

Last & fanciest application of micro-controller is
to implement a multi-channel analyzer (MCA)

Explain a bit:

MCA's typically used in nuclear/particle physics

Particle hits detector, emits flash of light/electric current

Amplitude of flash \sim energy of particle



Lots of particles \Rightarrow lots of flashes

Want to know distribution of particle energies

\Rightarrow distribution of flash amplitudes

MCA handles this:

ADC converts flash to digital level

sort into bins: say "1" = minimum level

"100" = max level

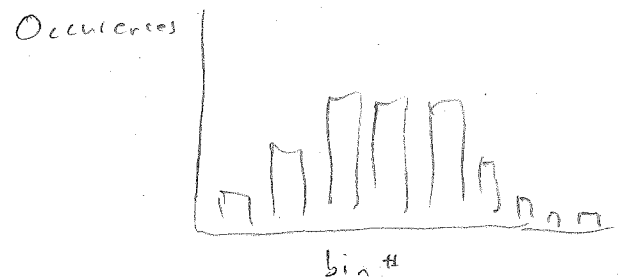
So median intensity flash goes into bin 50

As flashes accumulate, keep track of # of times

each bin occurs

At end, output histogram

Describes energy distribution
of particles



We will implement with microcontroller

One cheat: true MCA detects & counts pulses

we don't have an easy way to generate random pulses

Instead use clocked system:

Have continuous voltage $V(t)$ (from fgen)

Sample at time steps T

Otherwise follow MCA idea: bin values, generate histogram

Tells you about distribution of $V(t)$

Useful for any nonperiodic signal: oscilloscope just shows noise

Microcontroller makes job pretty easy

Discrete circuit design would be much harder

Two more notes about end-of-course:

[Next week, hold office hours on Thursday 3-5 pm
not Tuesday.

[Also available for drop-in & appointment.

[For final, bring calculator & scratch paper