This document was submitted to the MIT Media Lab as part of David's 2013 application. It provides **a high level overview of his work prior to MIT**.

For his latest projects and work, please visit his website, **http://www.davidbramsay.com**

Music & Engineering Portfolio

David Ramsay

MIT Application, 2013

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High School Years (pre 2005)

Undergraduate Years (2005-2010)

Fulbright Year (2010-2011)

Bose Years (2011-2013)

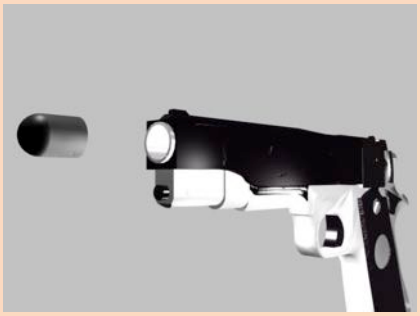
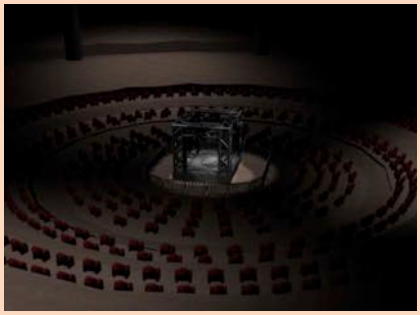
2001-2005, TJHSST

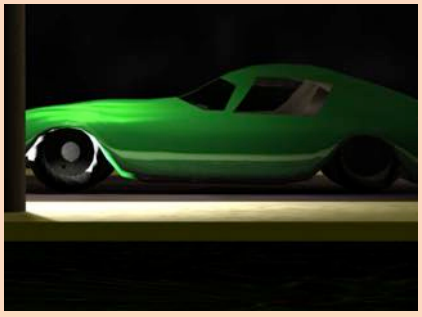
David attended Thomas Jefferson High School for Science & Technology (TJHSST), consistently ranked in the top 4 high schools in the country. Alongside a standard high school curriculum, he earned 23 college credits from classes like:

Electronics (microcontroller and audio)
Architectural Drawing/CAD
LISP/C++ Programming
Robotics
Calculus I

Final Project: Integrating 3D Models with Real-Time Video

David worked in the school's CAD lab for a semester to create and integrate several models for a 3D music video for his high school rock band.








2001-2005, TJHSST

HIGH SCHOOL ACTIVITIES:

TJHSST Future Business Leaders of America
Catholic Life Community- President, Vice President, and Board Member (4 years)
TJHSST Football Team
TJHSST Varsity Golf Team
Boy Scouts of America
Guitarist in alternative rock band
Presidential Classroom National Security Seminar (Georgetown University)

HIGH SCHOOL AWARDS:

YOUTH BRONZE CONGRESSIONAL MEDAL

AP SCHOLARS AWARD

NATIONAL MERIT FINALIST SCHOLARSHIP

2 ACTIVITY LETTERS, FBLA and GOLF

2 ACADEMIC LETTERS

OUTSTANDING RESEARCH AWARD, NRL

RESEARCH PRESENTATION AWARD, NRL

HIGH SCHOOL WORK:

American Technology Services
Debugging code, web development, internal application writing.

Naval Research Laboratory (NRL)
Analysis of spider silk; building test equipment, writing controller software in Labview.

David entered Case Western Reserve University in 2005 after graduating from TJHSST with a perfect Math SAT score and a 3.89 GPA. Since then, he has been working to perfect a range of skills as a musician and electrical engineer, frequently with an eye towards biomedical applications.

2005-2010, Case Western

Sr. Project 1: Robotic Positioning System for Breast Radiation Treatment

David led a team of four engineers to develop a new robotic bench for breast radiation treatments. The previous standard of care in the Case Medical School was to manually position patients using a bench with crude (5 degree increment) adjustable pitch. The alignment of the patient in the radiation room is critical to the treatment, and additional degrees of rotational freedom or better resolution can enhance the accuracy of the radiation beam and minimize unnecessary patient exposure.

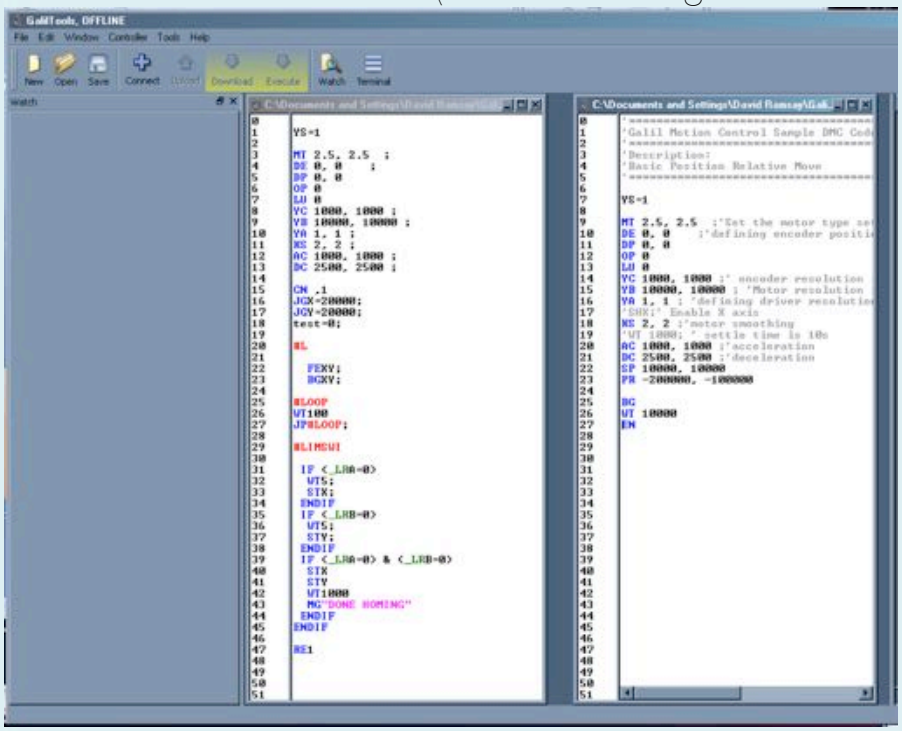
David's team developed a prototype bench, which offered continuous control over pitch and roll with two linear actuators. It was designed using high precision motor controllers, eddy current sensors, and radiation-grade electronics. In addition to enhanced control, the team developed a GUI and backend database to keep track of patient visits and seat angle presets.

David was the electrical lead and driving force of the group, organizing the team and holding everyone accountable. He was solely responsible for the motor controller code, the math (to transpose their linear motion into usable pitch and roll), and the GUI/database design and code, as well as the electronics parts selection, wiring, and system work. David used Visual C++ and stock motor controller DLLs to create the software.

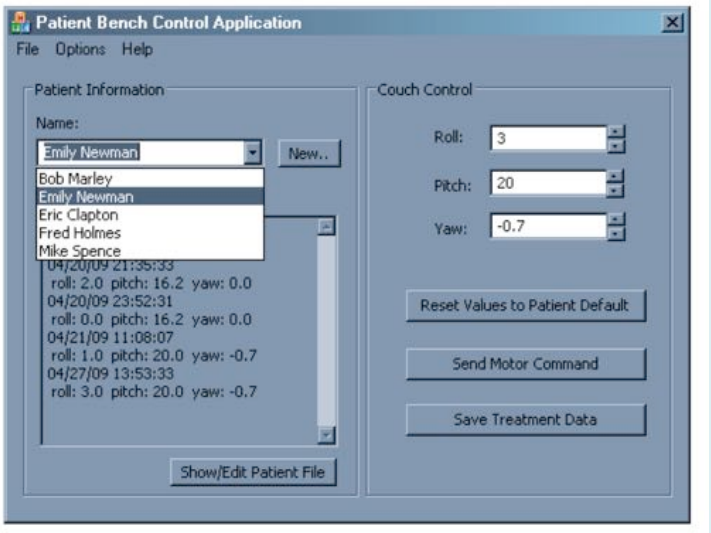
2005-2010, Case Western

Sr. Project 1: (Continued from previous)

Motor controller software (used for testing and motor commands)

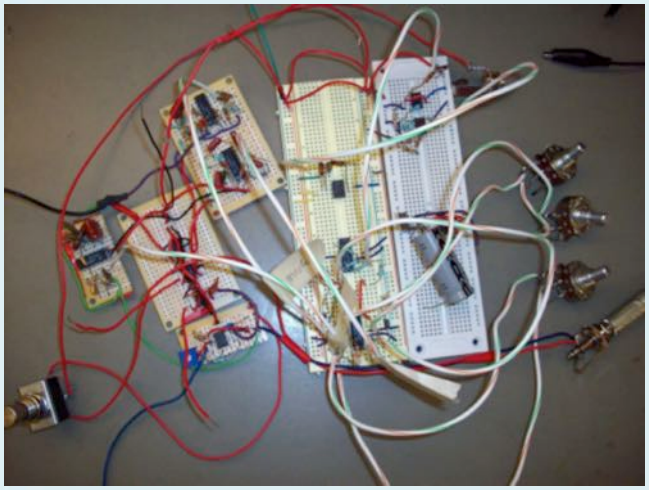


Samples of the GUI /database David designed (1/6 screens included in the application):



2005-2010, Case Western

Sr. Project 2: Analog 'Distortion Pedal' Design



David led a team of three engineers to develop a novel analog effect he had conceptualized. He was solely responsible for the circuit design, part selection, and execution of the project.

