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## MIDI To Score Automated Drum Transcription

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## OVERVIEW

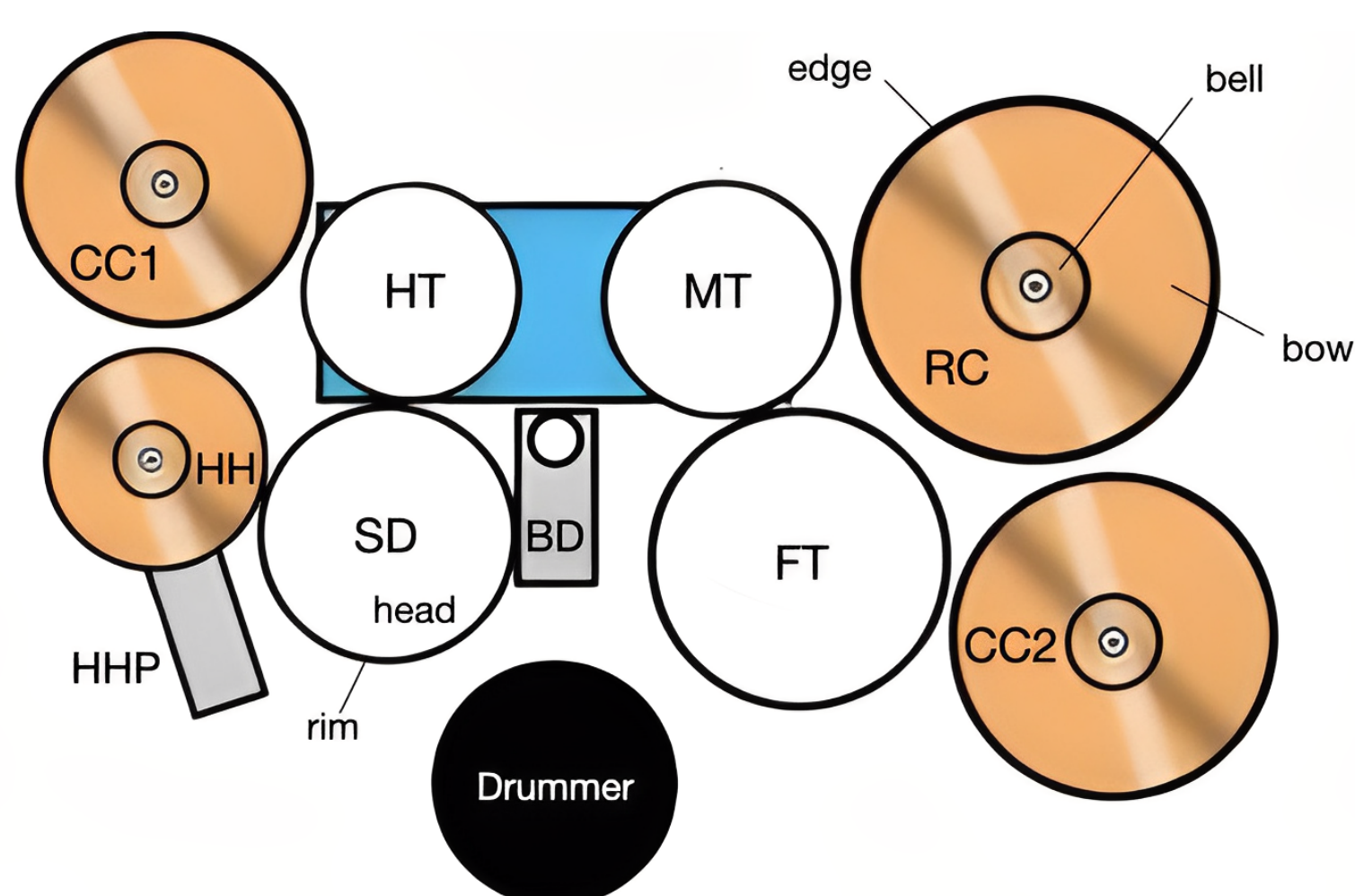
We propose our method for automated drum transcription, which is a special case of music transcription of polyphonic instruments.

We implemented this method in `qparse`, a C++ and python library able to build a whole dataset of music scores from a set of MIDI recorded performances.

## DRUM NOTATION

Drums have a notation specific to each of the elements, and for also the way that the drummer has to hit the drum or cymbal.

