

A Pilot Study of Vibration Pattern Measurement for Facial Surface during Singing by using Scanning Vibrometer

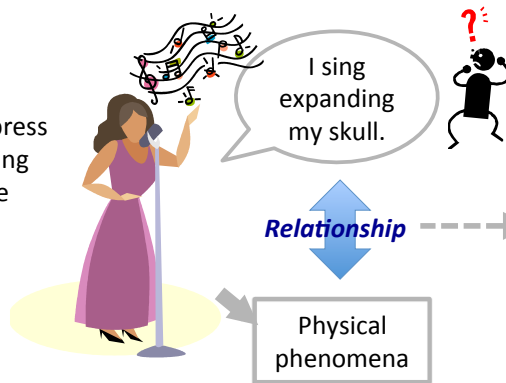


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Motivation

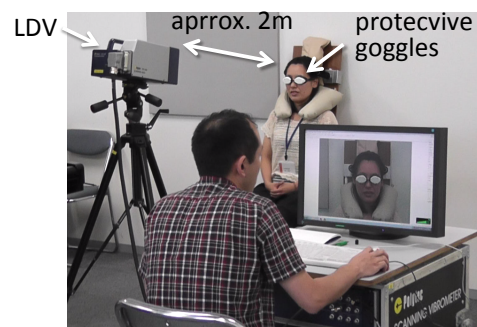
Expert singers can express their somesthesia during singing in their unique expressions.



We measured the vibration velocity pattern of the facial surface during singing for expert singers.

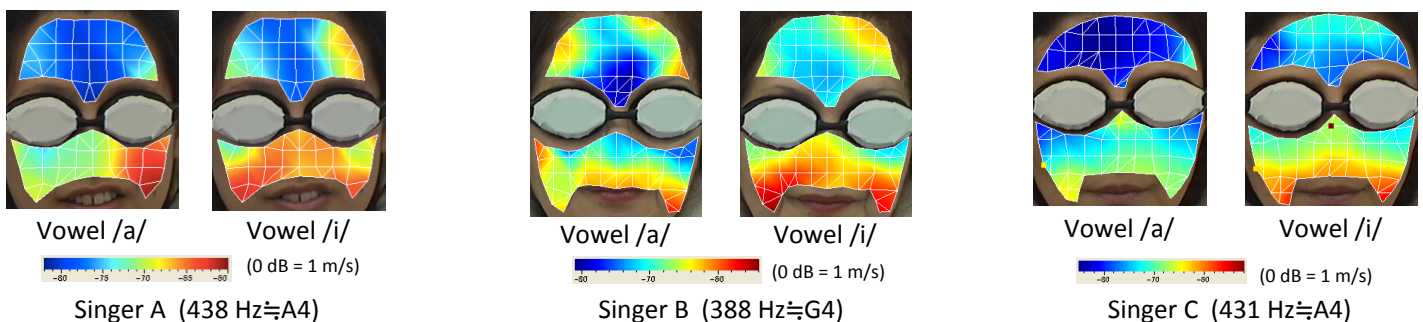
Methods

- Scanning laser Doppler vibrometer: Polytec PSV-400-M4
- Participants: 3 female expert singers
 - Singers A and B: Classical singers
 - Singer C: Musical singer
- Data acquisition
 - 100 Hz to 10 kHz of the vibration velocity
 - Triggered by singing voice
 - One measurement point was probed within 1 s.
- Experiments
 - Vowels: /a/ ↔ /i/ (falsetto, at their comfortable pitch height)
 - Pitch height: A4 ↔ F5 (falsetto)
 - Falsetto ↔ Modal



Results

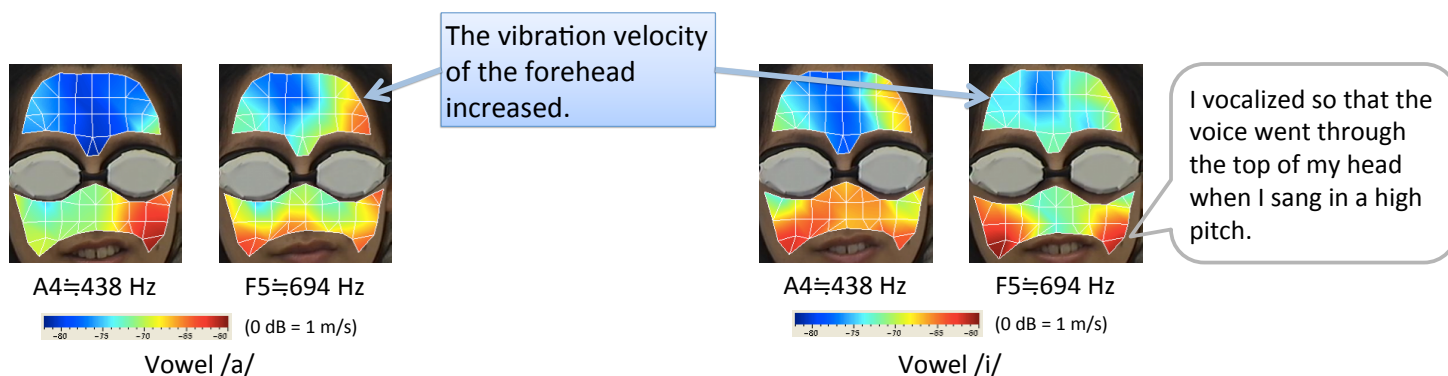
1. Vowels (falsetto)



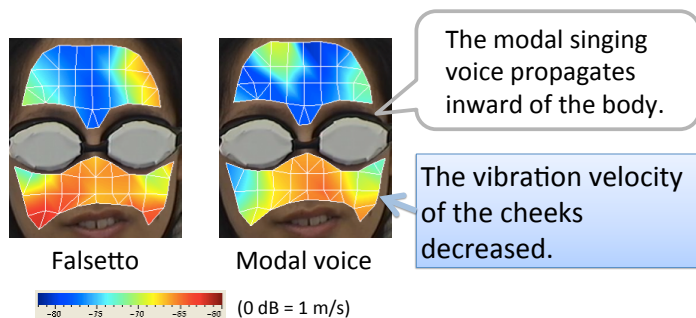
The amplitude of the vibration velocity for the vowel /i/ was larger than that for the vowel /a/.



2. Pitch height (singer A, falsetto)



3. Falsetto and Modal voices (singer A)



Conclusions

- We proposed a novel method of measuring the vibration velocity patterns of skin surfaces during singing.
- The results showed clear contrasts between the patterns for the vowels, pitch frequencies, and vocalization methods.
- This method can be used
 - to evaluate singing voices
 - as a visual feedback of a singing exercise
- We need to confirm the reproducibility of the measurement.
- The vibration patterns may be easier to relate to the somethesis than the spectra of the speech sounds or trainer's comments using unique expressions.