

# Pause-internal phonetic particles in speech communication

## An introduction to the PINTS project

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## 1 Introduction

### Pause-internal phonetic particles (PINTS)

- Breath noises
- Tongue clicks
- Laughing
- Coughing
- Hesitation particles (*uh, um*)

### Issues

- Incomplete inventory of PINTS
- Lack of unified transcription

### Areas of Focus

- Pauses in general
- Pauses in synthetic speech
- Pause modeling and implementation
- Acoustic breath noises with kinematics

## 2 Goals of this project

- Thoroughly investigate and classify pauses and PINTS
- Improve speech synthesis with human pause patterns
- Evaluate pauses within speech fluency which could influence:
  - non-native speech
  - fluency disorders
  - simultaneous interpretations
  - cognitive diseases (e.g., dementia)
- Determine speaker and language specificity of pausing behaviour and the use of pause-internal particles

## 3 Research questions & hypotheses

- What are the phonetic characteristics and communicative functions of PINTS and how do they combine in production?
  - vowel quality of hesitation particles (*uh, um*) seems to be language-specific [2]
- How do PINTS contribute to the perception of speech?
  - some PINTS shift attention to upcoming material
  - speech fluency is affected by pauses and potentially PINTS
  - breath noises have a strong chance of signaling individuality via idiosyncratic acoustics [3]
- To what degree can synthesized speech benefit from using PINTS?
  - inclusion of breath noises in synthesized speech can enhance processing and perceived naturalness [1]

## 4 Material

### Corpora

- Different languages: German, English, French (and others to be determined)
- Read and spontaneous speech

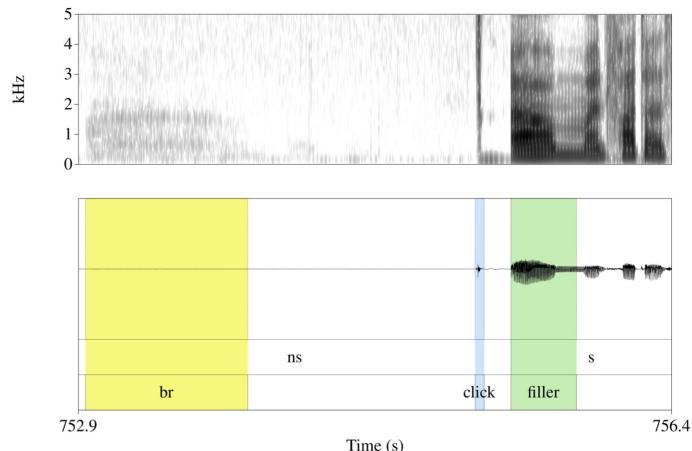
### New Recordings

- Read and spontaneous speech of native German speakers
- Including speech under physical stress (e.g., treadmill running)
- Recordings of audio, Electroglossography (EGG) and Respiratory Inductance Plethysmography (RIP)

### Methods

- Production experiments (distribution and acoustic characteristics of pause-internal particles across speakers and languages)
- Perception experiments (acceptance and naturalness of pauses and particles in natural and synthesized speech)

## 5 Example



**Figure 1:** The first tier is subdivided in non-speech (ns) and speech (s), the second tier includes PINTS such as breathing (br), clicks, and fillers (here: *um*).

## References

- [1] N. Braunschweiler and L. Chen. "Automatic detection of inhalation breath pauses for improved pause modelling in HMM-TTS". In: *8th ISCA Workshop on Speech Synthesis*. July. 2013, pp. 1–6.
- [2] M. Candea, I. Vasilescu, and M. Adda-Decker. "Inter- and intra-language acoustic analysis of autonomous fillers". In: *DISS 05, Disfluency in Spontaneous Speech Workshop, Sep 2005, Aix-en-Provence, France*. 2008, pp. 47–52.
- [3] J. Trouvain. "Affektäußerungen in Sprachkorpora". In: *Electronic Speech Signal Processing, ESSV 2010, Proceedings of the 21st Conference, Berlin, 8-10 September 2010*. Ed. by H. Mixdorff. Vol. 58. Studientexte zur Sprachkommunikation. TUDpress, Dresden, 2010, pp. 64–70.