Aurora - The Engineer's Perspective

- a bit about me
- how I got involved
- advantages/disadvantages of inter-disciplinary collaboration
- technical details

About Ed

- Assistant Professor in Electrical and Computer Engineering
- my research area is wireless communications (e.g. design of cellular telephone systems)
- teach digital logic and microcomputer system design
- my involvement in the visual arts is limited to choosing between Helvetica and Times-Roman fonts

How Did I Get Involved?

- Richard called me early in June and hinted that I was the best-qualified person (in the world!) to answer some question about an op-amp
- (flattered) I went to his studio and helped David troubleshoot one of the prototype circuits
- in return Richard offered to make me a collaborator on the work, thus (very cleverly!) making me part of "the team"
- two weeks later (mid-June) five of us met in a lab in the Music department to listen to various "aurora-like" sounds

How Did I Get Involved (ctd)?

- I was then asked to suggest how to implement a circuit to generate that sound
- since the best solution (a digital sound generator) was beyond Richard or David's current abilities, I volunteered to do it
- after spending several weeks over the summer designing, building and testing the (relatively) simple circuit, I handed it over at the end of September

Advantages of Inter-Disciplinary Collaboration

- you can do much more ambitious projects
- a chance to practice your craft rather than just teach it
- it gives you a different perspective on this ”academic” thing
- a university is a fantastic source of expertise in many disciplines, why not make use of it?

Possible Pitfalls with Inter-Disciplinary Collaboration

- (a guess) few interdisciplinary projects involve equally leading-edge research in all the disciplines involved
- may not generate many "brownie points" for some
- GSCs (Grant Selection Committees) and ARPT (Appointment, Review, Promotion and Tenure) committees are not set up to judge inter-disciplinary work

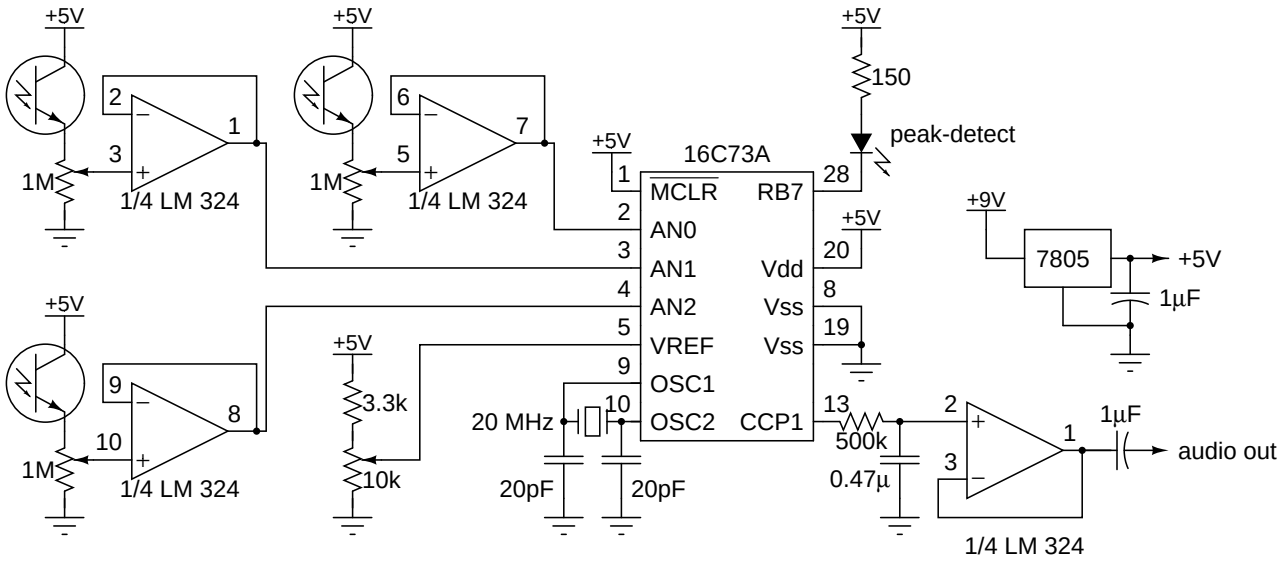
Digital Audio

- we can generate sounds by computing the level of a waveform many (8000) times per second and converting these values to a voltage that drives a speaker (just like a CD player)
- in our case these samples are ”synthesized” from equations describing the sounds rather than read from a CD
- the synthesis involves computing the values of sine waves and pseudo-random numbers (for noise-like effects)
- these computations need to be done very quickly (a new sample every 125 microseconds)

Microcontrollers

- to keep costs low, we use a microcontroller: a single-chip that includes a microprocessor, memory (RAM and ROM), and analog inputs and outputs
- this type of chips is commonly used to control household appliances
- with some clever programming, it can also be used for simple digital signal processing (DSP) applications

The Circuit


+5V
2
1
3
1M
1/4 LM 324
6
7
5
16C73A
MCLR
RB7
AN0
AN1
Vdd
AN2
Vss
VREF
Vss
OSC1
OSC2
CCP1
150
peak-detect
28
20
8
19
+9V
7805
1µF
9
10
3.3k
10k
20 MHz
20pF
13
500k
0.47µ
audio out
4
5
9