The University of Calgary Phonetic Inventory: An instructional tool for students and teachers of phonetics.

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This article is an overview of a multimedia phonetics program being developed at the University of Calgary under the supervision of Doctor Michael B. Dobrovolsky as an instructional supplement to introductory phonetics courses. The program's name is the **University of Calgary Phonetic Inventory**, or **UCPI**. UCPI is a program being developed under funding to Professor Dobrovolsky of the Linguistics department from LEE, the University of Calgary's Learning Enhancement Envelope program. As a tool to help develop the phonetic perception of budding linguists, UCPI will provide students with a large quantity of transcription practice through exposure to digitally recorded word lists in different languages. It will also include a series of tutorials to guide them systematically through the topics covered in an introductory phonetics course.

BACKGROUND

UCPI is not the first phonetic program to be built for the purpose of instruction. The previous computer programs available to phonetics students at the University of Calgary are "Sounds of the World's Languages" and its complement, "A Course in Phonetics," both of which were developed by Peter Ladefoged and associates at the UCLA Linguistics department for somewhat similar purposes. Many features of these two programs have been incorporated into UCPI. Other phonetics software includes the University of Victoria Phonetics Database and IPA Tutorial, and the Oxford University Press CD-ROM Database of Western European languages.

Sounds of the World's Languages (SOWL)

This program has a fairly simple point-and-click interface. On entry, you are presented with a list of all the languages demonstrated in the program. You pick a language, and an information screen pops up. After learning a little about the language's background and the properties demonstrated in this particular word list, you can go to the sounds by clicking on another button. The word list itself is presented in a slightly different format for every language, depending on what is being demonstrated. All words are displayed in phonetic transcription, with an English gloss accompanying. You simply move the cursor over the transcription and click, and the word is played back. There are also buttons to allow you to listen to a series of words—for example, all the "front vowel" examples in a language—and to listen to all the words. The transcriptions accompanying the sounds give the students some exposure to the practice of phonetic transcription, though no option is present for the students to test themselves.

There is some inconsistency in SOWL's transcriptions. For example, there are very detailed transcriptions of the clicks in !Xoo but phonemic (not phonetic) vowel

transcriptions in Turkish. Another problem with this program is that some languages have very few words demonstrated, making it difficult for students to get a "feel" for the phonotactics of the language. An example of this is Japanese, which only has three words shown.

Positive features of this program include an IPA cross-reference function, so students can look up languages that demonstrate a particular sound—for example, high front rounded tense vowels. Also, its map system allows students to view languages' geographical locations, and lets them access nearby languages. The section titled "Sounds Index" permits students to look up languages that demonstrate specific phonetic properties, such as clicks or front rounded vowels. There is another fun feature—recording and playing back the student's own voice—but this function is not reliable enough on our computers to be very useful.

A Course In Phonetics (ACIP)

ACIP is a theoretical accompaniment to the SOWL program. ACIP focuses on teaching the students about the articulation of sounds, and having the students practice these sounds themselves. It is organized in a format similar to that of a textbook, due to the fact that it is ancillary to Ladefoged's text, *A Course In Phonetics*. The click-and-point interface, like the other program's interface, takes the user to sound demonstrations of the concepts being covered. Unfortunately, the majority of the demonstration sounds are either from English or are invented. This makes it less helpful for students who want to learn to discriminate sounds in real languages and in languages exotic to English.

Together, the SOWL and ACIP programs form a fairly good supplement to an introductory phonetics course. Indeed, the user is are meant to be able to move between the two at the click of a button, to combine their power, though this feature doesn't always work in our computer lab. Many of the handy, helpful features of these programs have been incorporated into our UCPI, such as the point-and-click language lists, the phonetic property index, and the backup course system.

Language and Sound

Aspects that were perceived to need improvement, such as the inconsistent transcriptions and the sometimes limited lists of words, prompted Dr. Dobrovolsky to try developing his own instructional language program and database. Under several STEP grants, a phonetic inventory of languages was researched and recorded, and a beginning was made to tie this database to a new computer program of Dobrovolsky's "Language and Sound." This was meant to have consistently more data for the user to read, listen to, and transcribe. A start was made, and some improvements were worked out. Unfortunately, this program was restrained by the same limitations as SOWL and ACIP, since all were developed on the Macintosh platform in HyperCard, which is a high-level but somewhat simplistic development tool. That is why, in the initial planning of UCPI, Authorware was chosen. Authorware is a package for developing multimedia material of the type that was desired in UCPI.

UCPI

In organizing UCPI, we took the best aspects of the other programs and tapped the expanded powers of multimedia to create an interactive program to teach students the main concepts of phonetic theory and transcription. As yet, the program is not complete, though only a few cosmetic alterations remain to be done before the content—the words from all the languages that have been recorded—can be fitted in. I will provide a brief run through the main sections of the program, to give the reader an idea of the nature of this program. Unfortunately, no written article can do a multimedia program justice.

When the user first opens the program, an introductory page appears which described the main options to the user, so first-time users do not need to spend hours getting acquainted with the program before actually using it. The main sections of the program are:

(1)   Language List
(2)   Phonetic Properties Tree
(3)   Backup Course
(4)   Help System
(5)   Glossary
(6)   IPA Charts
(7)   Individual Language Word Lists and Custom Word Lists.

(1)   Language List

As with the SOWL program, there is a list of languages. If the user knows which language to access, a simple click brings up a page of information on that language, including such figures as the phonetic inventory of that language. From here, another click brings up the list of words from that language. I will return to the word list in section (8).

