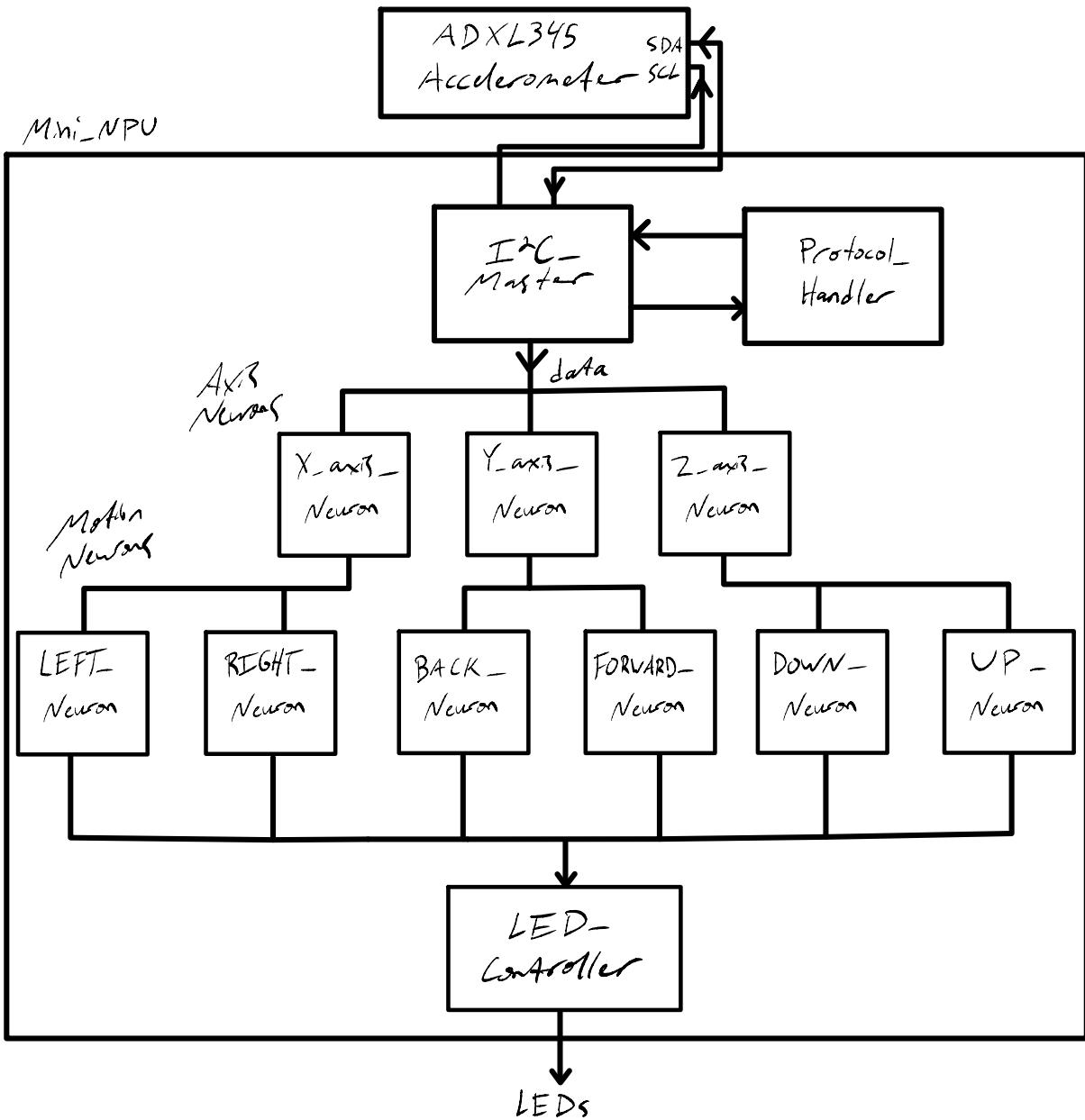


Christian Cherry
18-224
Semester Project

Mini_NPU Design Schematics



Testbench Overview

Testbench will act as the accelerometer and generate a series of serial I₂C data transactions corresponding to physical motions to replicate the data transfer of the ADXL345 Accelerometer. The design will output a 3x4 array corresponding to what motion it thinks it saw, and the TB will take this output and compare it against the actual motion of input to the dut.