The concept behind the project was to drive a power tube into more or less distortion based on the fundamental of the note played. For example, a low note on the guitar (lowest two strings) could cause more distortion than a higher note (upper two strings), or vice versa.

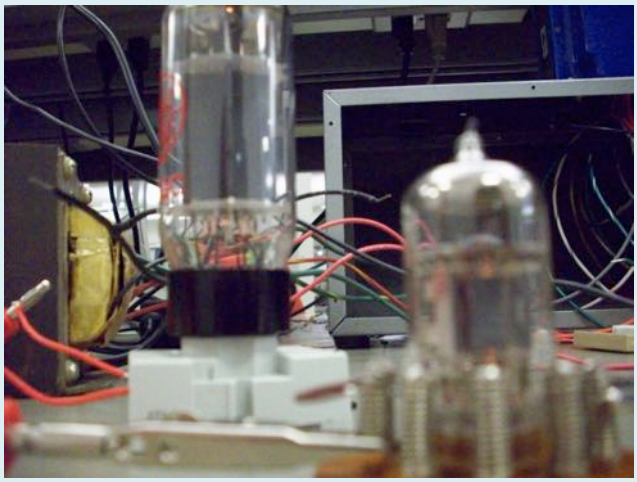
This is a complicated effect to create. The core of the design is a full Class A tube amplifier circuit that David designed using a 12AX7 preamp and a 6L6-GC Pentode power stage (driven at 350V). Creating more or less distortion through the power tube requires altering the gain of the guitar signal into the power stage.

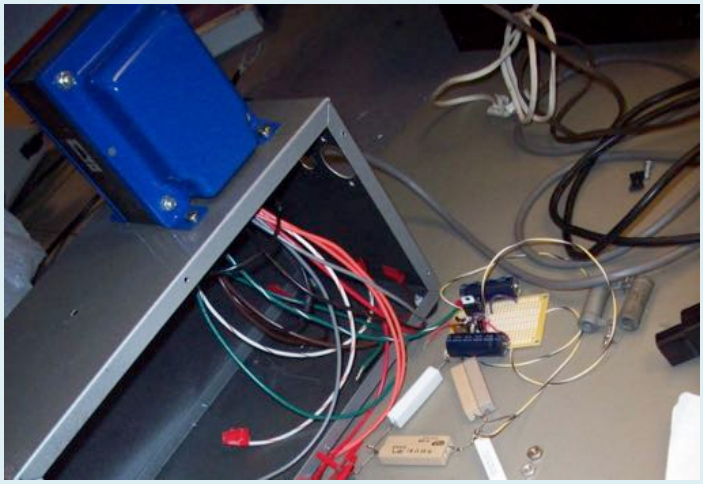
In order to accomplish this, David designed three 8th order analog filters, to divide the input into 80-180,180-400, and 400-1200 Hz ranges. The three filtered signals were then rectified, sent through a user-controlled gain element, and summed to create a control voltage. This control signal corresponds to the desired gain through the tube. David designed a FET based Voltage Controlled Gain circuit to automatically modulate the gain.

Once the signal was sent through the power tube with varied gain, it must be scaled back by a complementary gain on the output (so that the guitar signal isn't rapidly changing volume when you simply want it to distort more). David designed and created a feedback loop on the output, to adjust its envelope to match the envelope of the bypassed input signal. Of course, to do this properly, the power stage output had to be dropped back to a line level signal through a hefty bridged-T attenuation stage.

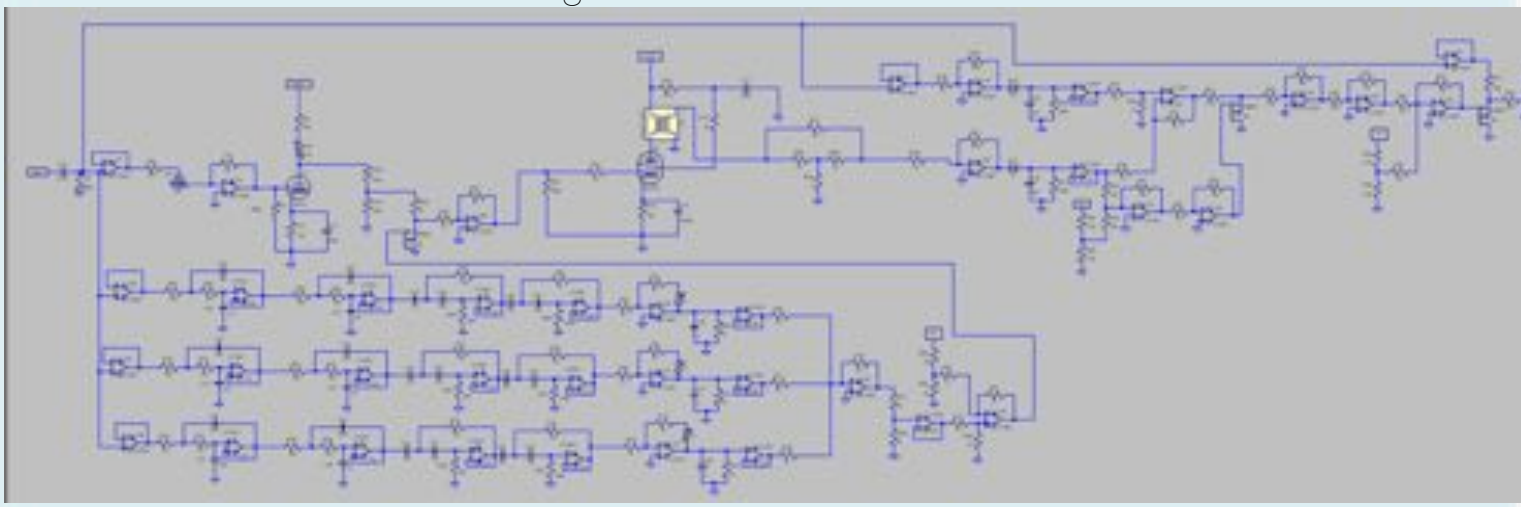
2005-2010, Case Western

Sr. Project 2: (Continued from previous)

