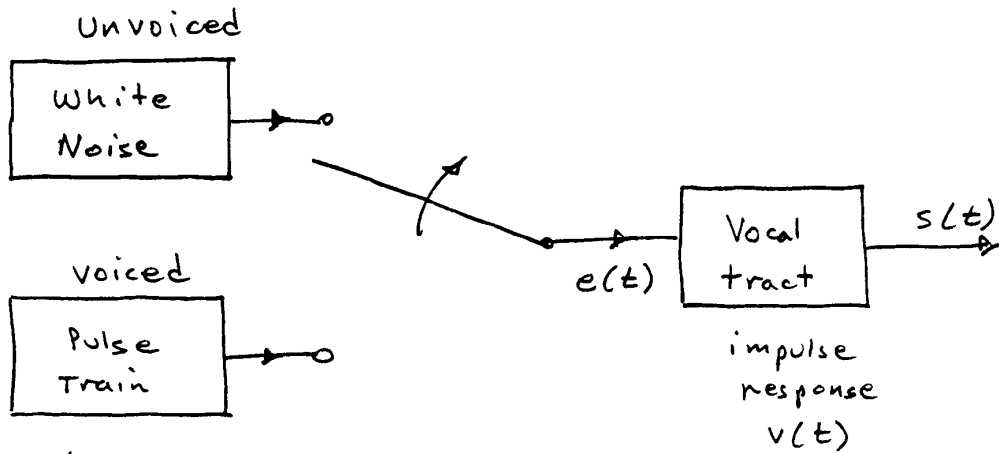


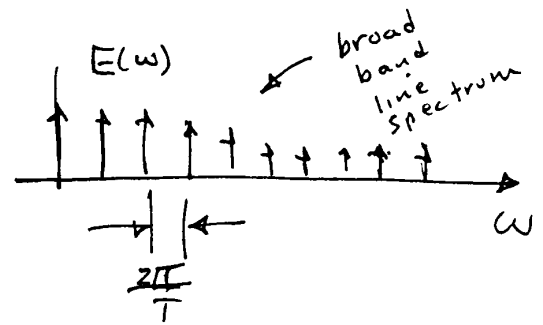
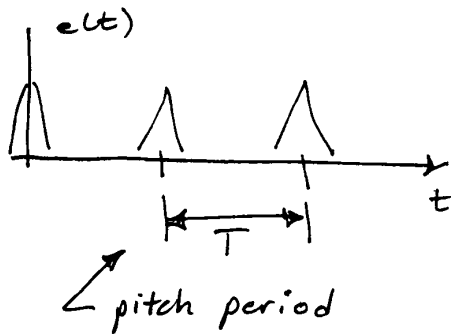
Simple Speech Model



Excitation

Voiced

periodic air pulses pass through vibrating vocal chords



Unvoiced ~~force air through a constriction in vocal tract producing turbulence~~

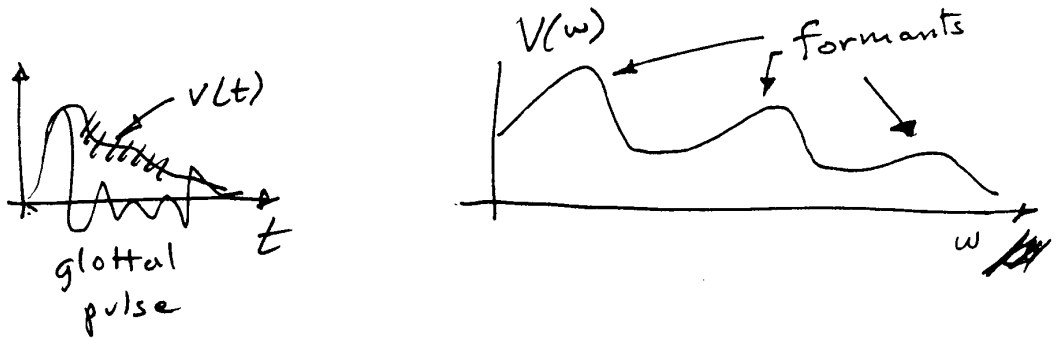
force air through a constriction in vocal tract producing turbulence

