Software Announcements

SpeechLab: PC Software for Digital Speech Signal Processing

Many experiments in speech perception require that acoustic speech stimuli be presented to subjects in a precisely controlled fashion. For this purpose, sometimes all that is required is to record tokens of natural speech from human speakers, but usually, before these can be used as stimuli, they have to be edited and processed in various ways. If particular parameters of the acoustic speech signal must be controlled for, the stimuli may have to be created by means of a speech synthesizer. A speech synthesizer allows for the deliberate control and systematic variation of, for instance, fundamental frequency and the frequencies and bandwidths of the formants of the speech signal. However, the synthesizer parameters must be determined by measurements of their values in samples of natural speech. Thus, the preparation and running of experiments utilizing speech stimuli requires software that includes procedures for recording, reproduction, analysis, and processing of speech signals.

SpeechLab, a menu-driven Borland-Pascal (Borland, 1992) program running on IBM-PC compatibles, was created to subserve these needs. The program comprises procedures for the preparation and the running of experiments using auditory speech stimuli. If apt analog-to-digital/digital-to-analog hardware is installed, SpeechLab can be used to record and replay speech and other acoustic signals. Signals may be inspected in the built-in visual waveform editor. The editor supports marking, zooming, selective replaying, insertion, deletion, cutting, and pasting of signal segments. Signals may be submitted to spectral analysis routines computing the power and the linear prediction spectrum, the sonagram, the linear prediction error, the fundamental frequency contour, and the frequencies and bandwidths of the first three formants. The linear prediction procedures are based on the work of Markel & Gray (1976). Signals can also be processed and transformed in various ways—for example, amplified, added, subtracted, windowed, filtered, up- and downsampled, ramped, and multiplexed. SpeechLab reads and writes binary wave form files in PCM (pulse code modulation) format. ASCII files, WAV files, and ILS files (Signal Technology, 1989) may be imported and exported. Certain experimental paradigms can easily be implemented under the control of SpeechLab by using the built-in command interpreter.

The program includes a visual software interface to the Sensimetric Co. implementation of the speech synthesizer described in Klatt (1980) and in Klatt and Klatt (1990). The formant tracker module can write parameter files for

the Klatt synthesizer, which may be used as a start in resynthesis trials. Naturally, the synthesizer software KLSYN88a cannot be included with the SpeechLab software described here, but it can be obtained separately from the Sensimetric Corporation (1991). Nonsynthesizer functions are not compromised if the Klatt synthesizer is not installed.

System requirements. SpeechLab runs under MS-DOS on IBM-PC compatibles equipped with 640K of conventional memory. An Intel 80386 CPU or higher is recommended. At least 1 Mb of extended memory is required to run SpeechLab with the Creative Lab Sound Blaster card. The PC should be equipped with a VGA video board and a mouse, and, for the recording and reproduction of sound signals, with a 16-bit Sound Blaster card (Creative Labs, 1993) or an Ariel DSP16+ digital signal processor card (Ariel, 1990).

Availability. The SpeechLab software, including a user manual, is available via anonymous FTP (ftp.gluon.hawk.plattsburgh.edu/pub/compsych) from COMPsych, a PC software archive for psychology (Hornby & Anderson, 1994). Alternatively, for a handling charge of \$15, the software may be obtained on a floppy disk (3.5- or 5.25-in.). Please direct requests to dies0230@mailszrz.zrz.tu-berlin.de.

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