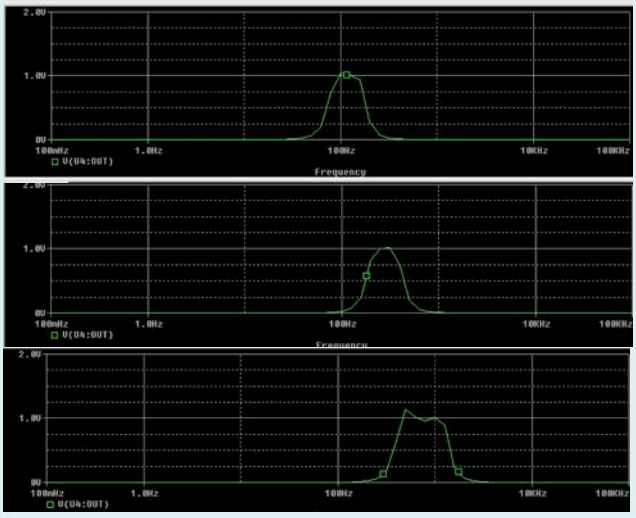


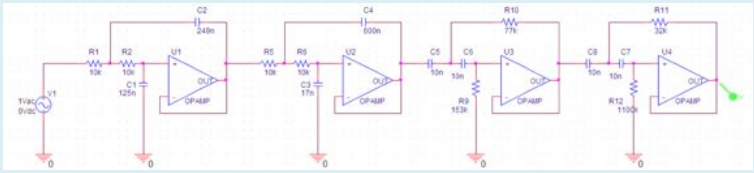


Final Schematic of the entire design



Spice Filter Simulations

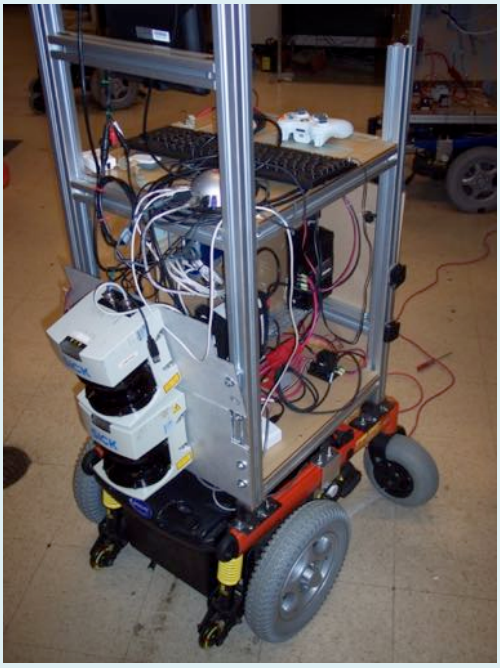




2005-2010, Case Western

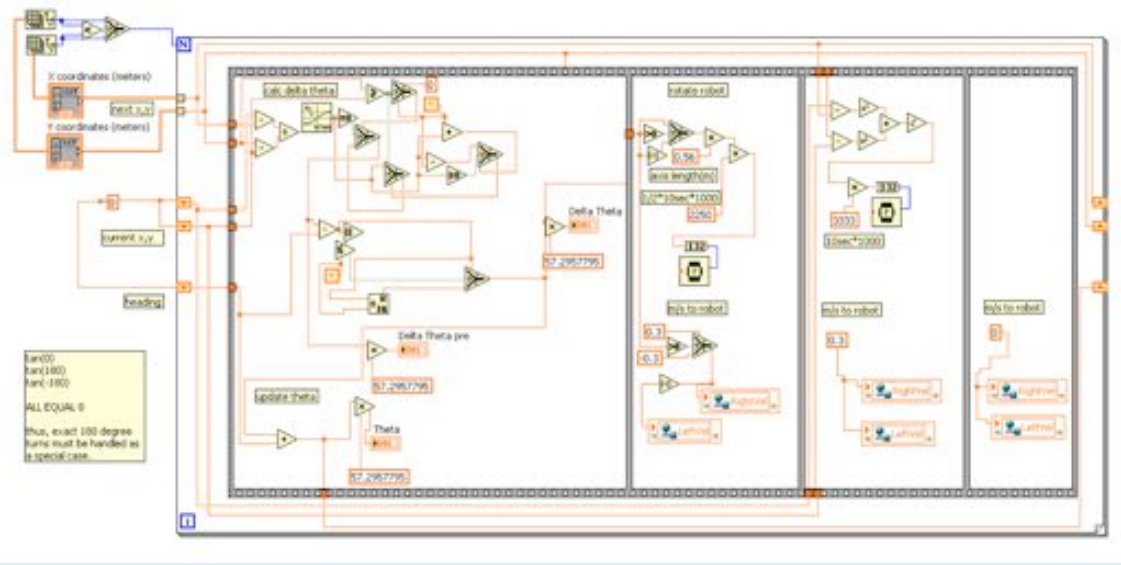
Robotics Project

David spent a semester working as part of the Robotics Team at CWRU, writing software for 'Harlie.' The Harlie robot is equipped with GPS, LIDAR, cameras, and wheel encoders. It runs NI hardware, thus the main development platform for the robot is Labview. Harlie was entered in an intelligent ground vehicle competition the following summer.



```
stepsize = 0.01;

cx = 0.0;
cy = 0.0;
cdis = 99999.0;
caway=0.0;

len=length(Xarray);

if (len>size(Yarray))
  len=length(Yarray)
end;

for ni = 1:len-1

  xa = Xarray(n);
  ya = Yarray(n);
  xb = Xarray(n+1);
  yb = Yarray(n+1);

  xdelta = xa-xb;
  ydelta = ya-yb;

  h=sqrt( (xb-xa)^2 + (yb-ya)^2 );

  while ( [[xdelta>=0]&&(xa>=xb)  ][(xdelta<0)&&(xa<xb)]] && [[yd

    if (sqrt( (xa-xcur)^2 + (ya-ycur)^2 ) < cdis )

      cdis= sqrt( (xa-xcur)^2 + (ya-ycur)^2 ) ;
      cx=xa;
      cy=ya;
      caway=cdis;

    else

      if (sqrt( (xa-xcur)^2 + (ya-ycur)^2 ) < handlelength)
        cx=xa;
        cy=ya;
        caway=sqrt( (xa-xcur)^2 + (ya-ycur)^2 );

      end

    end

    xa=xa-(stepsize/h)*xdelta;
    ya=ya-(stepsize/h)*ydelta;

  end
end
```

David worked primarily on Harlie's steering algorithms. His code would process an array of x/y coordinates and translate those to discrete wheel velocities, which would feed a PID control algorithm. He started with a simple design that would steer the robot along straight-line segments. He moved on to advanced planning algorithms as the semester progressed, such as 'wagon handle' steering. David incorporated extra logic for handling paths that loop back, are poorly defined, or otherwise fail to meet standard specifications, so that Harlie could make optimal, real-time steering decisions.

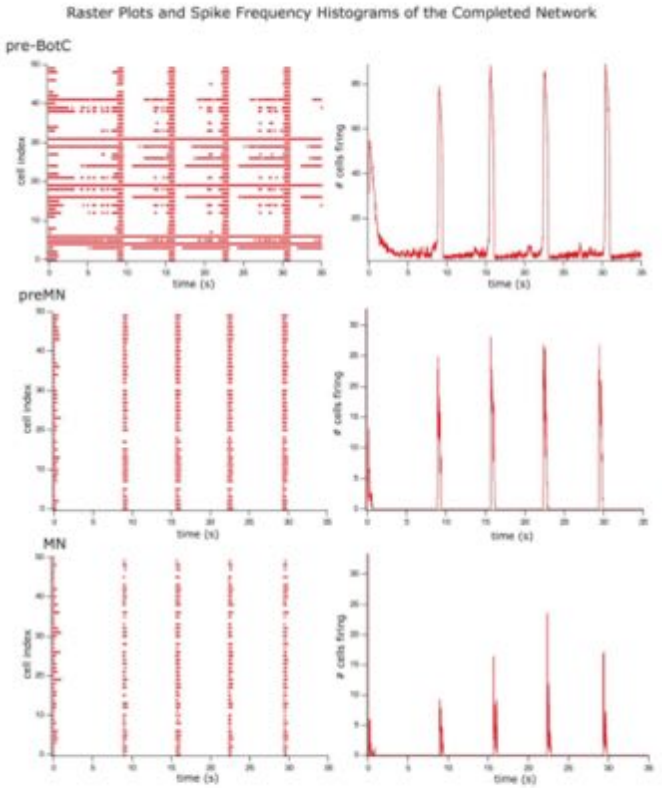


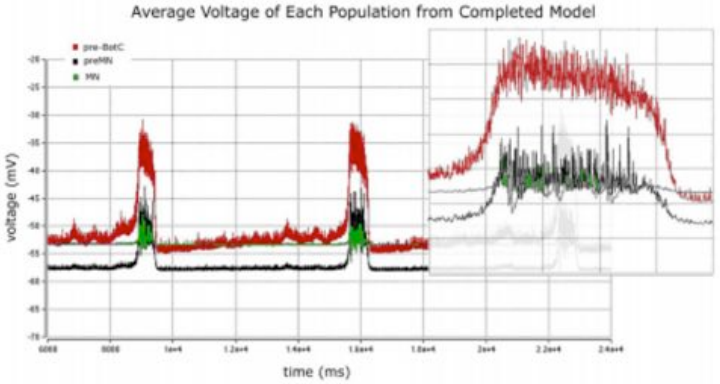
2005-2010, Case Western

NIH Brainstem Modeling Project

David spent the summer of his junior year working in the National Institute for Neurological Disorders and Stroke at the National Institutes of Health, as one of sixteen students chosen nationally for the Biomedical Engineering Summer Internship Program.

David developed a computational model of neuronal networks in the mammalian brainstem. Previous work had characterized the three main types of neurons that make up the sub-populations responsible for respiratory pattern generation. No model, however, had been created to simulate more than individual neuron behavior. The non- linear model David designed included three distinct neuronal populations, and incorporated all relevant empirical data. The resulting simulations were compared to observed network phenomena to provide insight into network feedback, interconnection, and resilience.