Protocol Handler

Inputs

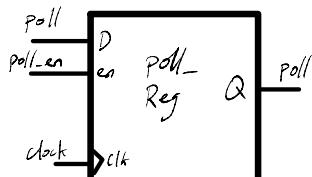
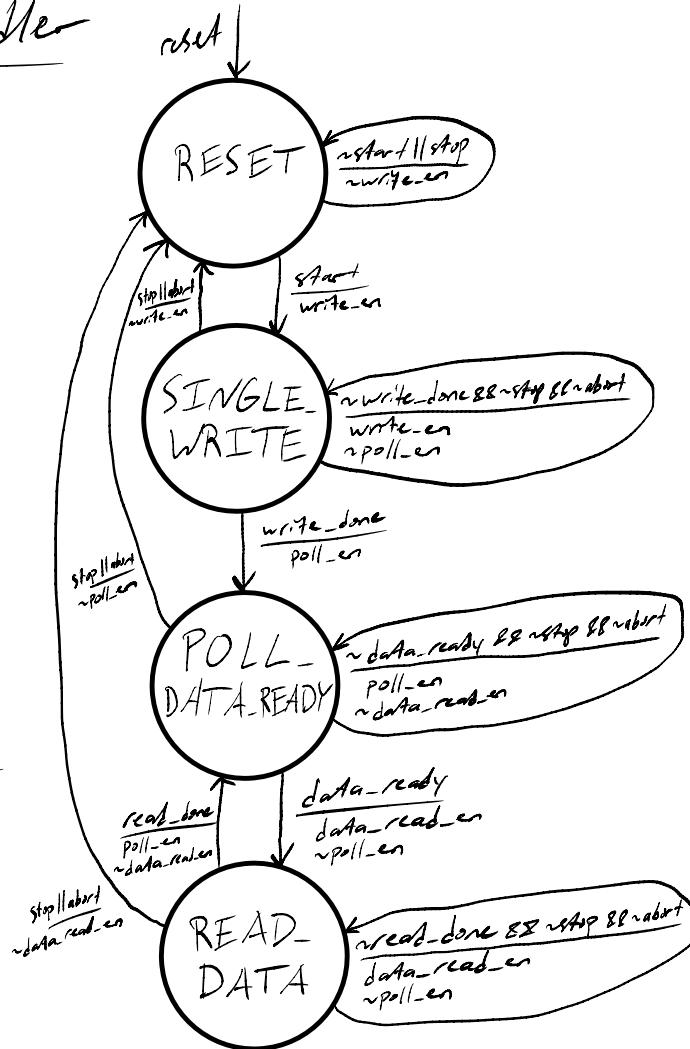
clock
reset
start
stop
abort
write-done
data-ready
read-done

Outputs

write
poll
data-read

Control Signals

write-en
poll-en
data-ready-en



I²C Master

Inputs

reset
clock
stop
SDA
write
poll
data-ready

Outputs

SCL

wrMe-done
data-ready
read-done
abort
data-avail

$$\begin{aligned} [15:0] X_DATA &= \{X1_DATA, X0_DATA\} \\ [15:0] Y_DATA &= \{Y1_DATA, Y0_DATA\} \\ [15:0] Z_DATA &= \{Z1_DATA, Z0_DATA\} \end{aligned}$$

