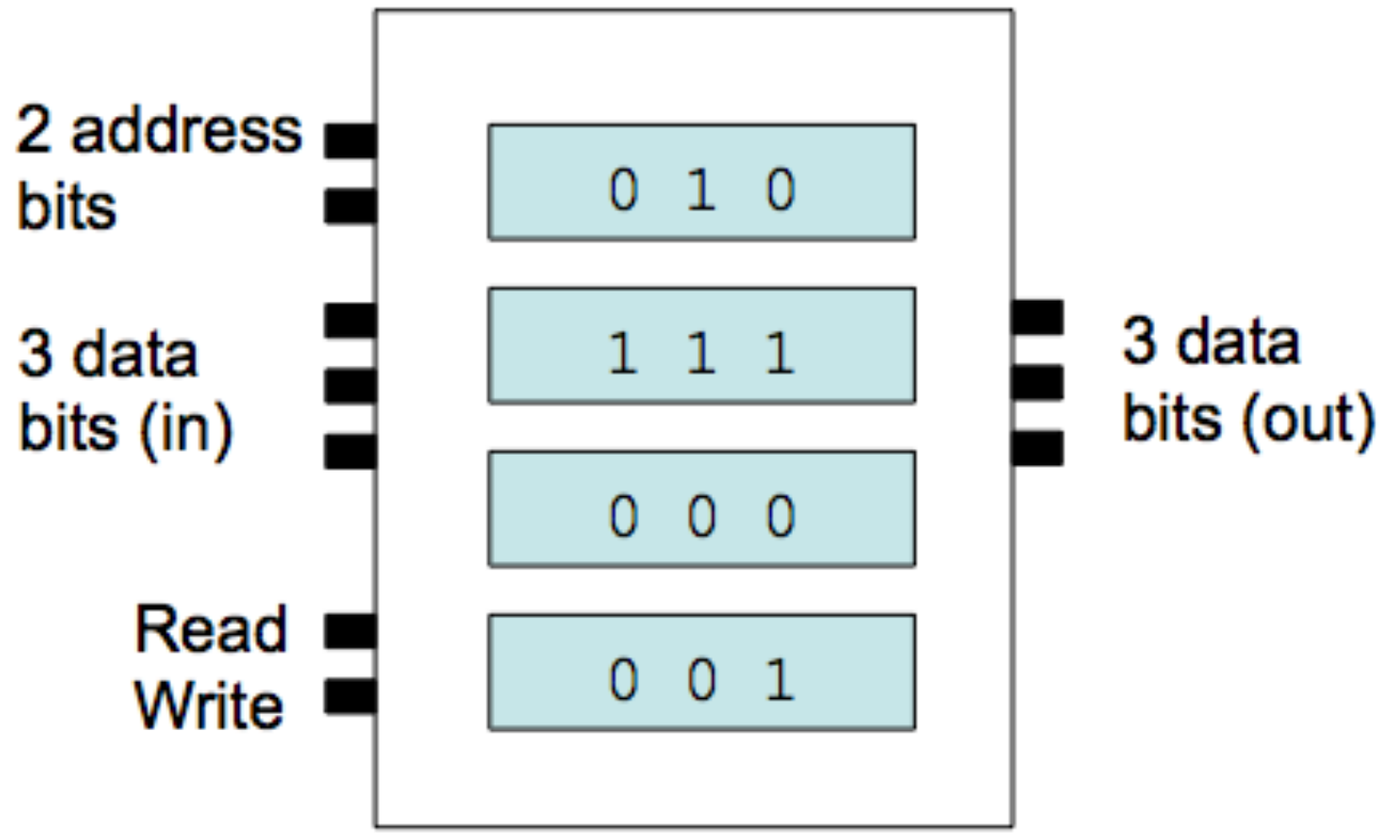
https://images-na.ssl-images-amazon.com/images/I/61wzOqnANGL._SX679_.jpg

Random-access memory (RAM)

A 512K x 8 RAM (About 4.2 million bits)