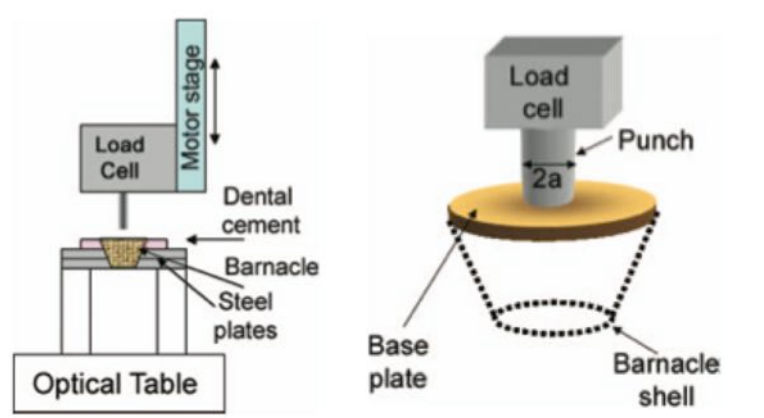
2005-2010, Case Western

NRL Barnacle Research Project

David worked at the Naval Research Laboratory on several projects- most notably, he designed an experiment to measure the rigidity of barnacle baseplates.

Barnacles are marine organisms that attach themselves to ship hulls, and cost the Navy millions of dollars every year in fuel consumption. Previous techniques to mitigate barnacle attachment are now illegal (toxic paint) or relatively ineffective. As a result, there has been a focused effort to model/understand barnacle release mechanics, using a rigid approximation for the barnacle.

David's work showed that a rigid approximation was incorrect, and provided the data necessary to improve the model.



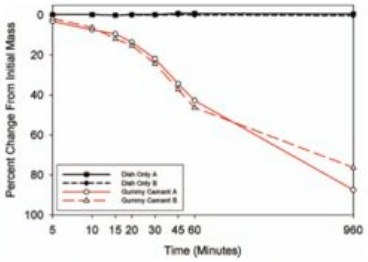
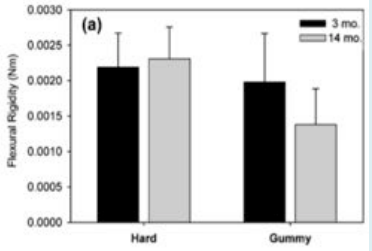


Figure 5. Gummy barnacle cement mass change over time, in air at room temperature and humidity. The cement layer was removed with a scalpel and placed in clean, 1 cm^2 aluminium dishes. Empty dishes were weighed as control.



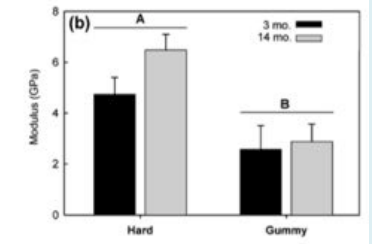


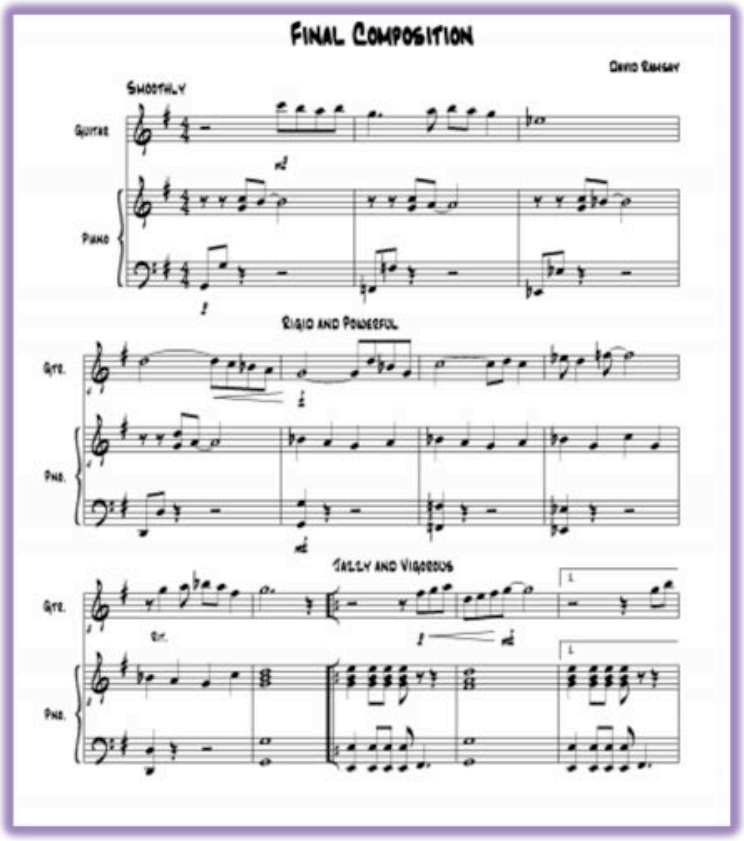
Table 2. Two-way ANOVA for flexural rigidity.

Source of variation	df	SS	MS	*F*	*p*
Age	1	5.50 E^{-7}	5.50 E^{-7}	0.195	0.661
Cement	1	3.16 E^{-6}	3.16 E^{-6}	1.122	0.296
Age × cement	1	1.25 E^{-6}	1.25 E^{-6}	0.444	0.500
Residual	39	2.82 E^{-6}	2.82 E^{-6}		
Total	42	2.76 E^{-6}	2.76 E^{-6}		

David designed and built an apparatus to test barnacle base-plates using precision motor controllers and force sensors, as well as the software to capture and process sensor data. He tested his fixture rigorously to ensure it was rigid enough to provide reliable measurements, and modeled its compliance in his calculations. He also tested for rate-dependence in barnacle fracture behavior.

Once he obtained the required data, David performed statistical analysis- separating out barnacle populations by age and adhesion type. He was able to calculate overall rigidity of the baseplates using measurements of barnacle size and basic approximations for the barnacle baseplate and punch geometry. His work is published in the peer-reviewed journal *Biofouling*, and has been cited extensively in the biofouling community.

2005-2010, Case Western



Collegiate Music

David earned a B.A. in Music from Case Western. He studied Jazz and classical guitar under Don Better at the Cleveland Institute of Music (CIM). He played in the jazz and classical guitar ensembles, and performed regularly. He also arranged a jazz chart for the Case Big Band in his final semester.

Outside of CIM and Case, David was writing and recording music in his free time. He audited an audio recording class, and worked as an audio engineer for live bands on WRUW's 'Live from Cleveland' radio show. In addition to the Live from Cleveland show, David co-hosted a country-roots station on the WRUW channel as 'the Durango kid'.

CLEVELAND INSTITUTE OF MUSIC

FM 91.1 WRUW CLEVELAND, OHIO

2005-2010, Case Western

COLLEGE PUBLICATIONS:

Ramsay, et al. Base plate mechanics of the barnacle *Balanus amphitrite*(=*Amphibalanus amphitrite*). *Biofouling. 2008; 24(2):109-18.*

COLLEGE ACTIVITIES:

IEEE
Beta Theta Pi Fraternity
Jazz & Classical Guitar Ensembles
WRUW DJ and Audio Engineer
Eta Kappa Nu and Golden Key Honor Societies
Berklee Summer Guitar Workshop

COLLEGE AWARDS:

TRUSTEE SCHOLARSHIP (HIGHEST MERIT)

CASE ALUMNI ASS'N SCHOLARSHIP

WHO'S WHO AT AMERICAN UNIVERSITIES

GOLDEN KEY NAT'L HONOR SOCIETY

ETA KAPPA NU HONOR SOCIETY

DEANS HONORS/HIGH HONORS ALL SEMESTERS (6 HIGH HONORS)

FULBRIGHT SCHOLARSHIP

COLLEGE WORK:

Bose Corporation
Speaker array design, speech intelligibility analysis, audio measurements and real-time prototyping

GE Energy
Automation of substation schematic and wiring diagrams, misc. tasks (marketing, regulatory)

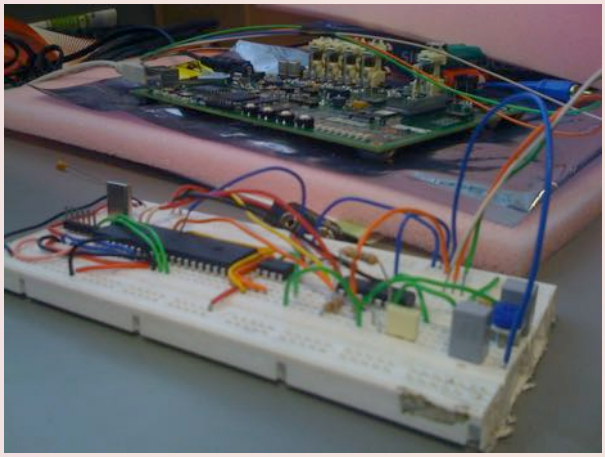
Nat'l Institutes of Health (NIH)
Computational modeling of neuronal networks in the mammalian brainstem

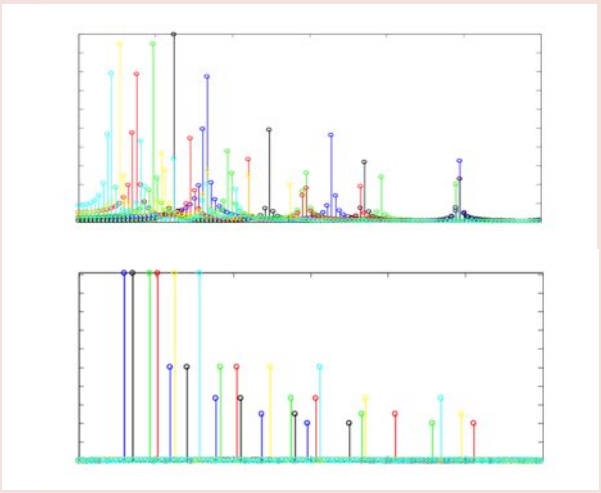
Naval Research Laboratory (NRL)
Advanced imaging work, material property analysis, design and execution of mechanical experiments

David graduated cum laude with a 3.79 GPA, earning a B.A. in Music and a B.S. in Electrical Engineering with a focus on signal processing. David also authored a peer-reviewed article on biomechanics through the Naval Research Laboratory (where he was asked to return for three consecutive years) and worked for a semester at GE Energy in Chicago, all while maintaining his engineering coursework and music performance. He also spent six weeks at Berklee's summer blues guitar session in 2006.