Status Signals

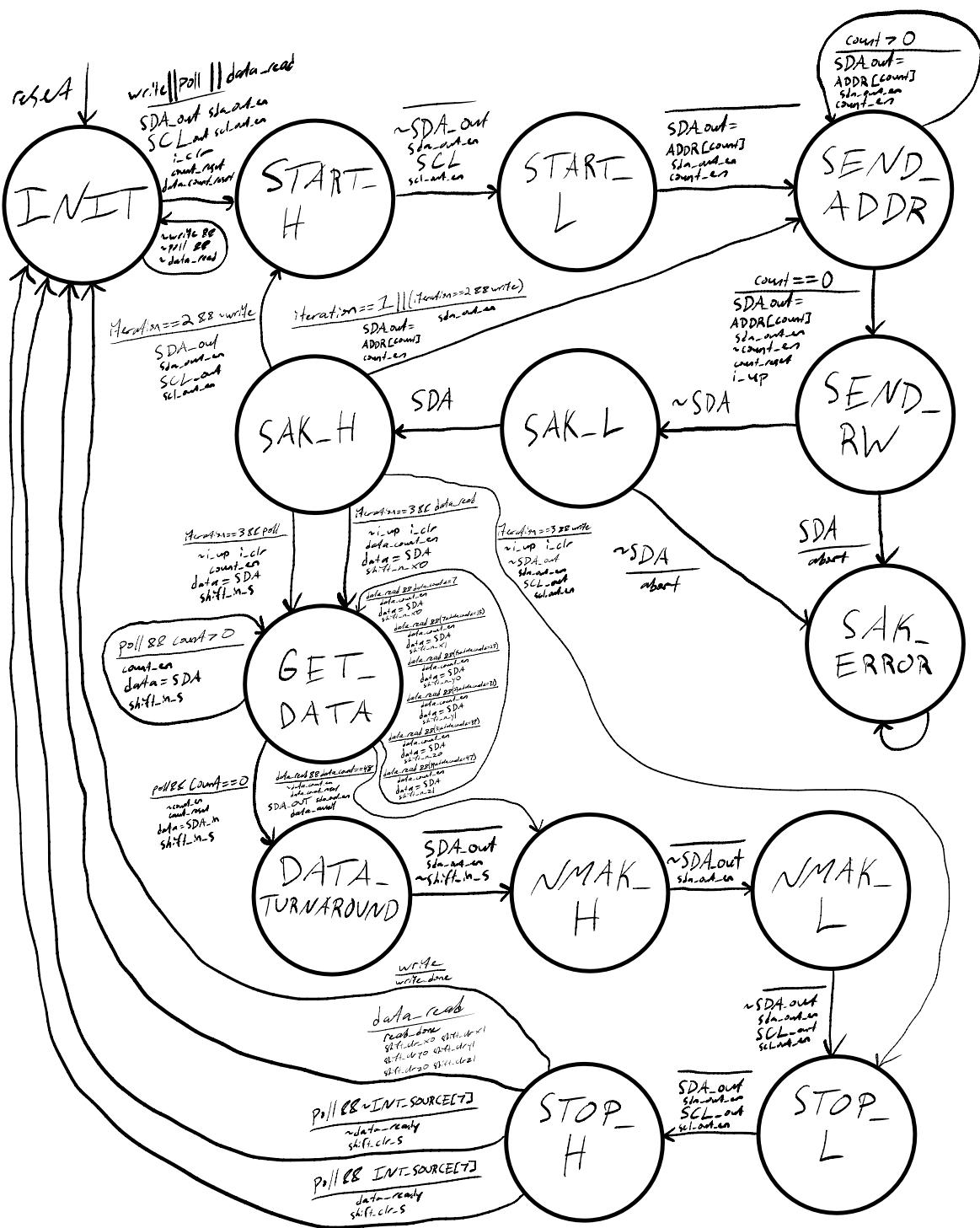
[1:0] If_errat⁹
[3:0] count
[5:0] data-count