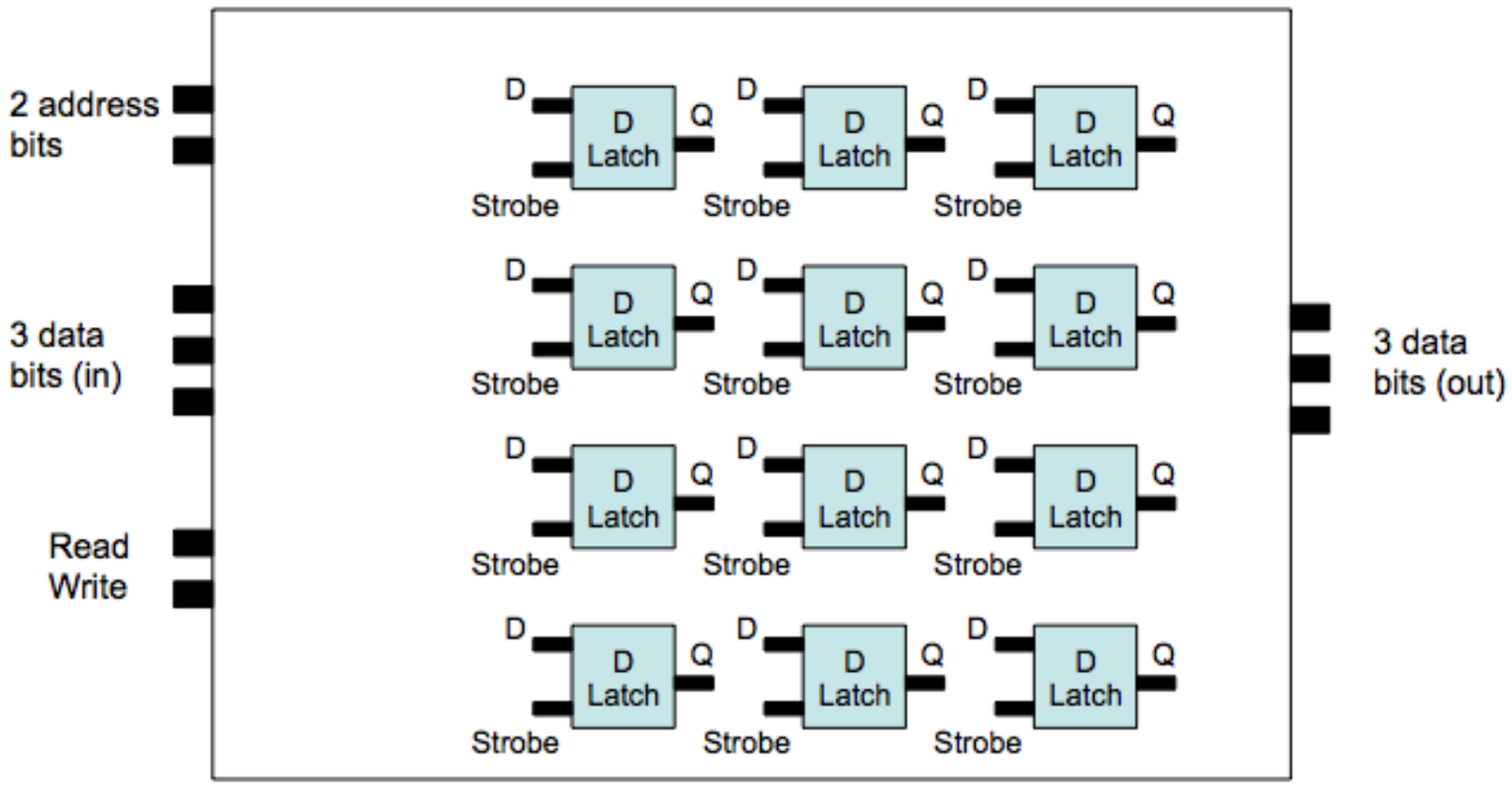
A *small* piece of RAM

Interface: we can read or write one of four rows of memory, and each row stores three bits