(2)   Phonetic Properties Tree

Another way that students can access the languages stored in the database is through the Phonetic Properties Tree, which is based loosely on the Sounds Index of SOWL. Since students studying phonetics would tend to go through a course one aspect of languages at a time, rather than one language at a time, the Phonetic Properties tree lets students seek out those languages that demonstrate, for example, a three-way VOT contrast. The structure of the Properties Tree is designed to reinforce students' understanding of the relationships between various aspects of languages.

Since it is a large section, covering almost sixty different properties of languages, there are some easy-to-learn conventions for moving around, which are explained in detail in the Help System.

(3) <u>Backup Course</u>

This section corresponds roughly to the UCLA's "A Course In Phonetics". It is not an entire, independent phonetics course in itself. It is rather meant to be a supplement—a series of tutorials to reinforce classroom instruction. It is presented in a logical progression of lessons that covers all of the major topics addressed in an introductory phonetics course. It is not tied to a specific textbook, and so is hopefully useful to more than just the one instructor and course here at the University of Calgary. Following is an outline showing the structure of the course:

0	**Overview**	**3**	**Trills, Taps, and Flaps**
1	**Airflow Coordination**	3.1	Trills, Taps, and Flaps introduction
1.1	Airflow introduction	3.2	Trills
1.2	Lungs and breathing	3.3	Taps
1.3	Larynx and phonation	3.4	Flaps
1.4	Airstream mechanisms	**4**	**Vowels**
2	**Articulation**	4.1	Vowel introduction
2.1	Articulation introduction	4.2	Spectrograms
2.2	Manner of articulation	4.3	Vowels as acoustic regions
2.3	Place of articulation	4.4	Cardinal vowels
2.4	Secondary articulations	4.5	Secondary properties
		4.6	Diphthongs

(4) <u>Help System</u>

For users who are very unfamiliar with computers, we have attempted to make the program as straightforward as possible, with tips and hints shown from time to time. However, when these hints are insufficient, the Help System is just a click away. This section of the program contains an expanded explanation of every section of UCPI, and will hopefully be sufficient for any user to use the program.

(5) <u>Glossary</u>

The glossary is an idea that arose from a presentation of the program earlier in the year. It has not been implemented yet, but the idea is to give users access to the concepts, in a manner similar to that of the Index of a textbook. It will be a list of terms that are covered in the Backup Course, and possibly also of languages demonstrated and phonetic properties covered. A single click will take the user to the corresponding point in the program, whether within the Backup Course, or at a language's information page, or somewhere in the Phonetic Property tree.

(6) <u>IPA Charts</u>

The International Phonetic Alphabet is the standard used in the transcriptions in UCPI. As such, this section of the program is a complete list of symbols and diacritics

from the IPA. The charts are an adaptation of the IPA chart (revised to 1993, corrected 1996) and the IPA charts in Pullum and Ladusaw's *Phonetic Symbol Guide*. Since the IPA symbols are simply shown, not typed by the user, this section is correspondingly succinct.

(7)   Individual Language Word Lists and Custom Word Lists

The word lists are essentially the heart of UCPI. There will be a Language Word List for each of the languages stored in the program. Here, students will be able to learn more about the sounds and patterns of that language, as well as finding items to construct their Custom Word Lists out of. The Custom Word Lists are lists the users build themselves out of words from various languages. A student could, for example, collect words with clicks, or uvular sounds, or any other property that is relevant to the study of phonetics, from as many languages as UCPI contains to demonstrate those.

We have included many of the basic playback functions that the SOWL program has. The options for playback are listed in Table 1. Note that the "Speech Sample" and "Add to Custom List" buttons are only available in the Language Word List section, and the "Delete from Custom List" button is only available in the Custom Word List section.

Table 1.

Button Name	Type	Function
1. Play All	Simple button	Plays all the words in the list sequentially.
2. Speech Sample	Simple button	Plays the sample of spontaneous speech.
3. Compare Two	Checkbox	Allows user to compare minimal pairs.
4. Three Repetitions	Checkbox	Causes every word played to repeat three times.
5. Broad Transcription	Checkbox	Displays broad transcription of word selected.
6. Narrow Transcription	Checkbox	Displays narrow transcription of word selected.

To play a single word once, the user simply finds that word in the word list (under its English gloss) and uses the mouse to click on it. The word is played back. If the "Three Repetitions" checkbox is checked, the sound plays three times. The rest of the buttons are equally self-explanatory in their names, as Table 1 shows. The options to display or hide the transcriptions help students test their transcription skills easily, at either the broad, easier level or the narrow, more precise level of detailed transcription. Using the "Compare Two" checkbox, users can listen to minimal pairs to further hone their listening skills. The "Speech Sample" button plays back a stretch of continuous, spontaneous speech in the given language, to give users a feel for the rhythm and sounds of that language. Clicking on "Play All" will take the user through a recitation of the entire list of words, one after another, to summarize the list before and after the actual transcription practice, or simply to further become used to the sounds of that language in a general sense. The last of the functions to be discussed here are that users, after constructing their own lists, can save them on the hard drive. These can then be accessed later, along with the Preset Custom Lists, which the builders of the program will be setting to demonstrate some of the phonetic properties covered.

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CONTINUING WORK

The main programming of UCPI has nearly been completed. Once this is finished, all that will remain is for the sound reels that have been recorded by the phonetics lab to be transferred to the computer, and the final tests to be made. The current tentative schedule is to have this completed over the winter term—January to April 1998—and ready for use by May. Once completed, the program will be released on CD-ROM for both IBM compatible and Macintosh computers, and sold at cost to students of the University of Calgary. We also intend to make it available to other institutions, as we believe its use will not be limited to a single curriculum.

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