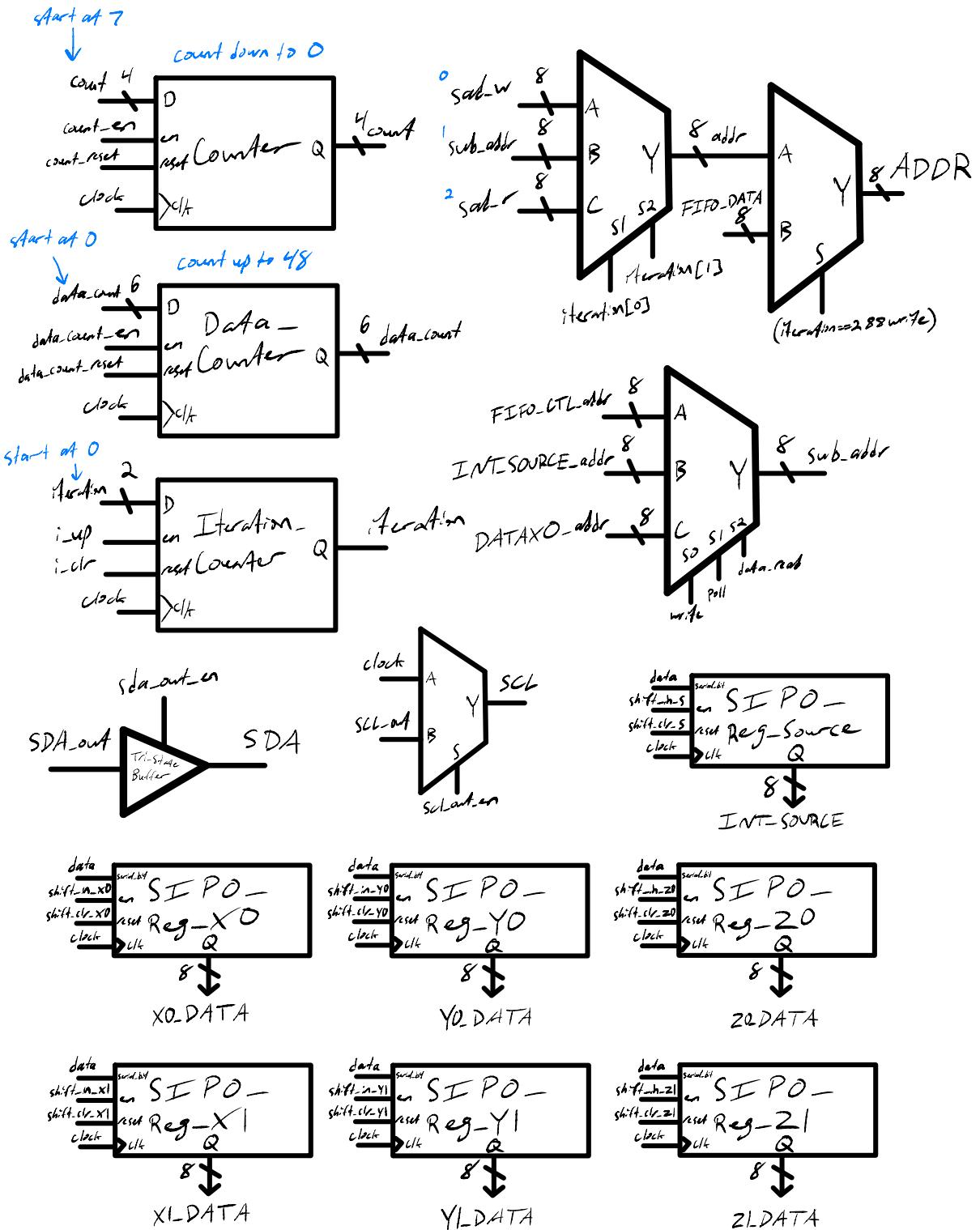
Local

SDA-out
SDA-in
[7:0] ADDR
[7:0] abbr
[7:0] sub-addr
[7:0] Sd1-w = 0x3A
[7:0] Sd1-r = 0x3B
[7:0] INT_SOURCE-addr = 0x80
[7:0] DATA_X0-addr = 0x32
[7:0] FIFO-CTL-addr = 0x38
[7:0] X0-DATA
[7:0] X1-DATA
[7:0] Y0-DATA
[7:0] Y1-DATA
[7:0] Z0-DATA
[7:0] Z1-DATA
[7:0] FIFO-DATA = 01100000
[7:0] INT-SOURCE
[3:0] count
[5:0] data-count
data

Control Signals

i-up
i-clr
count-en
count-reset
data-count-en
data-count-reset
shift-h-x0 shift-h-x1
shift-clr-x0 shift-clr-x1
shift-h-y0 shift-h-y1
shift-clr-y0 shift-clr-y1
shift-h-z0 shift-h-z1
shift-clr-z0 shift-clr-z1
shift-h-s shift-clr-s