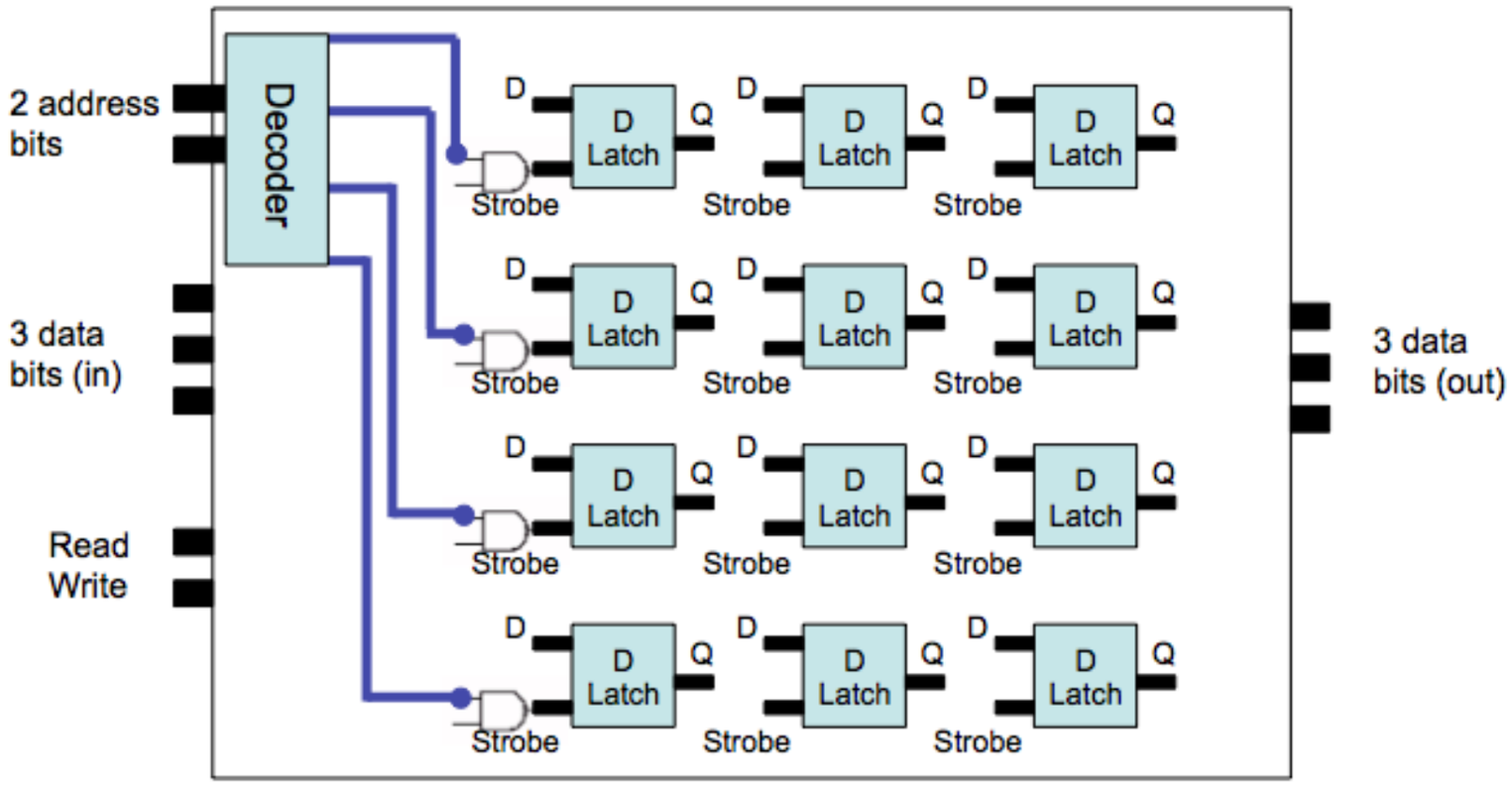
A *small* piece of RAM

Implementation