2010-2011, Fulbright

Fulbright Project





David spent the year after graduation at the Dublin Institute of Technology sponsored by a Fulbright Scholarship. As part of the Biomedical and Audio research groups, he worked to make the guitar easier to play for people with disabilities using DSP techniques.

The concept for David's work was inspired by a literature review of musical expression. The device should (1) follow principles of universal design, and (2) give the opportunity to have an embodied musical experience. Much of the current technology targeted for disabled populations fail to meet the criteria for complete musical expression, and thus fall closer to musical toys than instruments.

The prototype David built worked with any electric guitar once it is properly retuned. The DSP did the work of the guitarist's fretting hand, keeping track of the last several notes played and, based on probability, mapping the six next most likely notes to the six open strings. The guitarist had a visual indication of which notes were mapped to each string.

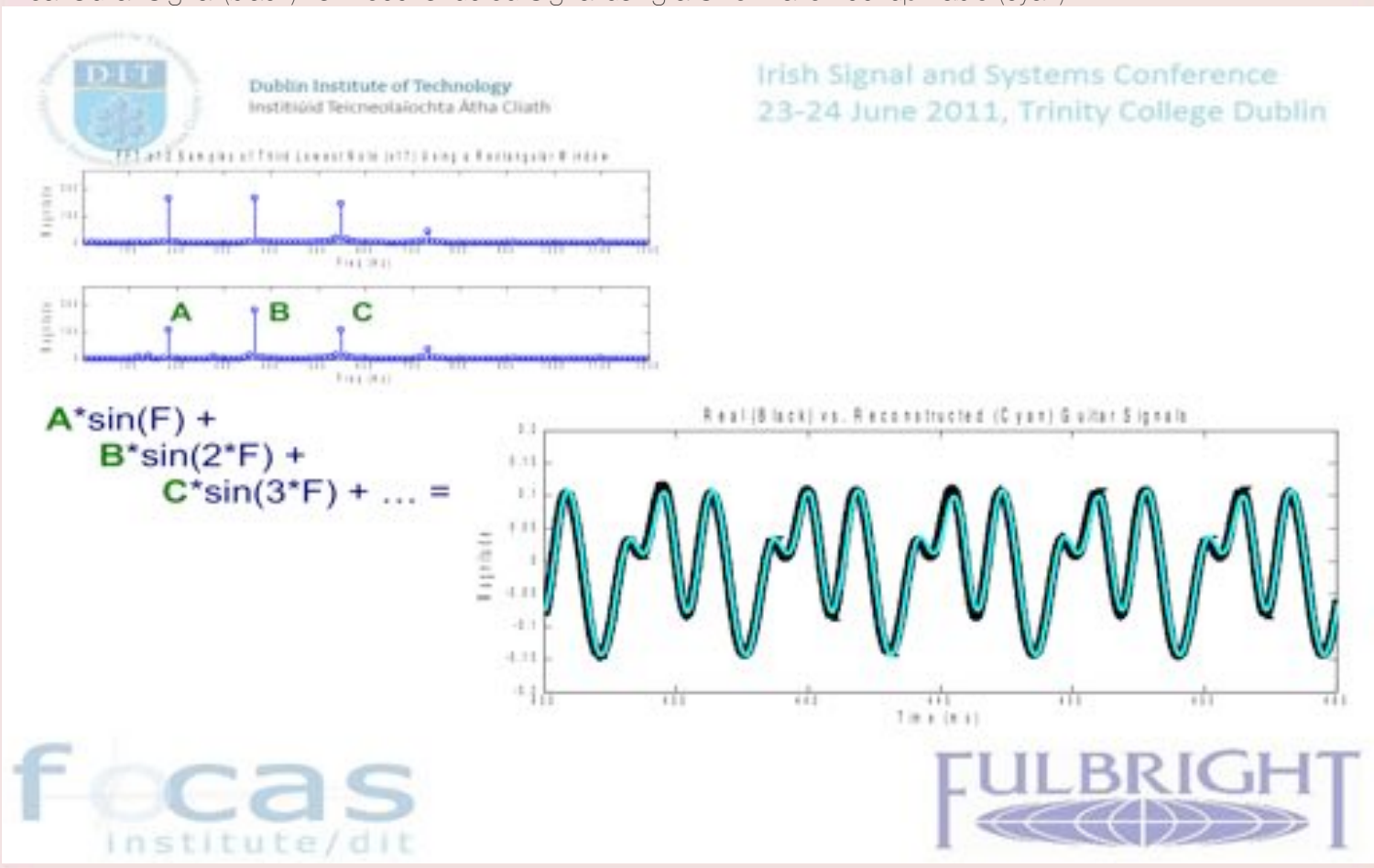
The DSP re-pitched each string in real-time. For this to work, string separation was required, so that multiple strings could be accurately recreated at new pitches concurrently. To achieve this with a standard guitar, David retuned the strings to frequencies that correspond to prime number ratio FFT bins based on a rectangular window. This allowed robust string separation and reconstruction up to the eleventh harmonic of each string. He published and presented a paper at the Irish Systems and Signals Conference on this core idea. A sample of the windowing effects and harmonic overlap of the six open strings before and after retuning this way can be seen above.

Fulbright Project (continued)

The core idea of separating and re-pitching strings this way was only a small part of the larger project, however. David used a hash lookup strategy for melodic prediction, which was seeded by a library of plaintext music notation. The DSP also robustly detected each note attack, correctly identified the string that was played during that attack (even if another string was already sounding and louder), re-pitched it to its new pitch, and predicted the next several most likely notes, all in real-time.

David created all of this as a working prototype in Matlab, and examined several strategies for attack detection, string detection, pitch-shifting, and melodic prediction. He then spent several months porting his work and optimizing C code to run on an Analog Devices EZ-kit with a hand-built front end. He concluded his Fulbright experience with a running and useable real-time implementation with his guitar.

Real Guitar Signal (black) vs. Reconstructed Signal using a Sine Wave Lookup Table (cyan)



2010-2011, Fulbright

FULBRIGHT PUBLICATIONS:

Ramsay, et al. A Novel Fourier Approach to Guitar String Separation. *Proceedings of Irish Signals and Systems Conference. Jun 2011.*

IN THE NEWS:


news center

Engineering and Music Major Named Fulbright Scholar

Case Western Reserve University est. 1826

David Ramsay
Photo by Susan Griffith


:: Full and bright future ahead for scholars

AT the launch of the Fulbright Awards 2011-2012 were Paul Duffy, Irish Fulbright awardee from DIT going to Purdue University in the US, Dr Gul Kremer, US Fulbright scholar based in DIT, and David Ramsey, US Fulbright student based in DIT. The awards provide recipients with the opportunity to study, lecture and research in top educational institutions around the US. Now more than ever, as Ireland works towards building a smarter economy, organisations like Fulbright that offer funding to students, scholars and professionals are a valuable resource. Visit www.fulbright.ie for further information and to apply. The final deadline for applicants is Tuesday, November 30, at midday. MAXWELL

FULBRIGHT ACTIVITIES:

DIT Guitar Society
DIT Rock Climbing Club
DIT Caving Society
DIT SCUBA Club
Performer in an acoustic duo, 'Windmill Road'

TRAVELS:

David spent 3 months after Fulbright backpacking through 17 European countries on his own. He ran with the bulls, hiked the Tour of Mt. Blanc, kayaked through Poland, and went wadlopen in the Netherlands.

David spent the year at DIT working on his project, but also managed to be very active in the community. He was a leading member of the Guitar Society, and made several caving, SCUBA, and rock climbing trips throughout the country. He took a seminar at Trinity College on Computer Music, and helped administrate DIT's senior level DSP course. He finished his experience with a conference publication and an extensive trip around Europe. He emerged with strong Matlab, DSP, and C/μC programming skills.

