

## Algorithmic State Machine (ASM) Charts

An ASM Chart consists of a series of ASM Blocks.

ASM Block:

- Single entry point.
- Single state box.
- Condition boxes.
- Output boxes.

State box:

- State name on top left.
- State code on top right.
- Inside contains a list of all outputs that are asserted.
- Often prefix signal name with  $H$ . or  $L$ . to indicate if it is asserted high or low.
- Often prefix with  $I$  if asserted immediately (instead of with next clocking event).

Condition box:

- Test an input to determine which output path to take.
- May have more than one per ASM Block.
- Order doesn't matter.

Output box:

- List outputs that are assert in this state with this input path.
- A unique exit path exists for each combination of inputs.

## Complexity Bounds

$M$  inputs,  $L$  Flip-Flops,  $N$  outputs.

States:

- Max =  $2^L$
- Min = 1

Transitions *from* any state:

- Max =  $2^M$
- Min =  $2^M$  (There is an exit transition fro every input combination)

Transitions *into* any state:

- Max =  $2^M 2^L$  (When every exit from every state goes to one input)
- Min = 0 (When no exit from any state goes to an input)

Output Patterns:

- Max:
  - Moore =  $\min 2^L, 2^N$  (Minimum of the number of states and output patterns)
  - Mealy =  $\min 2^M 2^L, 2^N$  (Minimum of the number of transitions and output patterns)
- Min = 1 (When all states/transitions have the same output)