

10 - algorithmic state machines

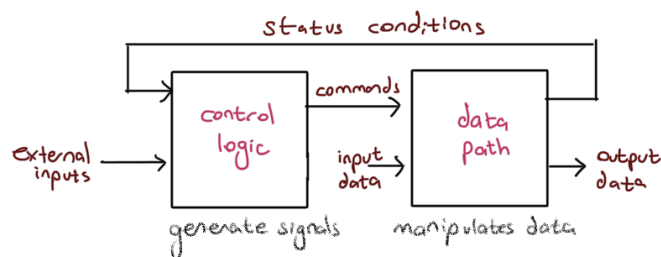
algorithmic state machines (ASM)

- to design larger digital systems
- modular approach
 - ↳ modules = registers, dec's, mux's, ..
- describes sequence + timing
- controls sequence and processes data

stored information classification

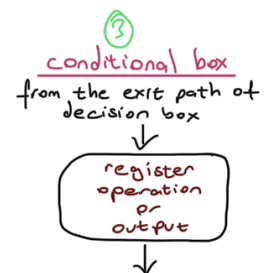
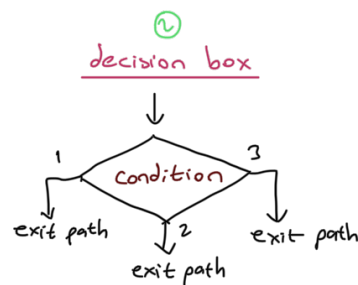
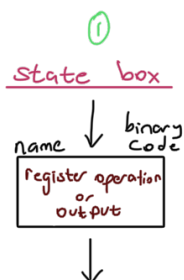
data: elements of information that manipulated by data-processing operations, (logic, arithmetic..)

control: command signals that controls the operations in the data section for desired data-processing.



