

Richardson's Senior Project Ideas Spring 2019

Analog Projects

- 1) Acoustic receive array - Construct an acoustic receive array from four or five microphones. Adjustable delays will allow the array to be focused along a desired bearing.
- 2) Analog Communications Board – AM/FM mod and demod.
- 3) Radio Transmitter – AM Stereo

Software Projects

- 4) Image Processing Toolbox - Develop an image processing toolbox for Scilab/Octave. (Windows/Linux)
- 5) Communication Simulation - Develop Octave routines to simulate analog (AM/FM/TV) transmission and reception systems. Individual routines should correspond to major component subsystems of actual communication systems. The user should be able to view either the waveform or spectrum of the signal at any point in the system. The AM and FM systems should transmit and receive a real (digitized) audio signal while the TV system should transmit and receive at least a black-and-white image. (Windows/Linux)
- 6) Analog Filter Design Package - Write a program for use in analog filter design. Must have a graphical user interface. The focus should be on analog filter design instruction. Must be cross-platform. (EE410 prereq)
- 7) Real-Time Operating Systems - Several possible topics: (1) Port of RTEMS to ARM/Coldfire, (2) RTOS for mbed. (3) RTOS for Arduino. (4) RTOS for Raspberry Pi (EE458 prereq)
- 8) Speech Processing – Implement Vocoder
- 9) Image Processing – Implement MPEG-4
- 10) Circuit Simulation - Development of free EDA (Electronic Design Automation) tool suite.
- 11) LTSpice Library – Develop analog and digital library of components for LTSpice.

Digital/Microcontroller Projects

- 12) DSP Based Guitar Tuner - Guitar tuner that uses DSP to detect the fundamental frequency. Could also tune guitar for robot guitar (<http://www.gibson.com/robotguitar/>)
- 13) Ping pong ball printer – Use microcontroller to control ink jet printer head to print text/graphics on a ping pong ball.
- 14) Electronic Mirror (webcam/dig cam to LED/wood block array)
- 15) Robotic Musical Instruments
- 16) Music Synthesis
- 17) Combination Lock Opener
- 18) Digital Communication Boards: Adaptive PCM, PAM/PWM/PPM