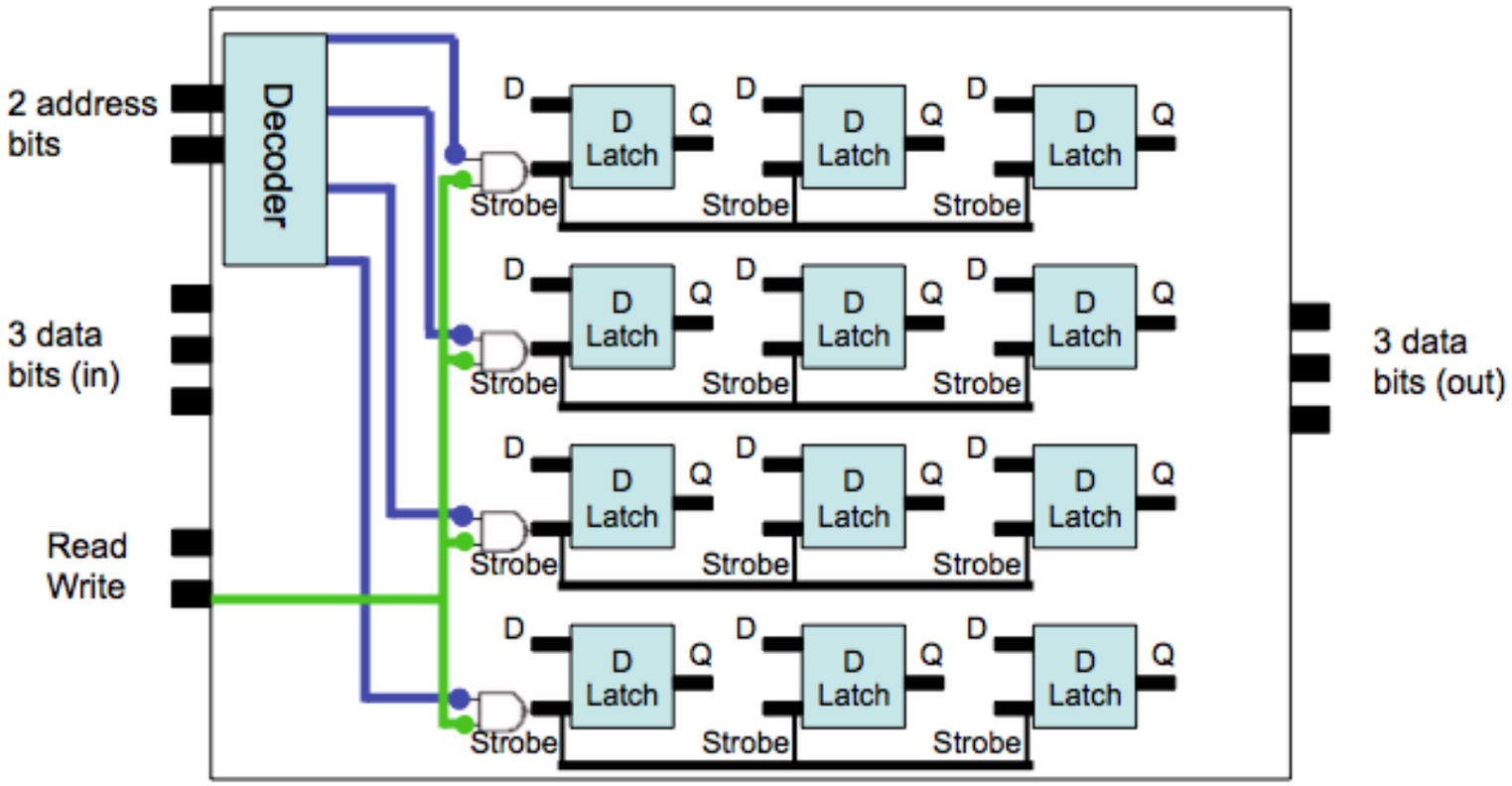
A *small* piece of RAM

Addressing: select which “line”