asm chart

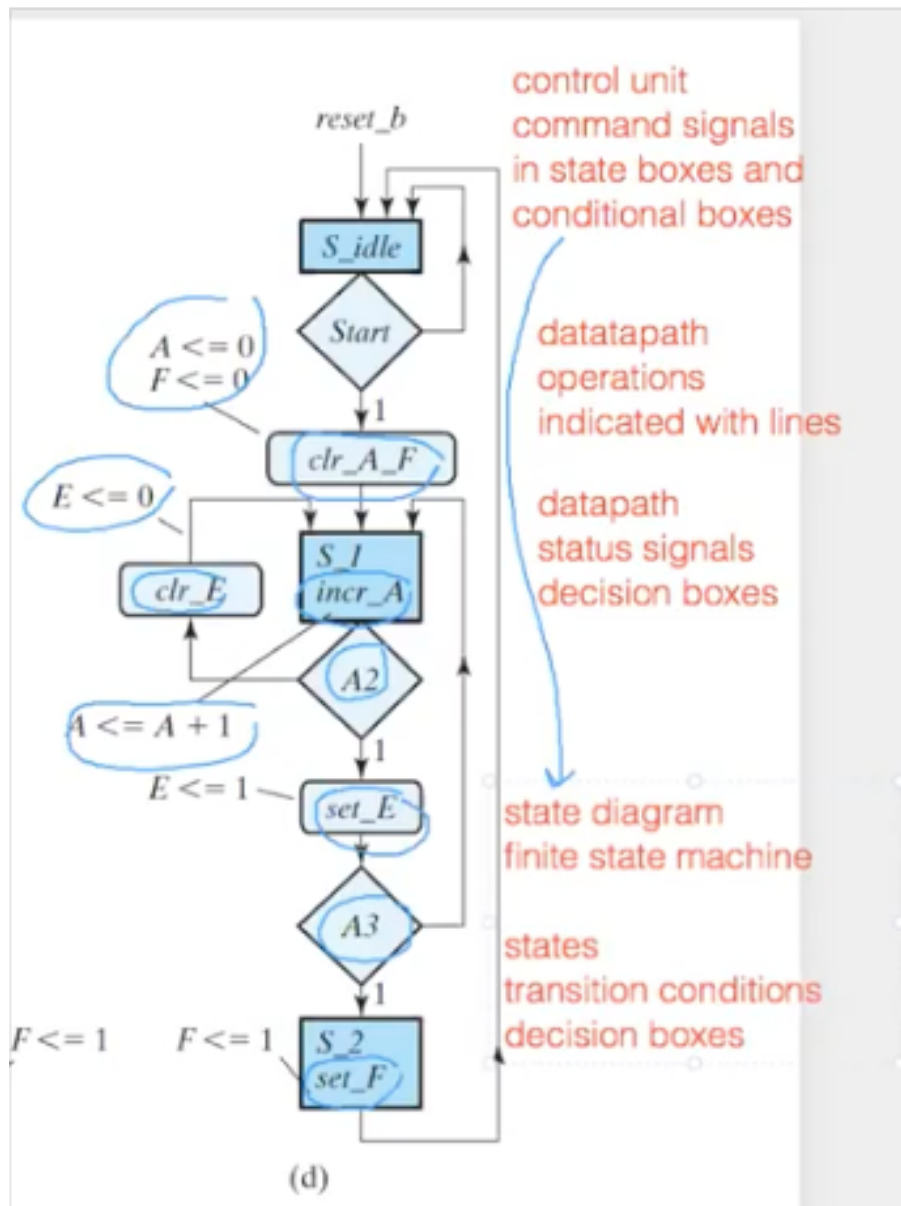
asm chart = 1+2
asm chart = 1+2+3



asm block

- 1 entrance
- n exit paths

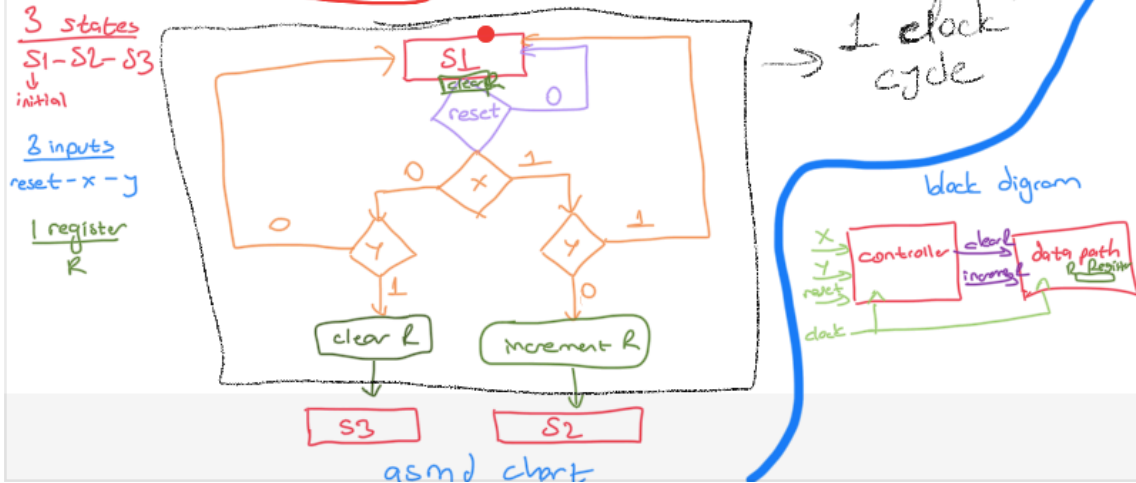
☆ the state of the system during one clock-pulse interval
 ↳ all operations ^{in same block} executed within a common pulse
 ↳ that is the main difference from flow-charts
 blocks start with state box



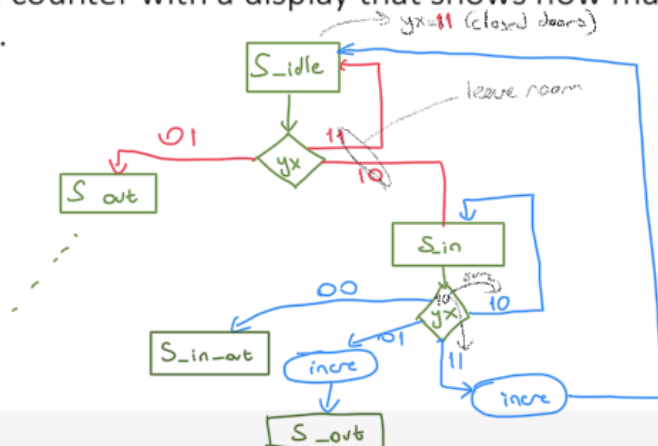
datapath \rightarrow state boxes + conditional boxes
control logic \rightarrow decision boxes + static transitions