2011-2013, Bose Corporation

BOSE®
Better sound through research®

"You not only learned a wide range of new tools, but also developed the experience to apply them to projects that resulted in meaningful work output. This is **above and beyond** what is expected for an Engineer I during your first year in research. **Your passion for audio and self-drive is an asset** to our systems engineering team. Your level of commitment and self-motivation has **set the bar for all current and new young engineers** in our group. A job well done."

From David's 2012 Performance Review.
Used with permission.

2011-2013, Bose Corporation

Interned in Audio Applied Research working on speaker arrays, speech intelligibility, and rapid prototyping.

Selected as 7th person in 5 years for the highly competitive PACE rotation program.

7 months in Noise Reduction (Headphones) Group, working in Matlab on real-time algorithms rooted in perceptual modeling, iOS Objective-C implementation for internal testing.

1 month in Process and Data Management, learning about product life cycle processes.

5 months in Automotive Electrical Engineering Group, working on car amplifier circuit design, debugging, bench-work, EMC testing, etc. Visited manufacturing facility to support amplifier build.

14 months as a full-time employee in Audio Applied Research, rapid prototyping and tuning of early concept systems, research in signal processing and psychoacoustic. Critical listening, practical systems skills, advanced Matlab signal processing.

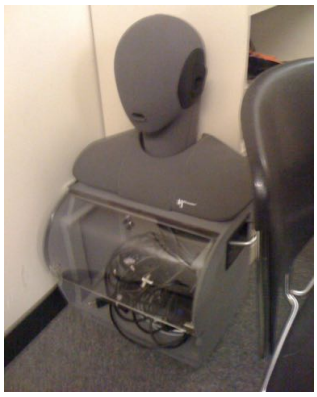
CONTRIBUTIONS:

Working prototype from NRTG being considered as a feature for several products, part of a patent application currently being reviewed internally.

Concept system prototyped by David is now in early manufacturing runs and will be released as a commercial product this year.

Automotive amplifier David supported is currently being manufactured and installed by the thousands.

David is currently Lead Systems Engineer on a major cross-disciplinary project in Research.



2011-2013, Bose Corporation

David worked in many divisions at Bose, and unfortunately due to confidentiality agreements can't discuss the technical details of his numerous projects. However, his projects can generally be described as follows:

Speech-related Array Design

David designed and implemented a speaker array, tested it in several acoustic environments, and implemented speech intelligibility metrics to measure certain aspects of that array design.
SKILLS: matlab, audio signal processing, real-time rapid prototyping, microphone/speaker arrays, audio measurements, speech intelligibility

Real-time Perceptual Modeling-Based Algorithm for iPhone Implementation

David designed a real-time, working prototype that would take a calibrated microphone input signal, perform psychoacoustically relevant analysis (using Moore's perceptual model), and make intelligent decisions as a result. This included an Objective-C implementation, so the application could be tested internally on iPhones and iPads, as well as human factors testing.
SKILLS: matlab, audio signal processing, psychoacoustics, perception, signals in noise, real-time rapid prototyping, human-factors testing, Objective-C

Car Amplifier Circuit Design

David supported several new car amplifier designs, a manufacturing run, EMC testing, circuit debugging, and circuit tolerance/specifications in the Automotive Systems Division.
SKILLS: circuit design, circuit troubleshooting, manufacturing, EE bench-work, EMC testing

Product Lifecycle Software Support

David supported a documentation and product lifecycle optimization effort within the company, interviewing managers about their business processes.
SKILLS: product lifecycle management, documentation, business structure/scalability, professional communication

Consumer Product Prototyping

David put together and tuned the first concept of a consumer product that has started manufacturing runs and will be released later this year. He measured, tuned, and demonstrated his work for key stakeholders in the company.
SKILLS: rapid prototyping, audio measurements, critical listening, EQ, limiting, spatialization/speaker arrays, signal processing, product demonstration

Signal Processing Research

David has been involved in several research efforts to improve speaker array design, automatic room equalization, speech intelligibility, and limiter topologies. He works regularly with systems varying from 2.1 topologies to eight channel arrays.
SKILLS: rapid prototyping, critical listening, acoustics, EQ, compression/limiting, upmixing, spatialization techniques, filtering, research methodology

Lead Systems Engineer on Multidisciplinary Research Effort

David is currently the Lead Systems Engineer on a high profile, multidisciplinary research effort centered on new transducer technology.
SKILLS: audio measurements, critical listening, system design, system tuning, EQ, compression/limiting, benchmarking

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EDUCATION:

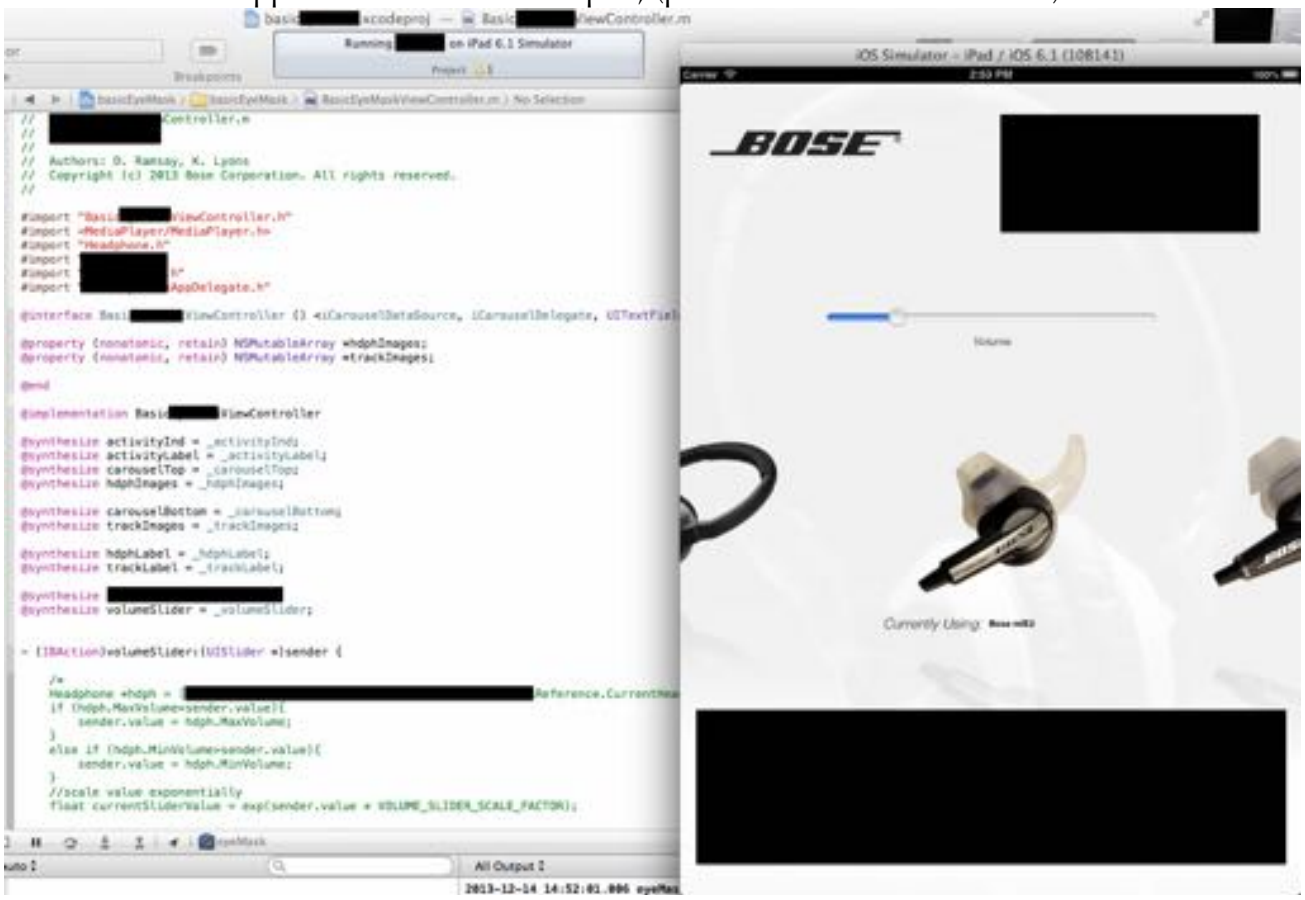
Internal Audio Measurements course. 10 weeks of labs and lectures, ~6 hours of actual measurements required for the final exam.

Internal Acoustics course. 12 weeks, based on Dr. Bose's MIT class. Tests, problem sets, and 4 hours of lecture each week.

