# Automatic recognition and transcription of unpitched percussive sounds

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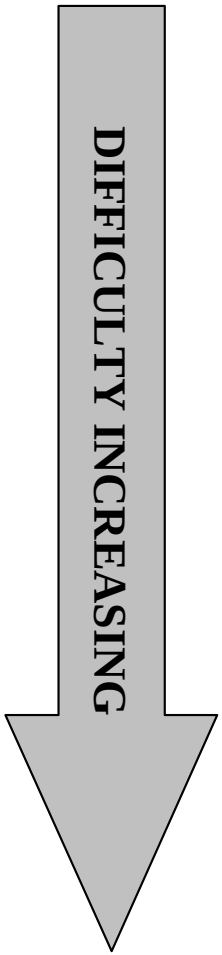
# Introduction

- **Transcription:**
  - Recognise percussive content from a music performance.
  - Generate some symbolic representation, e.g., score or MIDI file.
- **Manual vs. automatic process.**
  - Amount of training required.
  - Deterministicity.
  - Amount of work required for transcription.
- **Applications:**
  - Manual:
    - Transcription of a musical piece into a score.
  - Automatic enables also among others:
    - Object-based coding and scene description (e.g., MPEG7).
    - Smart music editor (for professional use).
    - Intuitive input medium for music applications (amateurs).
    - Compact representation for databases.

# Target (input) signals




- **Individual drum hits.**
- **Monophonic percussive signals.**
  - Only drums sounds and only one drum produces sound at each time.
  - ”Artificial” category (except for beatboxing).
- **Polyphonic percussive signals.**
  - Drum track of a normal musical piece.
- **Polyphonic music.**
  - Also other instruments present.

# Methods

- **"Traditional" pattern recognition approach:**
  - Signal segmentation.
    - Take only relevant part(s) of the signal, e.g., sound event onset detection.
  - Feature extraction.
    - Compact representation, attributes of the segment.
  - Classification.
    - Determine what the segment contains.
  - Working solution with low-complexity signals, but polyphonic music causes problems.
- **Source separation approaches.**
  - Separate drum track from polyphonic music.
  - Segregate each instrument into a separate stream.
- **Musicological modelling.**
  - Language models efficient in speech recognition.
  - Looks promising.

# Related research topics

- **Singing transcription.**
- **Polyphonic melody transcription.**
- **Chord recognition.**
- **Musical genre recognition.**
- **Instrument recognition.**
- **Source separation.**
- **Metrical structure estimation (tempo, measures).**
- **Musical piece structure analysis.**
- **Pattern and speech recognition.**
- **Language modelling**

# More information

- **Introduction to the problem and solutions so far:**
  - FitzGerald, D. and Paulus, J., ”Unpitched percussion transcription,” in *Signal processing methods for music transcription*, eds. Klapuri, A., and Davy, M., Springer-Verlag, 2006, in press.
- **Other publications:**
  - http://www.cs.tut.fi/~paulus/
- **Demonstrations related to the publications:**
  - http://www.cs.tut.fi/~paulus/demo/
- **Audio Research Group:**
  - http://www.cs.tut.fi/sgn/arg/