

Motivation

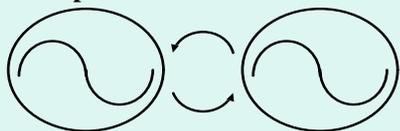
- Symmetric vocal folds: Synchronized oscillations \Rightarrow Normal voice
- Asymmetric vocal folds: Desynchronized oscillations \Rightarrow Hoarse voice
- Difficult to explore dependence of synchronization on asymmetry in human subjects
- Estimate asymmetry; Predict regime of synchronization from few sets of recording

Synchronous oscillations of vocal folds observed by high-speed Recording in Erlangen



Problem: Recording data from unknown system

coupled nonlinear oscillators



simultaneous recording of data

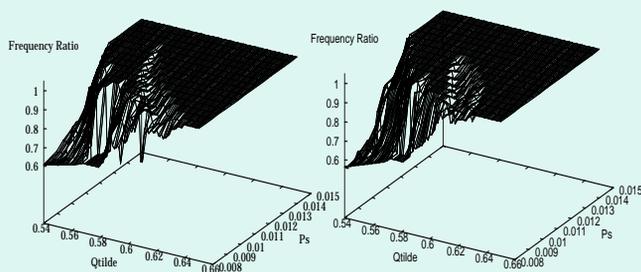
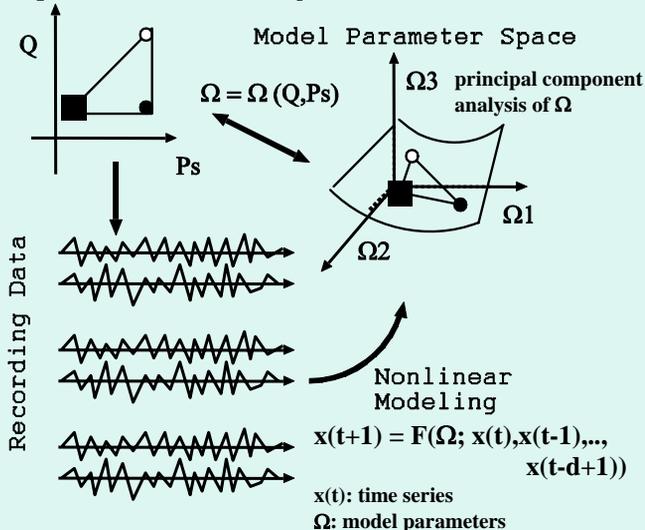


How to estimate coupling strength/asymmetry?
Is it possible to predict synchronization condition?

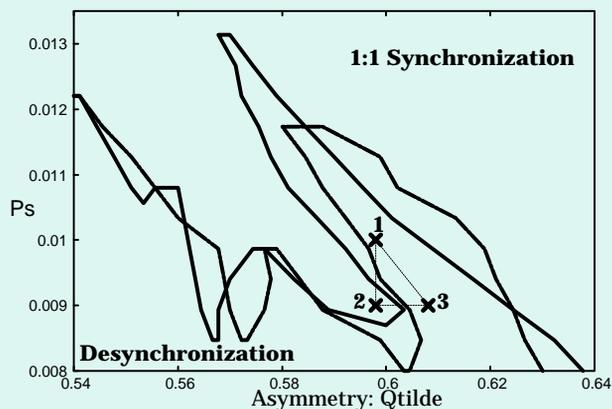
Methodology

- Nonlinear modeling and parameter extraction -

Original Parameter Space



Frequency ratio $F_{\text{right}}/F_{\text{left}}$ depending upon asymmetry and subglottal pressure (Left: original, Right: reconstructed).



Borderline between synchronization and desynchronization (Solid: original, Dotted: reconstructed, 3 points: data).

Summary and Outlook

- Predicting synchronization regime from data
- Application to Excised larynx data, High-speed recording, Voice range profile
- Clinical application