SKILLS:

Matlab, Objective C/iOS Development, critical listening, system design/tuning, advanced signal processing, rapid prototyping, psychoacoustics, acoustics, audio measurements, practical DSP, circuit design, schematics, bench-work, circuit debugging, SMD soldering

iOS application David developed, (parts redacted for IP reasons).



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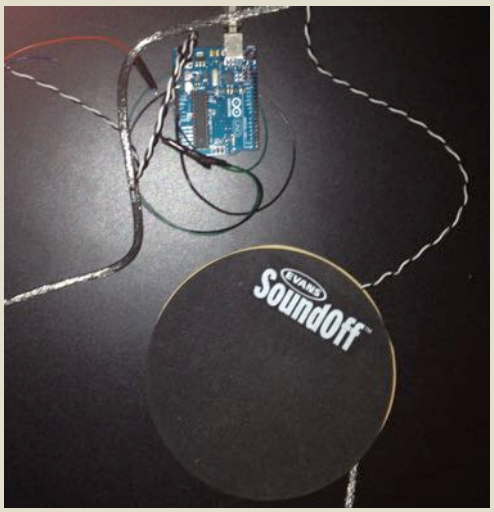
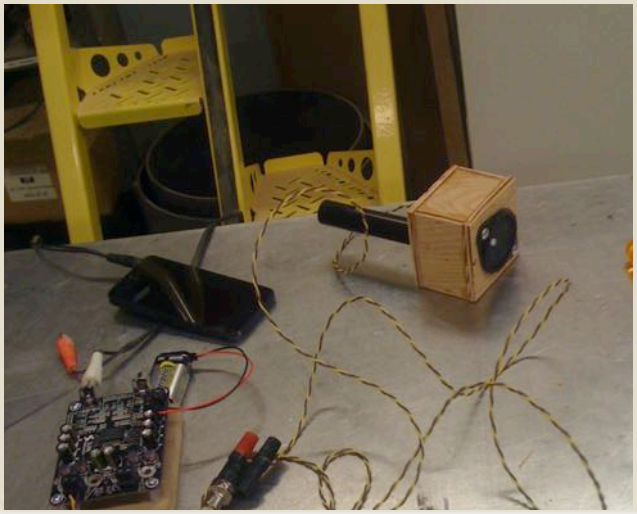
Independent Music Technology Projects

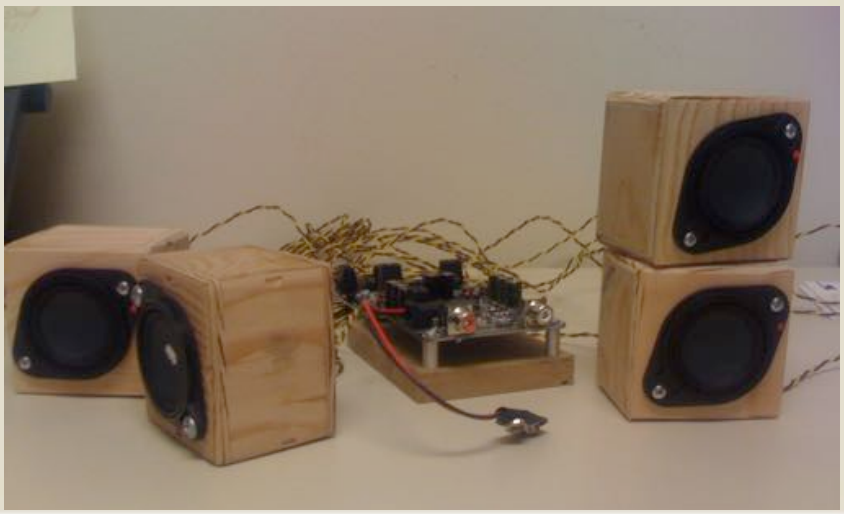
David spends a lot of his free time tinkering with various music technology- here are a few examples. Currently he's working to restore an old 70's Conn organ with a leslie speaker that he found for free.

David has also created a small drum pad and MIDI trigger using an Arduino. The control program David wrote includes hysteresis. While he uses the drum pad during performance, he's still working to evolve the solution to something more feature-rich.

Additionally, David has recently built a group of small speakers for testing and prototyping new system designs. In the first picture (bottom left), you can see an early experiment with port length and turbulence. In the second picture you may notice some white-out on one of the speakers—this was used in concert with a laser measurement system to obtain its Thiele/Small parameters, so that David could model these transducers and their enclosures in Spice.







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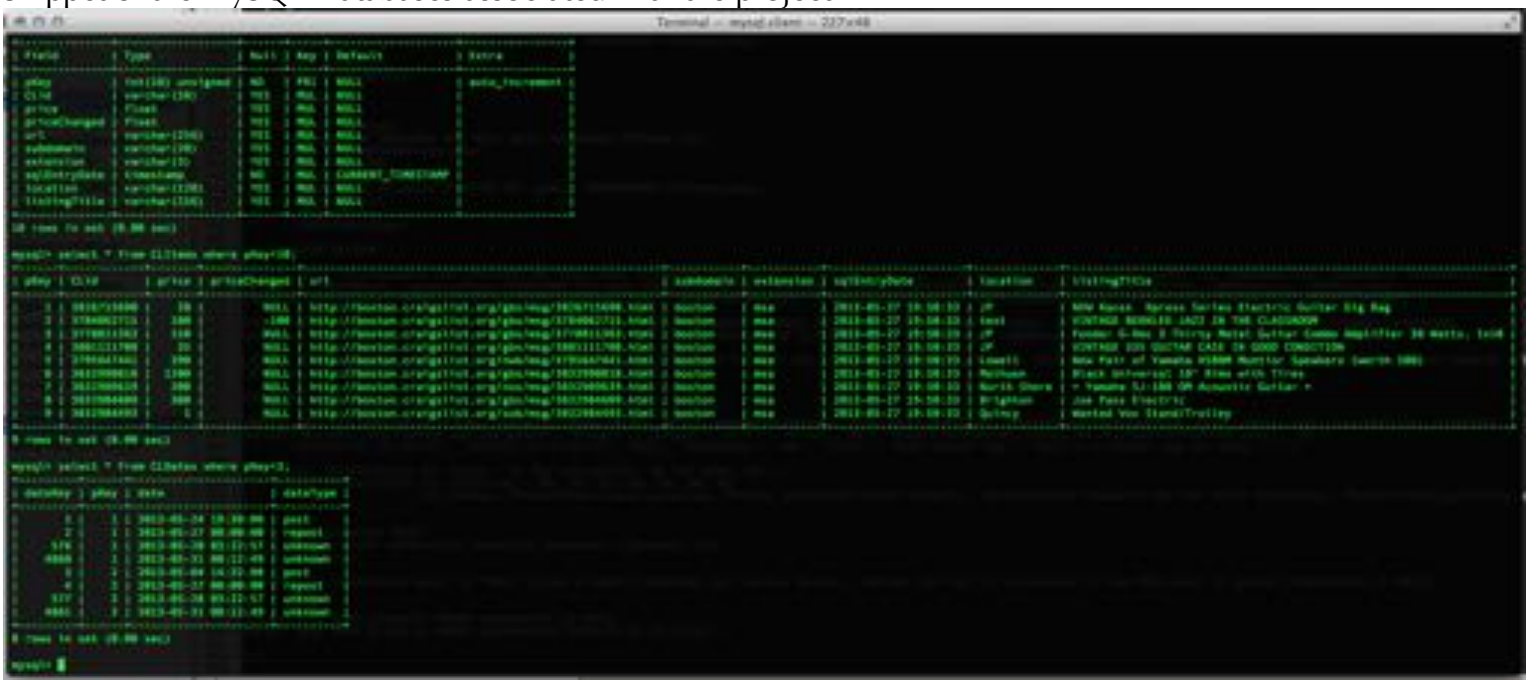
Personal PHP Projects

```php
<?php
//This is the new Craigslist DataMining class, which will update the CL tables.

class CLDataMiner
{
   public $html;
   public $subdomain;
   public $listingResult;
   public $url;
   public $delayInMicroSeconds = 500;//333333; //500000 is half a second


   ////////////////////////////////////////////////////////////////////////////HTML INTERACTION/////

   function getHTML($address)
   //call just puts the HTML in $html and the url that initializes the instance in $url
   {
      if ($this->url=='') {$this->url = $address;}  // Store the url for future reference
      $request = curl_init($address);
      curl_setopt($request, CURLOPT_RETURNTRANSFER, 1); // Return to string instead of console
      $this->html = curl_exec($request);
      curl_close($request);
   }


   function getCraigslistHTMLwithData($subdomain, $extension)
   //call just puts the HTML in $html and the url that initializes the instance in $url after const
   {
      $address = "http://$subdomain.craigslist.org/$extension/";
      $this->url = $address;   // Store the url for future reference
      $this->subdomain = $subdomain;
      $request = curl_init($address);
      curl_setopt($request, CURLOPT_RETURNTRANSFER, 1); // Return to string instead of console
      $this->html = curl_exec($request);
      curl_close($request);
      //echo htmlspecialchars($this->html);
   }


   function printHTML($html=NULL)
   //prints HTML passed to it, or whatever html is in $html if none is passed
   {
      if (is_null($html)) {$html = $this->html;}
      echo '<pre>';
      echo htmlspecialchars($html, ENT_COMPAT|ENT_SUBSTITUTE, "UTF-8");
      echo '</pre>';
   }


   ////////////////////////////////////////////////////////////////////////////CRAIGSLIST LIST-PAGE

   function appendAllListings($html=NULL)
   //calls 'getCraigslistListings on all pages of a craigslist subdomain/category (i.e., boston mus
```

David had an idea for a service that could accurately track a commodity value over several websites, over geography, and over time. For example, a rare piece of vintage music equipment may only be listed for sale once every few months- it'd be valuable to understand the item's post frequency and price volatility when attempting to buy or sell one. There are several interesting extensions of this core idea that David continues to pursue.