Ax3 Nuron

Inputs

reset
clock
stop
abort
[15:0] data
data_avail

Outputs

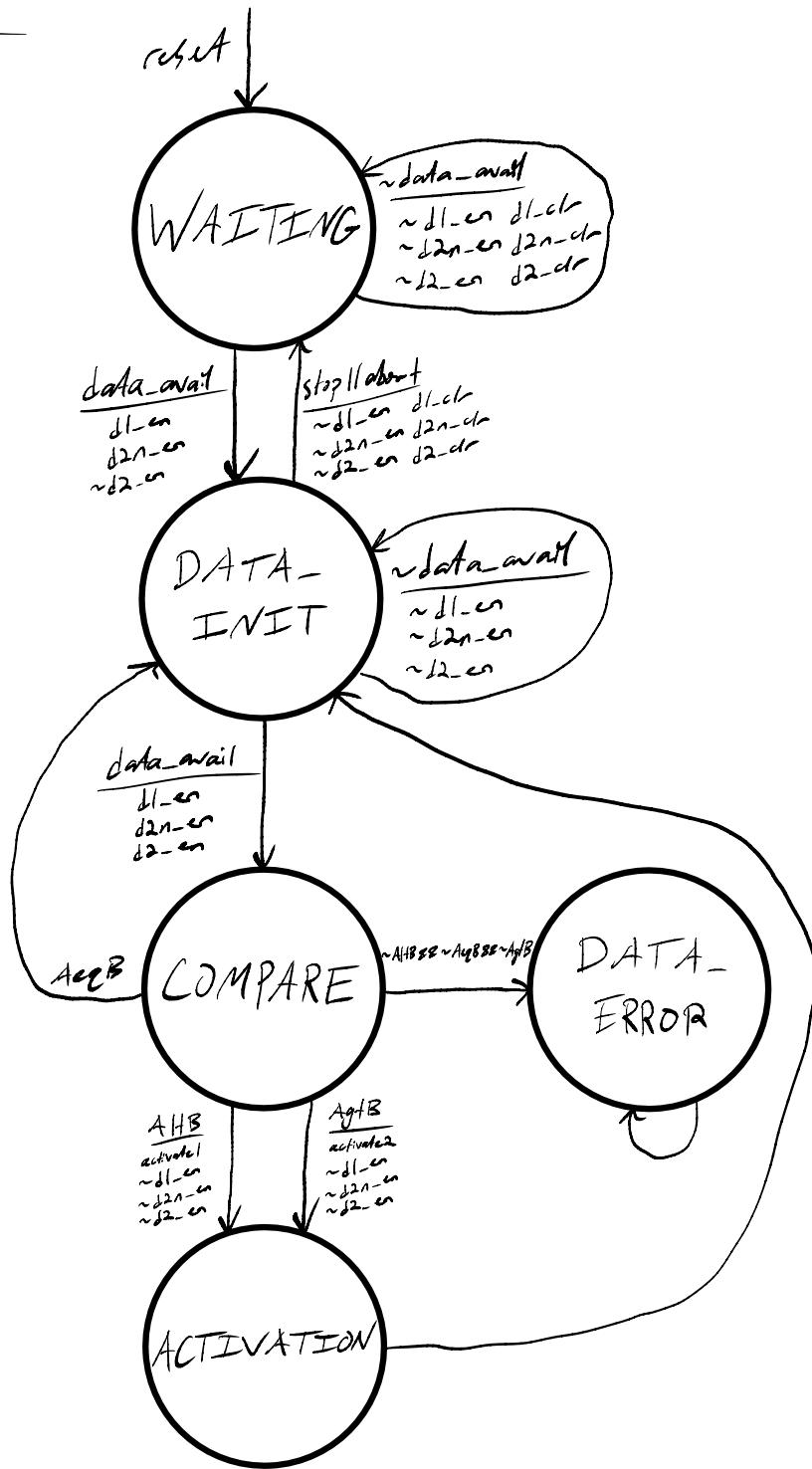
activated
activated2

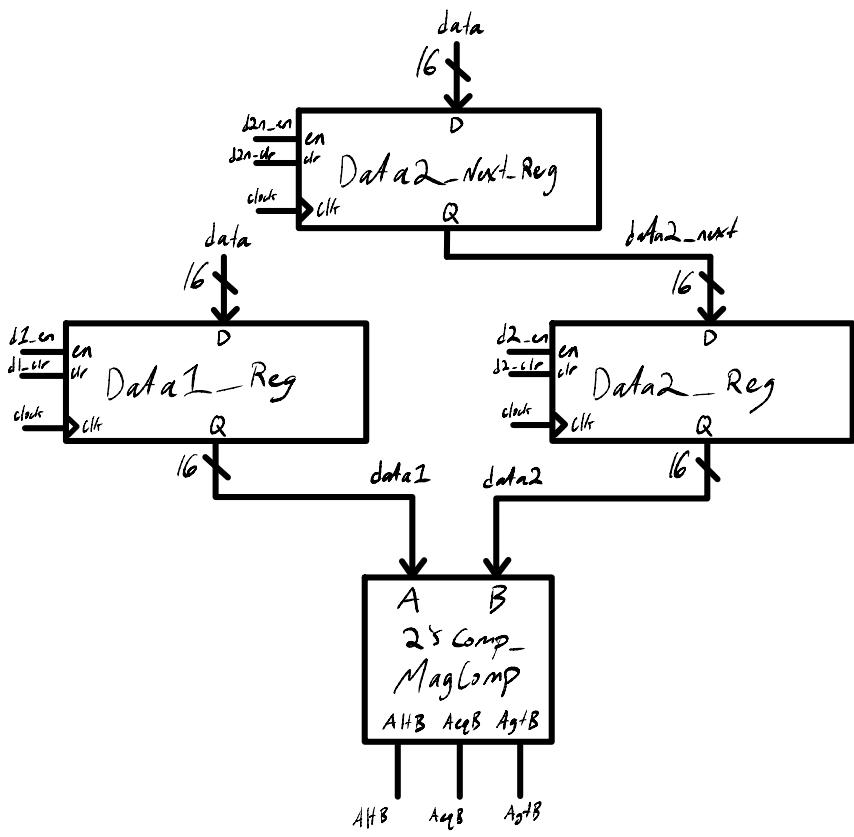
Status Signals

A1tB
Aq1B
Aq2B

Control Signals

d1-en
d2-en
d2n-en
d1-clr
d2n-clr
d2-clr





Motion Neuron

Inputs

clock
reset
activated

Outputs

fire

Local Signals

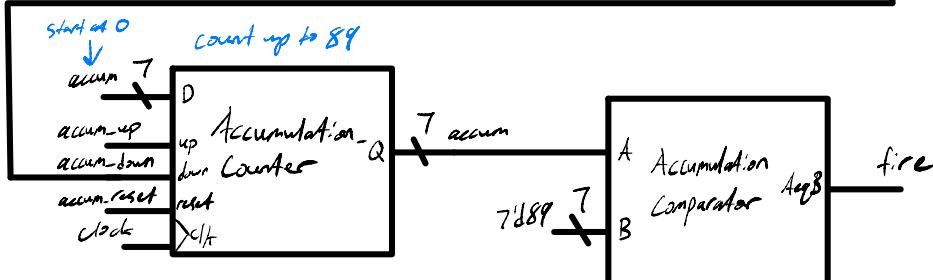