vocal tract

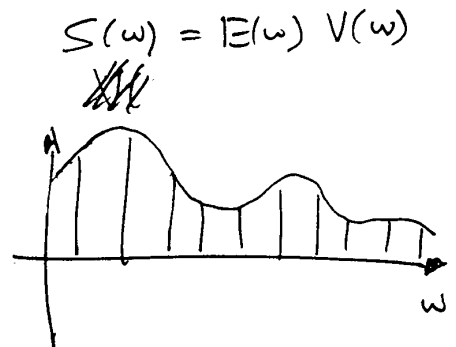
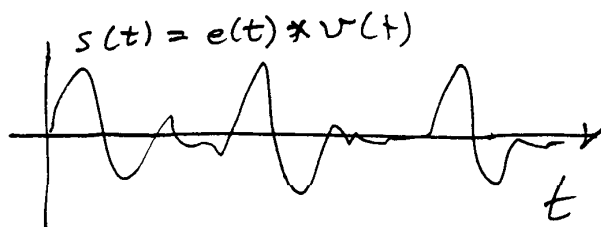
different voiced sounds are produced by changing its shape. \Rightarrow system is time-varying

However, changes occur slowly \Rightarrow over short time intervals can use an LTI model

Since vocal tract is a cavity, it resonates when excited. The resonant frequencies are the formants



voice waveform



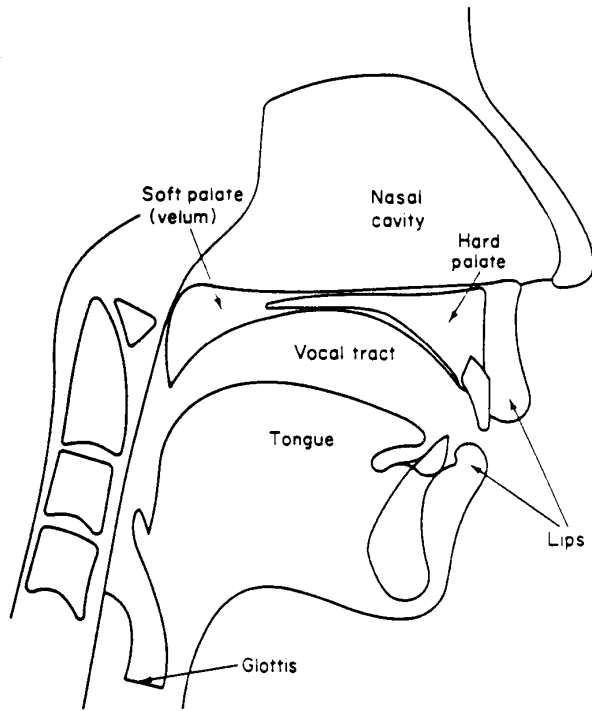


FIGURE 3-1. Cross-sectional view of the vocal mechanism, (after Markel and Gray).

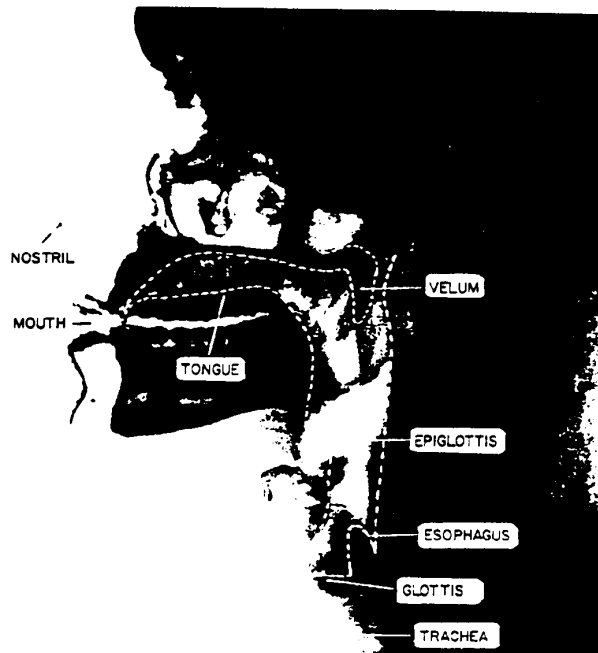


Fig. 3.1 Sagittal plane X-ray of the human vocal apparatus. (After Flanagan et al. [6].)