## Elements of the drumkit

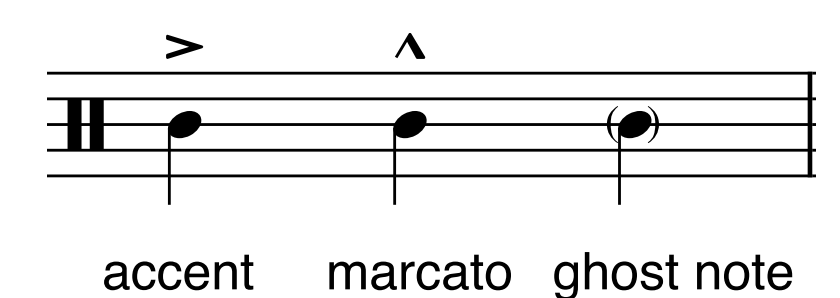


Pitches and note heads denoting the drum kit elements and modes for two different notations: US and Agostini.

- Bass Drum (BD, also called *kick*),
- Snare Drum (SD),
- 3 toms, from left to right: High (HT), Medium (MT) and Floor (FT),
- Hi-Hat (HH): the two cymbals that can be joined (*open*) or disjoined (*closed*) using a pedal,
- *ride* (RC), hit on the *bow* (the body) or the *bell* (the top part) of the cymbal,
- *crash* (CC) or *splash* (SC), usually hit on the *edge* to produce an explosive sound.

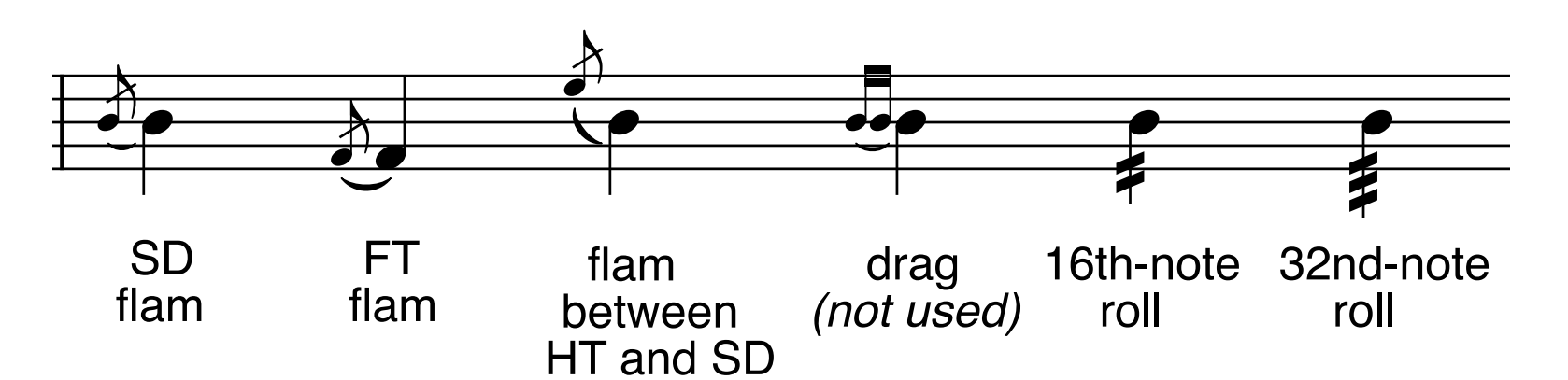
## Dynamics

- *accent*: indicates that a particular technique ought to be used, according to the related pitch,
- *ghost notes*: notes with low dynamics, but played firmly.



