

Measuring "voicing" with the S-T ACF



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$$\begin{array}{l} \text{speech} \nearrow \\ s[n] = \underset{\substack{\uparrow \\ \text{perfectly periodic} \\ \text{signal of per} = T_0}}{h[n]} + z[n] \end{array} \quad \dots \quad (1)$$

$$r_s[k] = \sum_m s[m] s[m+k]$$

From (1)

$$r_s[k] = \cancel{r_h[k]} + r_h[k] + r_z[k] \quad \dots \quad (2)$$

We have : $r_h(k = T_0) = r_h[0]$

$$\begin{aligned} (2) \Rightarrow r_s[0] &= r_h[0] + r_z[0] \\ r_s[T_0] &= r_h[0] + r_z[T_0] \end{aligned}$$

Apply a threshold : $\frac{r_s[T_0]}{r_s[0]} \underset{\substack{\downarrow \\ \text{rel power of harmonic component}}}{\geq} \text{Thr}$

$$\Rightarrow \frac{r_s[T_0]}{r_s[0]} = \frac{r_h[0]}{r_h[0] + r_z[0]}$$

rel power of harmonic component



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Relⁿ between ACF & Power spectrum

$$If \quad X(n, \omega) = \sum_{m=-\infty}^{\infty} x[m] w[n-m] e^{-j\omega m}$$

$$\& \quad S(n, \omega) = |X(n, \omega)|^2$$

$$\text{then} \quad r(n, k) \xrightarrow{\text{FT}} S(n, \omega)$$

$$\text{i.e.} \quad S(n, \omega) = \sum_{k=-\infty}^{\infty} r(n, k) e^{-j\omega k}$$

$$r(n, k) = \frac{1}{2\pi} \int_{-\pi}^{\pi} S(n, \omega) e^{j\omega k} d\omega$$