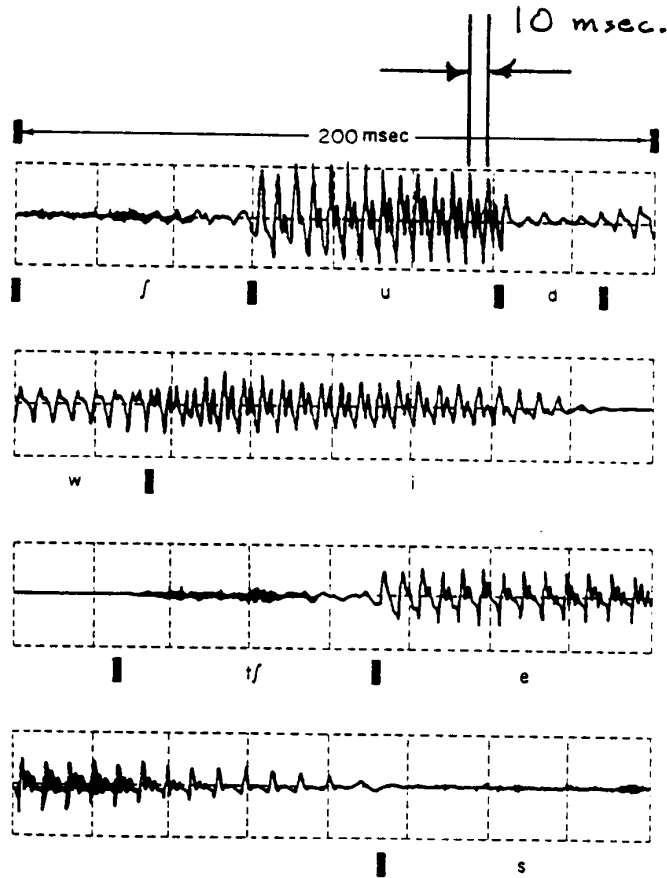
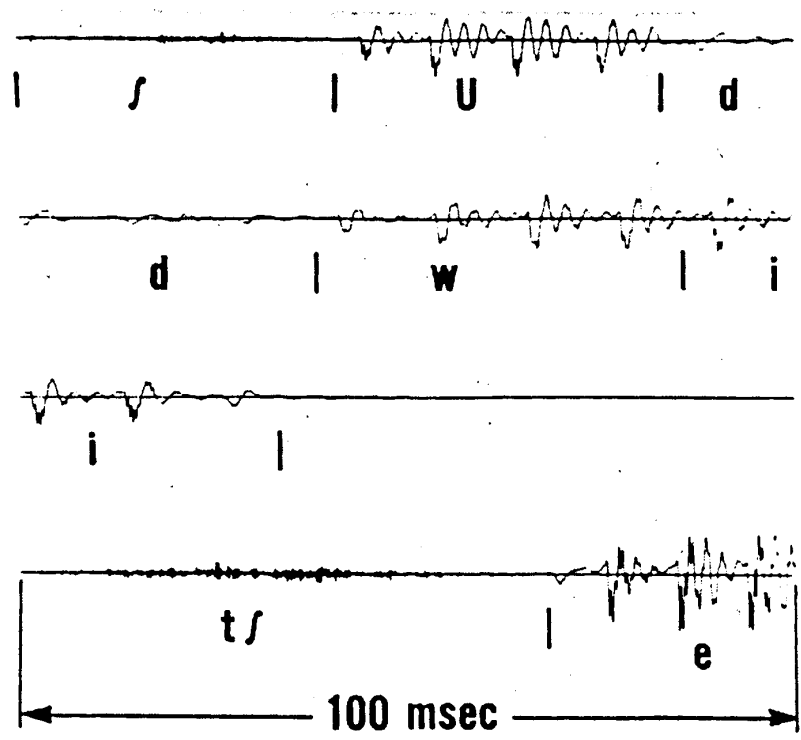
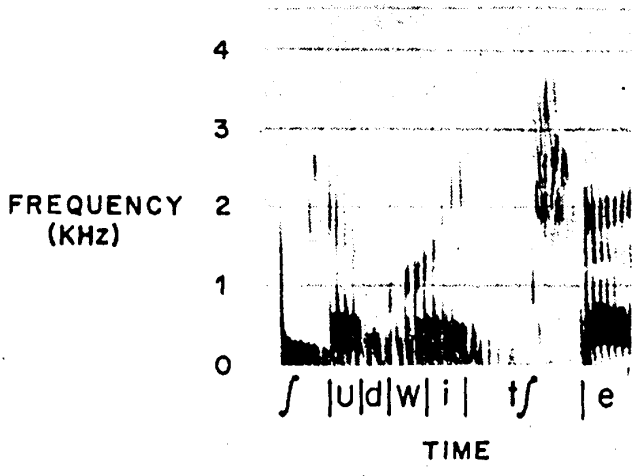


FIGURE 3-2. Example of a speech waveform illustrating different classes of sounds. The utterance is "should we chase ...".



(a)



(b)

Fig. 3.3 (a) Waveform of the utterance "Should we cha(se)"; (b) corresponding spectrogram.