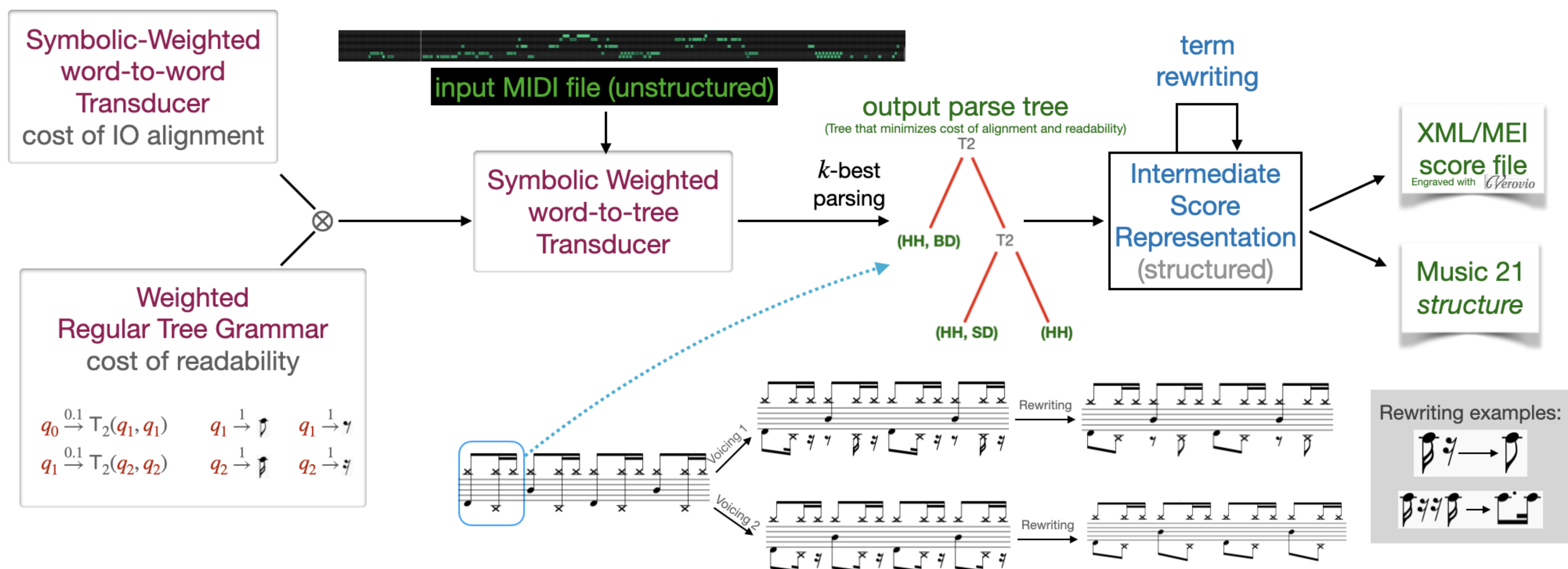
## Ornaments

- *flam*: figure made of one grace note, played with lower intensity and slightly ahead the main note,
- *drag*: two grace notes are played with the same hand, ahead of a main note played by the other hand.



## TRANSCRIPTION USING WEIGHTED PARSING TECHNIQUES

In order to transcribe a MIDI file into drum notation, we use weighted parsing techniques [1]. At the beginning, a transducer calculates the cost of aligning the MIDI and the output score, and detects MIDI errors. Moreover, a weighted tree automata specifies the language of the preferred output notation [2]. Together, they perform the transcription as the search for an optimal parse tree. To make the output easy to read, we then proceed with some post-processing on the parse tree: separating voices (one tree per voice), and rewriting for minimal notation.