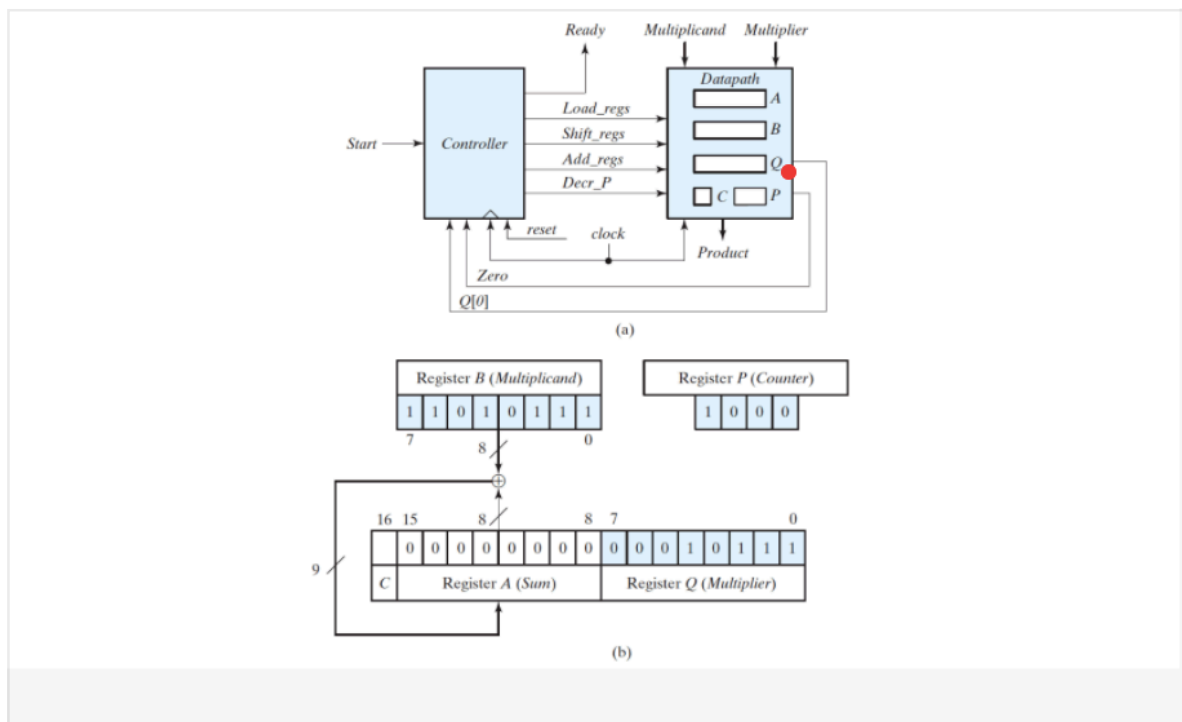
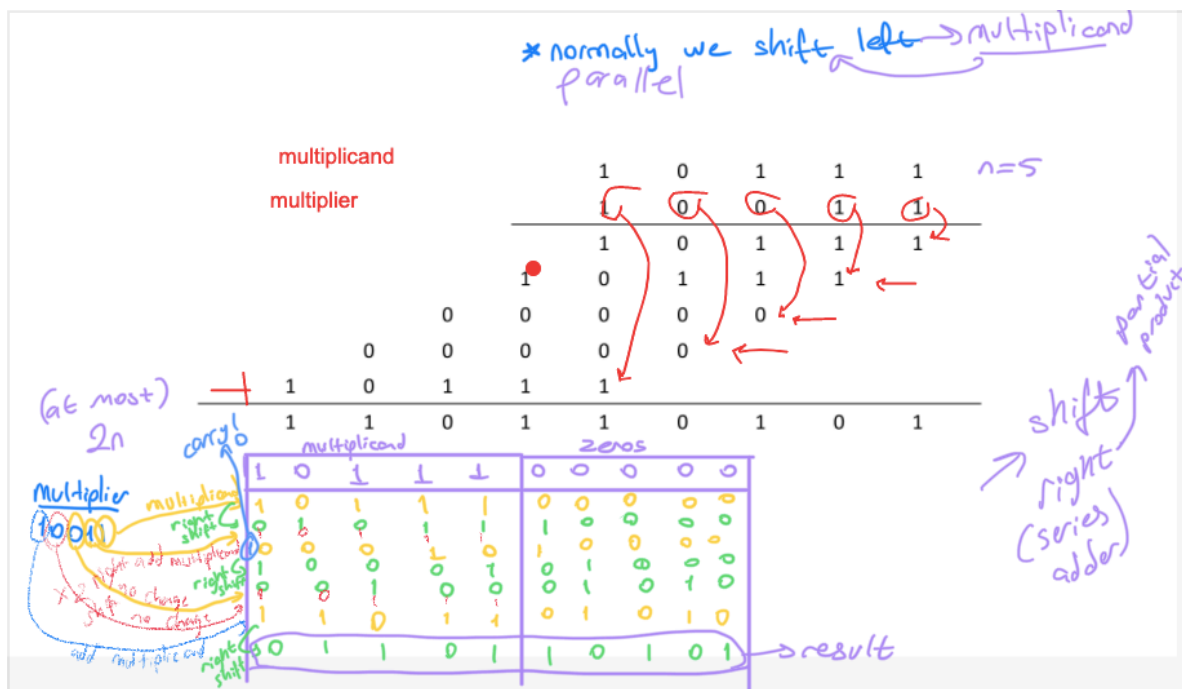
synchronous reset = is executed rising edge, or falling edge or .. (sync with the clock)
asynchronous reset = is executed immediately

