

A Collaborative Tool for Cross-language Speech Perception and Acoustic-phonetic Research

Dawn M. Behne¹ and Yue Wang²

¹Department of Psychology
Norwegian University of Science and Technology
dawn.behne@svt.ntnu.no

²Department of Linguistics
Simon Fraser University
yue_wang@sfu.ca

Abstract

A tool is described for coordinating cross-language research and education in acoustic phonetics and speech perception. This will be demonstrated in the Special Session on Education in Acoustics at ICA 2004.

1. Introduction

Research and education in speech communication face practical challenges in cross-language studies. Among these are (1) availability of native speakers and/or listeners of the language being studied, (2) laboratory availability in the vicinity of native speakers in order to attain high quality recordings and/or carry out controlled listening tests, and (3) these complications are magnified when more than one language is being studied. These are already a potential difficulty for established researchers who have greater collaborative options, but are especially a challenge for creating a learning environment for research education where real cross-language research issues can be addressed.

Wide-spread access to the internet has opened up alternatives for international data collection and collaboration. Speech materials gathered in one location can be analyzed in another location, and stored in a third location. This is especially suitable for cross-language research for which speakers or listeners of a language may not be locally available to researchers and students.

2. Aims

This project is being prepared in collaboration with an international group of researchers working with native speakers and/or learners of American English, Cantonese, Danish, Dutch, German, Japanese, Mandarin, and Norwegian.

We expect the project (1) to contribute to direct student participation in the full experimental process from the start of their research education, (2) to integrate student projects with active research, (3) to develop students' abilities to carry out research internationally, and (4) to promote comparable standards for cross-language research.

3. Method

The tool is envisaged to have two primary components: a database of speech materials which is linked to online experiments whose results are then logged back to the database.

3.1. Database of speech materials

At the center of the project is a database of speech materials developed and overseen as a part of education in speech research. This will involve interaction among researchers and students alike, an activity which can give students experience in international collaboration, emphasize its relevance as well as potential difficulties, and pave the way for future cooperation.

Speech materials from the different languages will be planned in a comparable manner with the purpose of studying set hypotheses. Our focus is on timing in speech and speech perception. Controlled audio recordings of the materials will be done by supervised students collaborating across locations, following a set of shared criteria. The recordings will be stored on a server which will be accessible to all the participating researchers and their students for acoustic analysis and further stimulus development.

Through use in research and student projects, the database will be extended to include acoustic measurements. Being accessible to several labs, measurement reliability can be assessed and issues of standards for cross-linguistic research discussed and evaluated.

The audio recordings will also be the basis stimulus development for listening tests, the results from which will also be included in the database.

3.2. Online experiments

Although many experiments are available online for participation (see e.g., [1][2]; see [3] for a historical overview of running experiments on the net), most are set up to gather data from students, where students participate in an experiment. From this a student's experience a participant's perspective, as well as how an experiment is set up. Much can be said for this, in particular in connection with developing methodological

skills. A few online experiments [4][5] go a step further with results that are plotted immediately after a subject/student completes the experiment. However, for most online experiments, the process stops there.

To participate in an experiment from start to finish, students would need to be able to access and download raw data for multiple subjects, including the subjects in the data pool which they have run and potentially others that are relevant for their project. PsychExperiments[7], developed at the University of Mississippi using Authorware (others alternatives include WebExp[8] and SonaSystems software[9]), allows students to run subjects using pre-prepared stimuli and experiment running programs for classic experiments, and collect their own data for statistical analysis and interpret their results. Our tool will use this approach as a model to build up set experiments that can be used to acquire speech materials and be used in listening tests. In this way prepared online experiments can be used by beginning students and provide a consistent online method for use in different locations internationally.

Advanced students would be able to set up their own perception experiments using the materials in the database. In order to maintain consistency across locations, the same software would be used for running experiments. Here, many commercial options are available. A viable solution for our purposes would be Wextor, developed by U.-D. Reips [10][11] which generates HTML and Javascript code and can be used for within-subjects and between-subjects factorial designs.

Students can also be involved in the data organization, such as creating summary files which include all subjects' data from one experiment., which we can then be used directly or combined for cross-language analyses.

All data, from acoustic analyses and perception studies, will be logged to the database, where reliability can be evaluated, student progression can be followed, and materials can be reused in cross-comparative studies. Experiments may be production studies, where material preparation is coordinated and shared criteria are used, or perception studies, with shared experimental setups and systematically prepared and mutually accessible speech materials. The materials and experiment-running support would be available to students for their own projects, for collaborative projects with students in other locations and by advisors in their own research and course materials.

3.3. Organization

A hub website will house the database materials and experiment coordination. Here materials can be used to run experiments and results will be directly logged to the database. Materials can be used there or at satellite locations by collaborators.

The tool will be developed with three levels of permission. *Subjects* will be able to access the prepared experiment. *Experimenters* (students) will each have a workspace, in which they create their individual experiments, and include design/stimuli, the actual experiment, and data. Similarly, each student can

upload stimuli, experiments, or files to their own workspace. Whereas each student will only have access to their own experimenter folder and the possibility to download from the database, *administrator(s)/course instructor* will have full access to experimenter folders and the database. An administrator can follow students progress and check (and if necessary, rerun) data that has been used in students' experiments before including them in the database. By only allowing administrators to upload materials to the database, we will be able use criteria for maintaining a reliable database and high research standards.

Research, as well as student project topics, can potentially be coordinated across locations around related research questions. For example, students in Japan could use vowel materials for Norwegian or Dutch to study the perception of vowel quantity in these languages by native speakers of Japanese. This also opens the possibility for students and researchers to work on a project using materials developed elsewhere.

4. Conclusions

The development of speech materials, doing acoustic-phonetic measures and running listening test can be put to fuller use through collaboration, which in turn opens for promoting comparable research standard. Easy internet access can make entire research environments more accessible in speech research education so that students become involved in on-going international research from an early stage.

5. Acknowledgements

Numerous people have contributed to discussions related to this project, including Takayuki Arai, Ocke-Schwen Bohn, Yukari Hirata, Allard Jongman, Terry Rew-Gottfried, and Joan Sereno. They are however free of responsibility for the description here.

6. References

- [1] <http://surf.to/experiments>
- [2] <http://psychexps.olemiss.edu/TechSupport/links.htm>
- [3] Birnbaum, M.H. (ed), *Psychological Experiments on the Internet*, Academic Press, San Diego, 2000
- [4] <http://coglab.wadsworth.com/>
- [5] http://www.ling.umu.se/~rand/KatPer/test_eng.html
- [6] McGraw, K.O., Tew, M.D., and Williams, J.E. "PsychExps: An On-Line Psychology Laboratory", in M.H. Birnbaum (ed), *Psychological Experiments on the Internet*, Academic Press, San Diego, 2000
- [7] <http://psychexps.olemiss.edu/index.html>
- [8] http://www.hcrc.ed.ac.uk/web_exp/
- [9] www.sona-systems.com/product.asp
- [10] Reips, U.-D., and Neuhaus, C. "WEXTOR: A Web-based tool for generating and visualizing experimental designs and procedures", *Behavior Research Methods, Instruments, and Computers*, 34:234-240, 2002.
- [11] Reips, U.-D. "The Web Experimental Psychology Lab [On-line]." <http://www.genpsy.unizh.ch/Ulf/Lab/WebExpPsyLab.html>, 1995.