Graham Voysey

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Employment

Hearing Research Center, *Boston University* **Boston, MA**
Research Engineer *Jun. 2010—present*
Biomedical research and software development focused on cetacean hearing and anthropogenic noise, speech rehabilitation therapy, and brain-computer interfaces.

- **The ESME Workbench** (Effects of Sound on the Marine Environment) is a modeling environment to estimate noise exposure and predict behavioral changes of marine mammals to anthropogenic noise.
  - Presented ongoing work at international conferences.
  - Developed data analysis tools for simulation results in collaboration with NOAA regulators.
  - Performed a ground-up rewrite in C# to produce an easy to use modern application as part of a two-person development team.
  - Integrated multiple databases with Entity Framework. Designed and wrote APIs for data access by customers in C#, MATLAB, and Python.
  - Developed the website, bug tracker, build environment, and data store.
  - Managed user outreach, training, debugging and support.
  - Supervised QA engineers responsible for application testing.
- **NinjaGame** is a speech rehabilitation video game for children with cleft palate and velopharyngeal dysfunction.
  - Re-implemented the game environment from a MATLAB prototype to a C# application used by patients in an out-of-clinic setting as part of a three-person effort over three months.
  - Developed and instrumented a SQLCE database using the Entity Framework 6 Code First ORM to securely store patient vocalizations and performance metadata for post-analysis by speech pathologists.
  - Mentored a graduate student in developing a custom database browser application for faster post-analysis.
  - Contributed to analysis of research results and submission of a peer-reviewed conference paper.
- **The Unlock Project** is a brain-computer interface for individuals suffering from locked-in syndrome that uses steady-state visually evoked responses to drive a computer interface.
  - Implemented a photodiode-based validation and test suite to ensure correct operation of stimulation parameters across arbitrary hardware platforms using Python and the OpenGL stack.
  - Curated and administered the GitHub repository for collaborative work with other research groups.
  - Re-architechted, documented, and deployed an installable version of the application.

Bioscience and Biomedical Systems Group, *Infoscitex* **Waltham, MA**
Staff Engineer *Nov. 2006—Feb. 2010*
Designed, developed, and analyzed biomedical products and systems with applications in cardiac physisiology, acoustics, noninvasive monitoring, and vestibular stimulation, serving the research needs of the DOD and NIH.

Selected Publications

[1]M. J. Cler, G. E. Voysey, and C. E. Stepp. Video game speech rehabilitation for velopharyngeal dysfunction: Feasibility and pilot testing. In *2015 7th Int. IEEE/EMBS Conf. Neural Eng.*, pages 812–815. IEEE, Apr 2015.

[2]K. Lee, W. Lv, E. Ter-ovanesyan, M. E. Barley, G. E. Voysey, A. M. Galea, G. B. Hirschman, M. E. Ng, K. Leroy, R. P. Marini, and R. J. Cohen. Cardiac Ablation Catheter Guidance by Means of a Single Equivalent Moving Dipole Inverse Algorithm. *Pacing and Clinical Electrophysiology*, 00(1):1–12, 2013.

[3]D. Mountain, D. Anderson, and G. E. Voysey. The Effects of Sound in the Marine Environment (ESME) Workbench: A Simulation Tool to Predict the Impact of Anthropogenic Sound on Marine Mammals. In *Proceedings of Meetings on Acoustics*, volume 19, page 010051, Montreal, 2013.

Grants and Awards

Massachusetts Eye and Ear Infirmary **Boston, MA**
BU Clinical & Translational Science Mini-Sabbatical *Jun 2016—Sep 2016*
One of three awardees of a staff sabbatical award to facilitate cross-disciplinary inter-institution research and collaboration. Collaborated with the Auditory Neuroplasticity Lab at MEEI/ Harvard Medical School to study novel stimulus optimization techniques to investigate the role of corticofugal projections from the auditory cortex in hearing impairment. The features of the efferent control network in cortical auditory processing were studied using a two-channel optogenetic probe and multichannel neural recordings.

Education

Boston University **Boston, MA**
M.Sc., Biomedical Engineering *2013—2016*

Master's Thesis

Title: Development of a Flexible Modeling Environment for Evaluating Subcortical Auditory Systems

Advisor: Professor H. Steven Colburn

Lab: Binaural Hearing Laboratory

Boston University **Boston, MA**
B.S., Biomedical Engineering *2002–2006*

Senior Project

Title: *Modeling and Visualization of Zebra Finch Spectro-Temporal Receptive Fields*

Advisor: Professor Kamal Sen

Lab: Natural Sounds and Neural Coding Lab

Computer skills

Languages: C#/.NET, Python 2.x/3.x, MATLAB
Operating Systems: Windows, Linux, Mac
Design Patterns: MVC/MVVM, Fluent, TPL Dataflow
Databases and ORMs: mysql, Sqlite, EF Code First
Version Control Systems: git, subversion
Misc: NI-DAQ, LaTeX

Selected SBIR/STTR Research Grants

Catheter Guidance System for RF Ablation of Cardiac Arrhythmia
National Institues of Health—SBIR 1 R44 HL079726–01, -03, -04 *Nov. 2006—Feb. 2010*
The Single Equivalent Moving Dipole model was developed to localize the site of electrical abnormalities on the surface of a arrhythmic heart to guide the catheter for a RF ablation surgical procedure in real time. Unlike other localization techniques, it required minimal induction of arrhythmia in the patient. The system was shown to accurately localize and guide an ablation catheter to within 4mm of a site of an induced ventricular tachycardia in a porcine model.

- Wrote the specifications for the data recording system, a 2kHz, 80-channel EEG. Oversaw its purchase, characterization, operation during research, and troubleshooting.
- Participated in development of control, acquisition, and post-analysis software in Labview and MATLAB.
- Designed analysis and testing procedures for phase I synthetic body phantom trials.
- Lead data recording and oversaw system use in Phase II animal trials performed at MIT and MGH.

Low-Profile Multimodal Acoustic Treatment
US Marine Corps—SBIR M67854–08–C–0038 *Jun. 2008—Mar. 2009*
A passive Helmholtz resonator-based composite acoustic shroud was developed to reduce the noise signature exhaust fans on the USMC EFV. Peak sound level was reduced from a mean value of 125 dB SPL by 30 dB SPL around the center frequency. The shroud was designed to be lightweight, low-profile, corrosion resistant, and durable in high temperatures.

- Tested the developed acoustic shroud composite materials to ASTM standards for impedance tubes.
- Developed a predictive model of overall sound attenuation in MATLAB, in collaboration with Raytheon.
- Demonstrated the accuracy of the predictive model compared to free field recordings of the shroud to be ± 1 dB SPL.