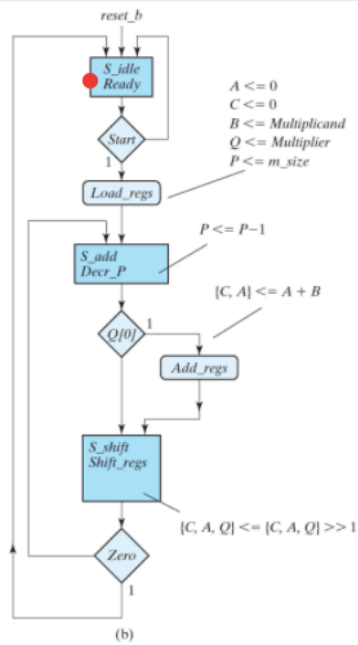
8.2 A logic circuit with active-low synchronous reset has two control inputs x and y . If x is 1 and y is 0, register R is incremented by 1 and control goes to a second state. If x is 0 and y is 1, register R is cleared to zero and control goes from the initial state to a third state. Otherwise, control stays in the initial state. Draw (1) a block diagram showing the controller, datapath unit (with internal registers), and signals, and (2) the portion of an ASMD chart starting from an initial state.



8.6 Construct a block diagram and an ASMD chart for a digital system that counts the number of people in a room. The one door through which people enter the room has a photocell that changes a signal x from 1 to 0 while the light is interrupted. They leave the room from a second door with a similar photocell that changes a signal y from 1 to 0 while the light is interrupted. The datapath circuit consists of an up-down counter with a display that shows how many people are in the room.

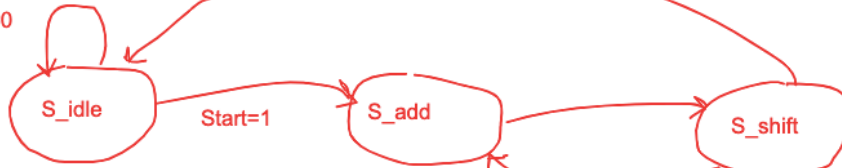






Control Logic

Start=0



encoding

- binary encoding 00, 01, 10 2 FFs
- gray coding 00, 01, 11 2 FFs
- one hot encoding 001, 010, 100 3 FFs

Zero=0

Zero checks if P is 0 or not