David taught himself MySQL and PHP, and now has a private GIT repository on BitBucket where he houses the php code he has written to automatically crawl resale websites and store item information in a MySQL database. He is working on analysis and data visualization currently, as well as supplementary applications.

Snippet of the MySQL Databases associated with the project



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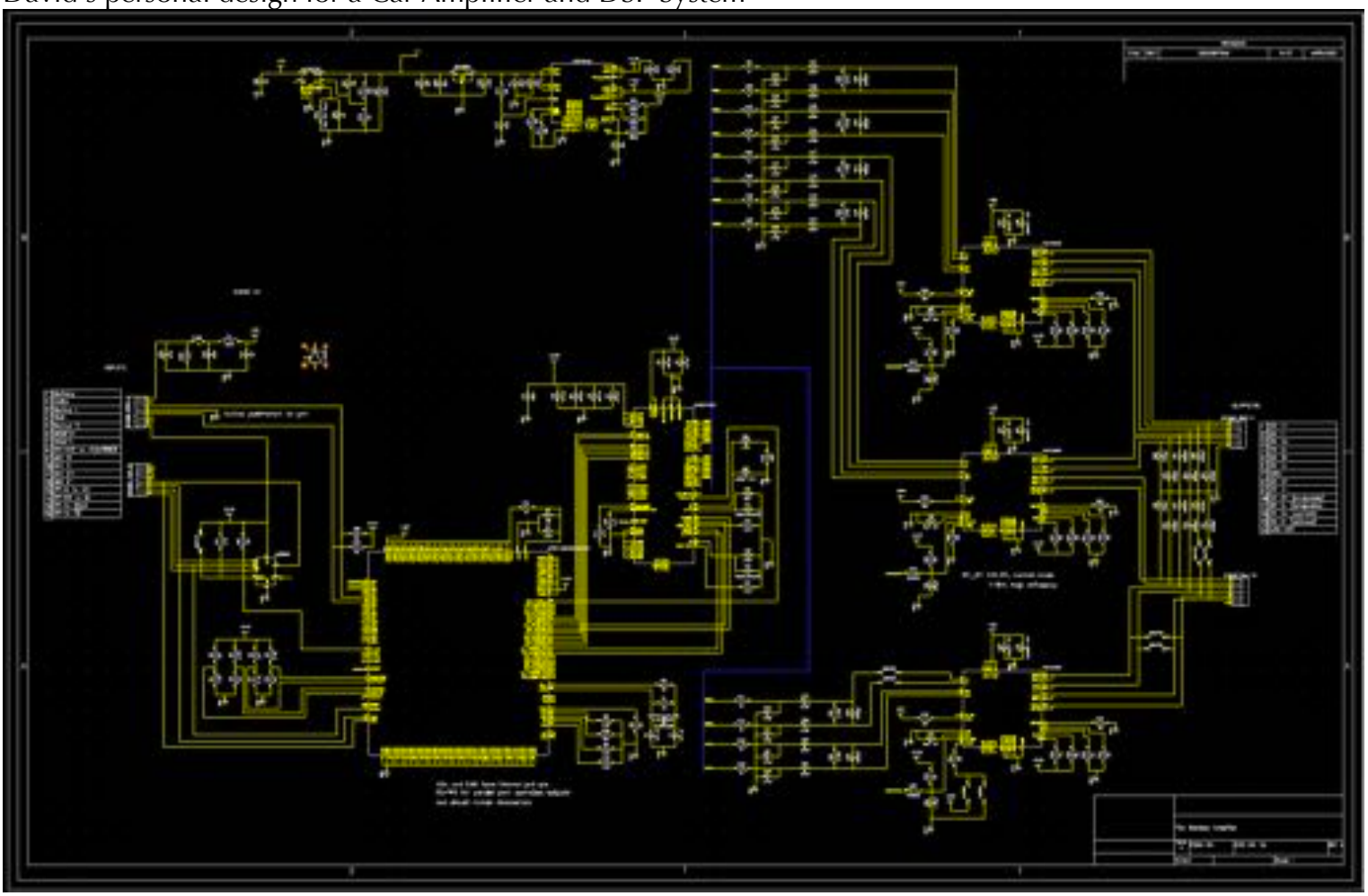
Personal Car Amplifier Project

During his rotation in Automotive, David began work on a car amplifier design to give him complete control over his car audio system. He intended to use this system as a test-bed for new signal processing techniques and system designs. The resulting circuit he designed was based on an Analog Devices ADSP-21262 DSP and a Flashcat USB programmer that could easily reprogram the amplifier. David's final design had 6 differential speaker outputs, one LED indicator, 2 button inputs, 3 line level differential inputs, and 2 car microphone inputs.

David finished his schematic design, and created several custom footprints to supplement the layout library of his design tool. He is in the process of doing a multilayer board layout.

David's personal design for a Car Amplifier and DSP System



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Music Production

David is passionate about music production, and has developed an impressive personal studio. He has a measurement microphone, which he's used to EQ his monitoring setup, and he's put a lot of time and effort into his gear and workflow. David prefers an all-analog signal chain, though he commonly uses Cubase, FL Studio, and Cakewalk.

Berklee Education

While working at Bose, David completed a *Professional Certificate in Music Production* from Berklee's online school. This included the following 5 classes:

-Critical Listening
-Music Production Analysis
-Recording and Producing in the Home Studio
-Art of Mixing
-Audio Mastering Techniques

Personal Gear

INSTRUMENTS: 6 guitars (Acoustic, Stratocaster, 12-String, Baritone electric, Handmade Classical), Bass, Clarinet, Accordion, Conn Electric Organ (w/Leslie), Saxophone, Electric Violin, Cajon, Xylophone, Melodica, Hi-Hat/Tamborine, Toy Organ, Harmonica, Recorders, Whistles

DYNAMICS PROCESSORS/EFFECTS: Great River ME-1NV Preamp, Empirical Labs Distressor, FMR Audio RNP Preamp, FMR Audio RNC Compressor, Alesis 33 band EQ, Stereo Bus Limiter, T.C. Helicon Voiceprism, Alesis MidiVerb II, Full pedalboard (tube screamer, carbon copy delay, etc), Mesa Boogie F-50, Roland Microcube, Fender Practice Amp

ROUTING/MIXING/MONITORING: Tascam MX2424 ADAT Recorder, Tascam 12 channel mixer (late 70s, dark sound), Yamaha 16 channel mixer, 2 patch bays, M-Audio Flying Cow Converters, M-Audio Fast Track Ultra Interface, EMU 1212m audio card, Rokit RP5s Monitors, Equator Audio D5 Monitors, Beyerdynamics DT-880 Headphones, Fender PA System

MICROPHONES: Shure SM57, Shure SM7B, Shure Beta 87a, Rode NT-1A, Octavia MK-319, AudioTechnica 4040

SYNTHESIZERS: Akai s612 sampler, Kawai KR-1, Roland M-OC1, Korg Microkorg

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Courage and the Bear

David is currently the co-lead vocalist, guitarist, and songwriter for an indie folk rock project called Courage and the Bear. The band has a regular gig, every other Thursday night, at the Nu Café in Worcester. Check out their website for more details.

(courageandthebear.bandpage.com)

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The Audio Motives

David is also the lead guitarist and backing vocalist in a rock trio cover band called *The Audio Motives*. He enjoys honing his lead guitar skills with this group. Check out their website for more info.

(www.theaudiomotives.com)

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Recent Work

Due to confidentiality agreements, little of David's work over the past two years can be discussed publicly. His personal engineering and music projects, however, demonstrate that David's curiosity, drive, and skills span several disciplines.

Check out David's website for more information:

http://www.davidbramsay.com

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