ECLIPSE, a multimodal analysis of speech pathologies

POLYTECH.MONS

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ECLIPSE:

Evaluation fonctionnelle **CLI**nique des **P**athologies vocales et **S**uivi **E**mbarqué - Clinical functional evaluation of vocal pathologies and embedded follow-up

Partners

Context

- Production of speech: - Vibration of the vocal folds
  - Flow of pulsated air in the vocal tract
  - Radiation at the lips

- Voice disorders : biphonation, diplophony, amplitude and frequency modulation

- Vocal assessment : - Perceptual evaluation (GRBASI scale)
  - Aerodynamic and acoustic measurements
  - Stroboscopic examination
  - Self-evaluation

- Limitations of vocal assessment: - Often limited to sustained vowels
 - Unable to follow the evolution of pathology during work
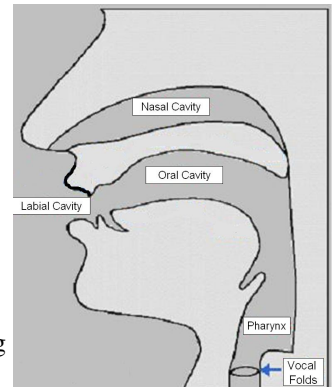
Goals

- Detection of dysperiodicities in connected speech

- Clinical station: estimation of voice pathologies (sustained vowel or connected speech), whatever the degree of hoarseness is; multimodal analysis between acoustic signal and images of the vibration of the vocal folds

- Embedded station: follow-up of the patient in his everyday life

Methods

ZZT: Zeros of the Z-Transform

Separation of speech into **glottal source** and **vocal tract response**
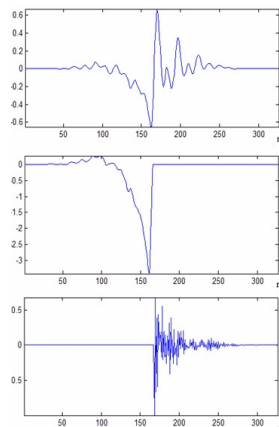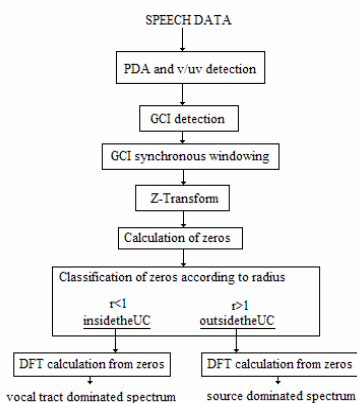
Left: algorithm of separation; Right: 1: Windowed frame of speech; 2: Glottal source; 3: Response of the vocal tract

B. Bozkurt, « Zeros of the z-transform (ZZT), representation and chirp group delay processing for the analysis of source and filter characteristics of speech signals», PhD Thesis, October 2005, FPMs

Multimodal approach

- Two modalities: **speech** and **images of vibration of vocal folds** (high speed imaging)

- Goal: extraction of information about voice pathologies from the two modalities **in synchrony**

- Diagram:
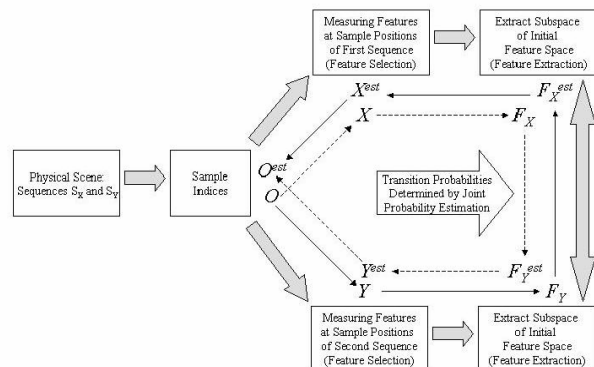
T. Butz & J.P. Thiran « From Error Probability to Information Theoretic Signal Processing», ITS Technical Report 03.03 – Group Brain, June 2003