Programs for the estimation of fundamental frequency, amplitude, and voicing of speech

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This set of programs implements Gold and Rabiner's (1969) method of estimating the pitch of speech, provides facilities for controlling the measurement period, and provides smoothed average measures of fundamental frequency, amplitude, and periodicity (voicing). The method of calculating fundamental frequency is one of the most efficient in terms of machine time. The measure of periodicity permits segments of the signal lacking any fundamental frequency to be detected.

Computer and Language. The program is written for a PDP-11/34 computer with an AR-11 analog-to-digital interface. It is written in modified BASIC V2 that incorporates a Macro-11 assembler subroutine. This subroutine controls the analog-to-digital interface that runs under RT-11, V03 (B). The memory requirement is 16K minimum. A FORTRAN IV V02.1 version is also available. The main program should be easily convertible to run on any machine with analog-to-digital conversion.

Input. A suitably amplified input (e.g., from a tape recorder) is put through an analog or digital filter and input into the analog-to-digital converter. A signal

above a threshold value triggers the main program, which samples the analog input for the next .5 sec. (This period can be readily increased, given sufficient memory.) The signal may be monitored on headphones and switched off at any time during the .5 sec without disrupting the program.

Output. Indications are given of when the sampling starts and finishes. Before execution of the main analysis, indications of whether the analog-to-digital converter is overloaded or underloaded are given, permitting the amplification to be adjusted and the program rerun, if necessary. Smoothed average measures of fundamental frequency, amplitude, and periodicity are then output for every 50 msec of the sample until the program detects that the tape recorder has been switched off or the end of the .5 sec is reached.

Program Availability. Listings of the set of programs in BASIC or FORTRAN and of the macroassembler subroutine can be obtained from either R. Heyman or R. Bird, School of Behavioural Science, Newcastle upon Tyne Polytechnic, Ellison Place, Newcastle upon Tyne NE1 8ST, England. Executable software can also be supplied on user-provided RX01-compatible flexible diskettes.

REFERENCE

- GOLD, B., & RABINER, L. Parallel processing techniques for estimating pitch periods of speech in the time domain. *Journal of the Acoustical Society of America*. 1969, 46, 442-448.

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