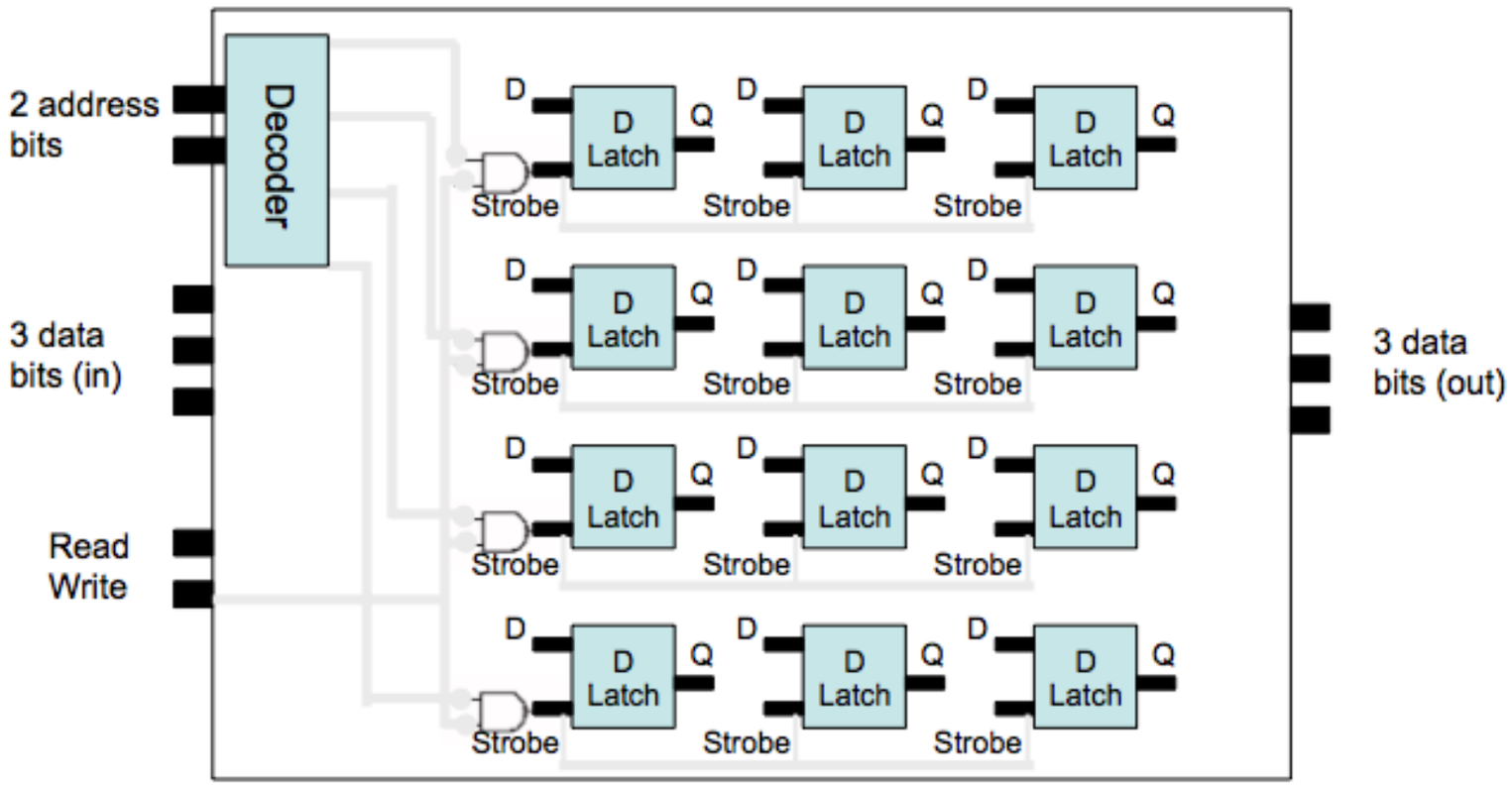


A *small* piece of RAM

Write mode

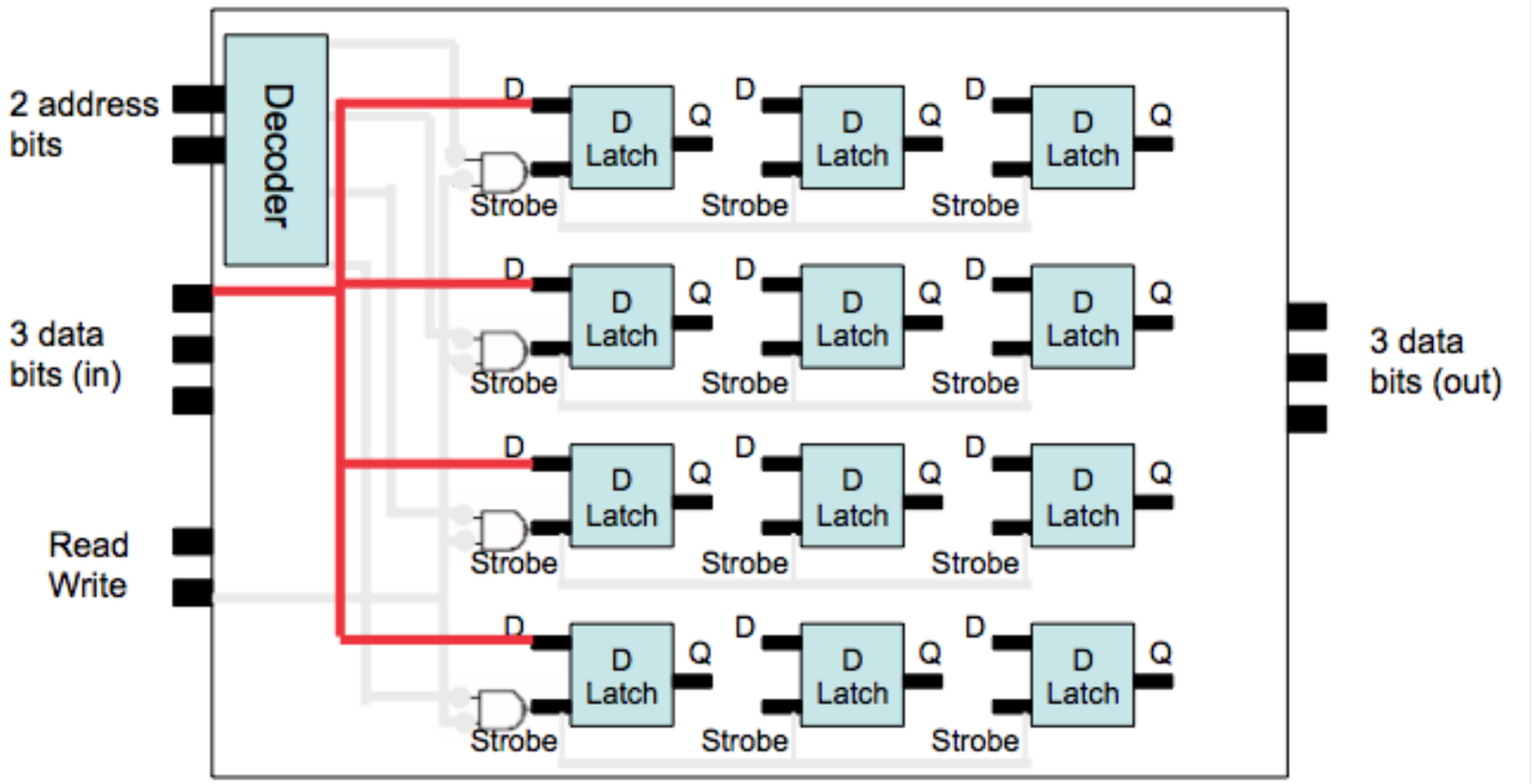


A *small* piece of RAM



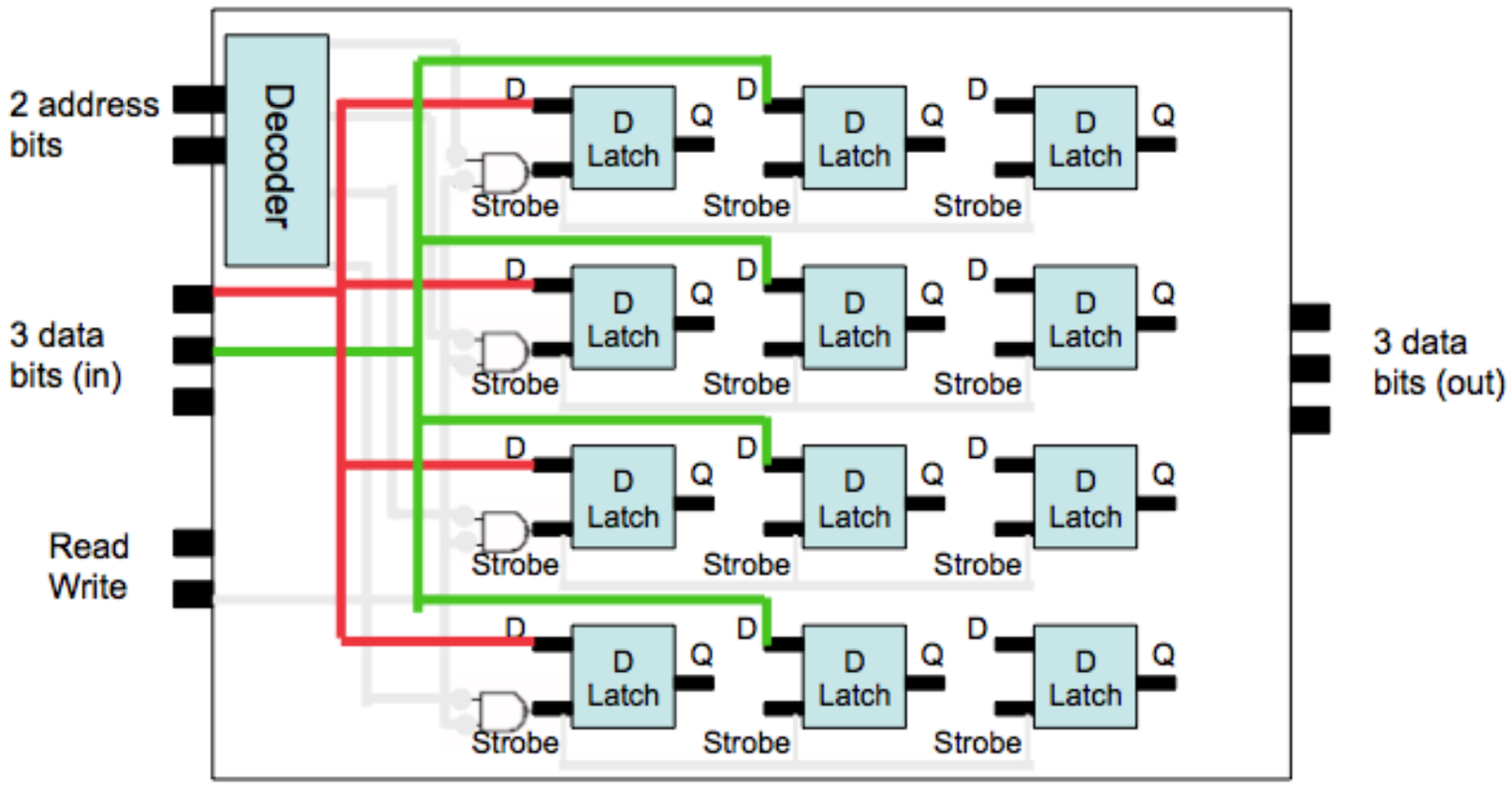