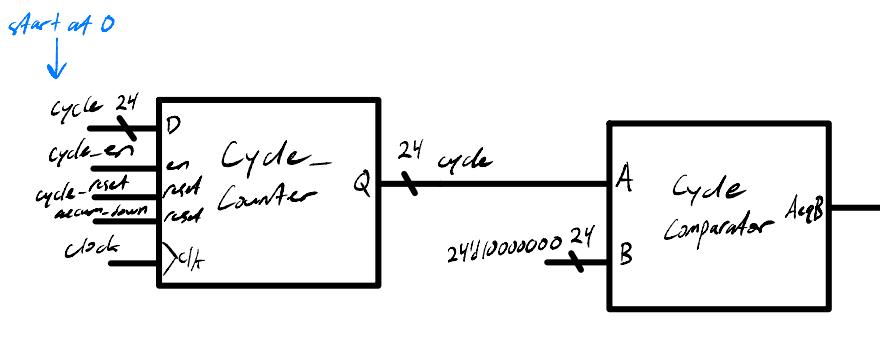
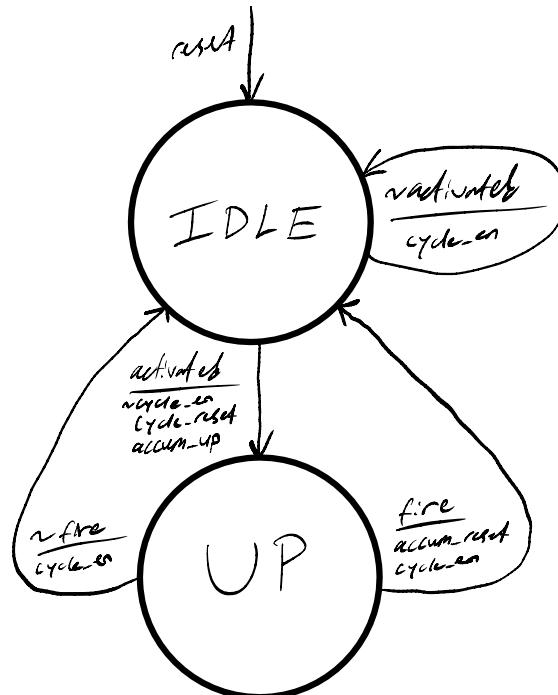
[23:0] cycle
[6:0] accum
accum-down

Control Signals

cycle-en
cycle-reset
accum-up
accum-reset

Status Signals

fire



LED-Controller

Inputs

clock
reset

[7:0] fire-array

Outputs

[7:0] LEDs

Status Signals

count-done

Control Signals

count-down

count-reset

led-en

led-reset

