

Dept. for Speech, Music and Hearing  
**Quarterly Progress and  
Status Report**

**Detection of voicing and  
Automatic segmentation  
schemes**

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#### D. AUTOMATIC IDENTIFICATION OF SOUND FEATURES

##### 1. Detection of voicing

Several systems for an automatic detection of voicing have been looked into. Methods based on the relative distribution of spectral energy as determined from various combinations of low-pass and high-pass filters have proved to be less successful than methods which rely on the intensity in a low frequency band compared with the average value of the syllabic intensity of the subject's speech. The accuracy of voicing detection may be further improved by the linear subtraction of a running measure from a zero-counting circuit operating on the unfiltered input speech. Voiced sounds have lower zero-crossing rates than unvoiced sounds.

##### 2. Automatic segmentation schemes

An inspection of spectrograms reveals the existence of natural acoustic boundaries between speech sounds or rather speech segments which may constitute a part of a speech sound. The criterion for the presence of such a boundary may be defined from the rate of change of spectral energy with respect to time in several band-pass limited regions of the spectrum. A linear summation of the absolute values of the rates of spectral changes provides a sensitive measure of the degree of spectral discontinuity. An experimental arrangement consisting of band-pass filters, rectifiers, smoothing filters, differentiating circuits, rectifiers, and a final smoothing and connection to a summation stage for several parallel channels has been constructed. Preliminary experiments have provided promising results.

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