A *small* piece of RAM

Wire data bits to corresponding memory bits



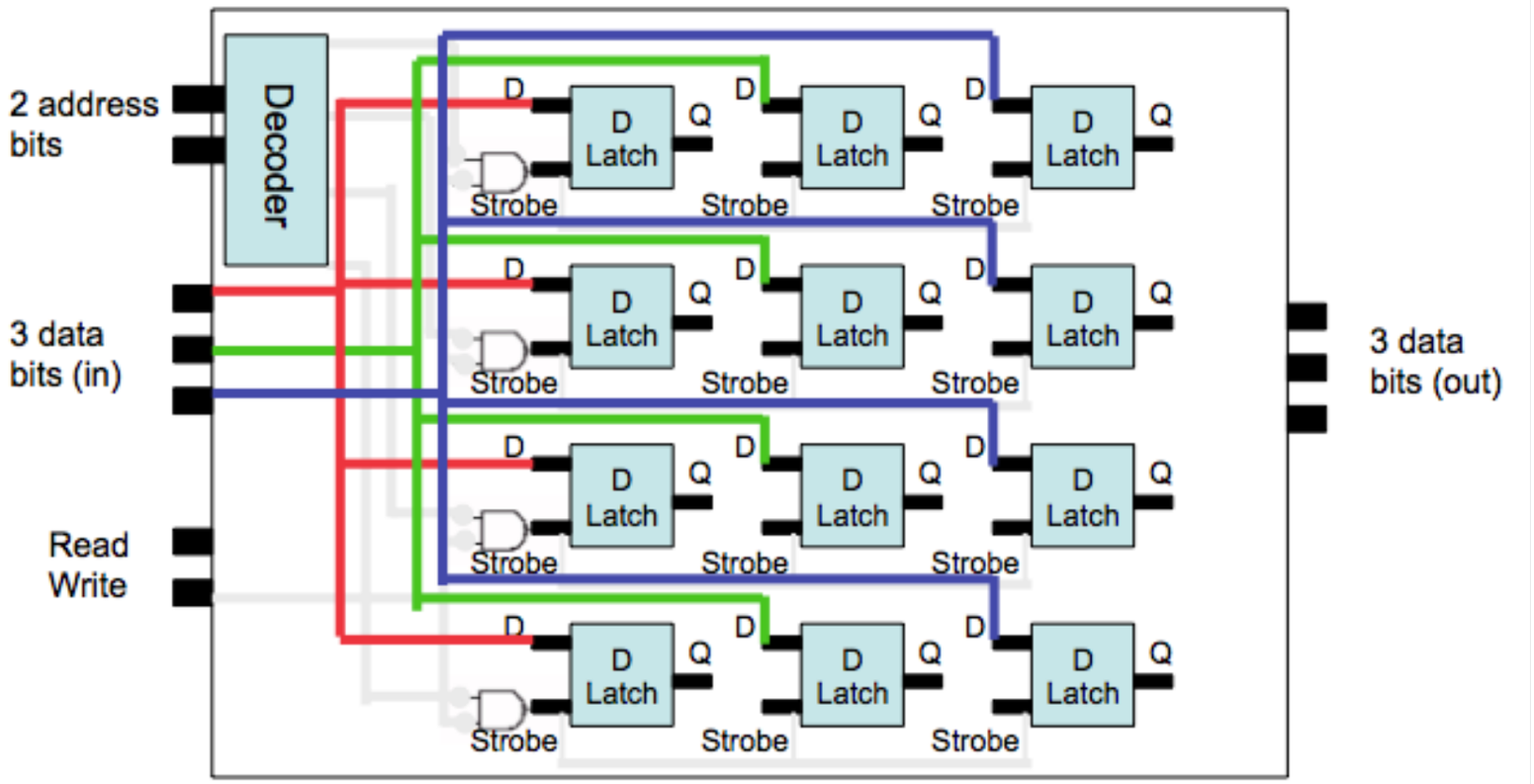
A *small* piece of RAM

Wire data bits to corresponding memory bits



A *small* piece of RAM

Wire data bits to corresponding memory bits



What counts as a problem?

Decision problems on finite, bitstring inputs.

What kinds of **problems** can **computers** solve?

Can sequential logic solve all the problems that a DFA can? How about a Turing Machine?

What counts as a computer?