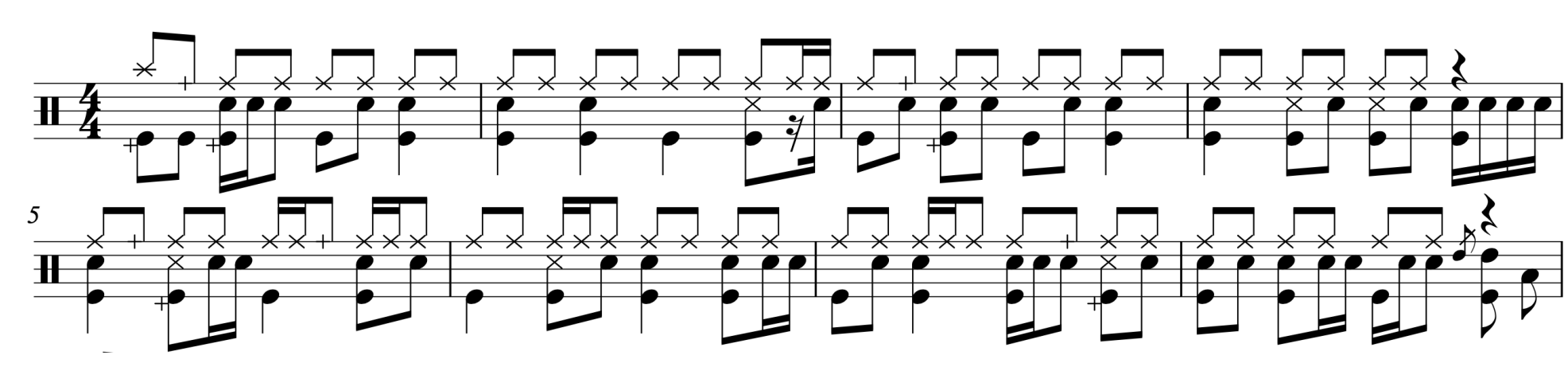


## EVALUATION

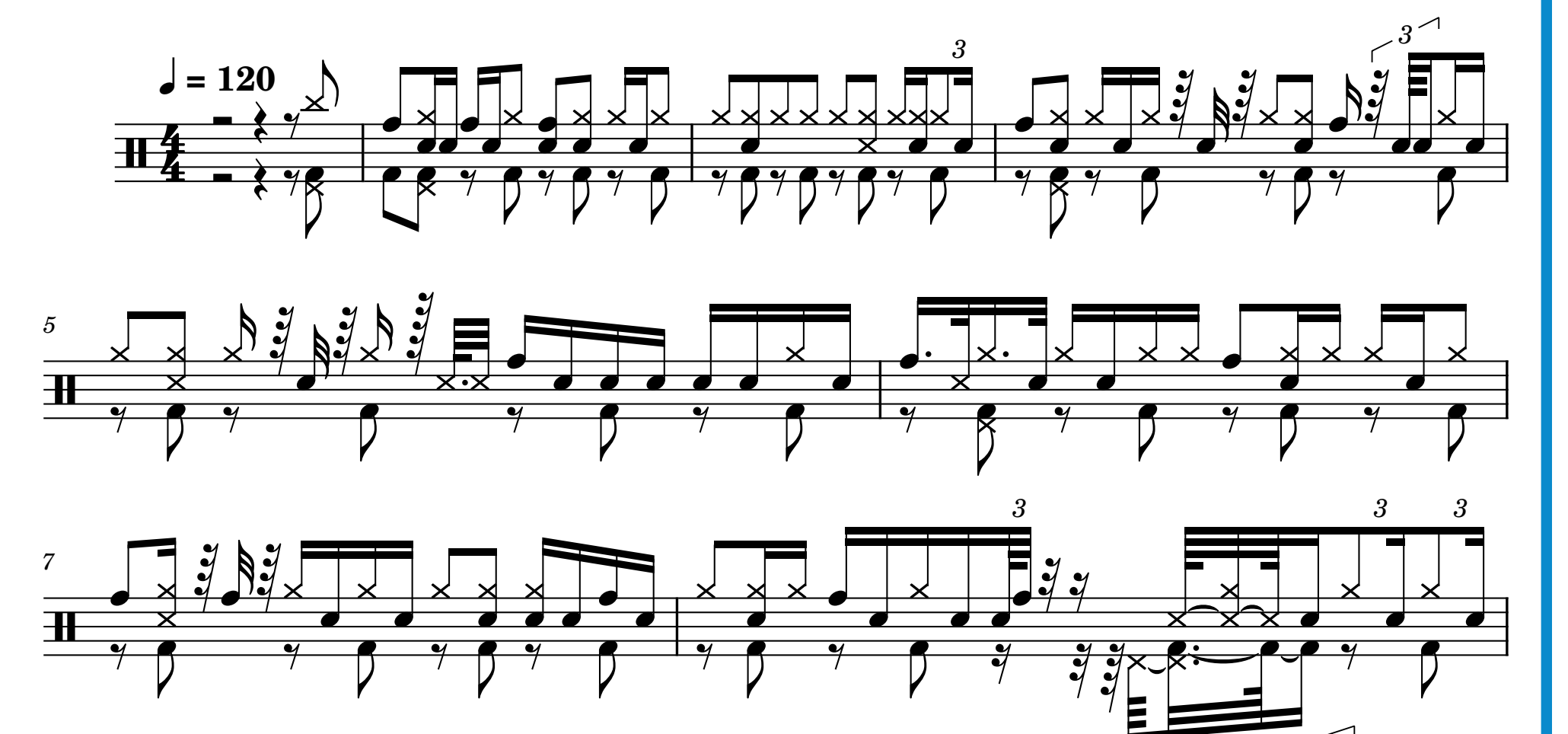
In our experiment, we used the Magenta's Groove MIDI Dataset [3]:

- proposes 1,150 audio files (~22,000 measures of drumming),
- diverse styles (e.g. funk, rock, jazz...),
- recorded from professional drummers performing on an electronic drum kit ROLAND T-11,
- recorded with a metronome: no need for a preliminary beat detection task.

Here is an example with one of the files from the Google's Groove MIDI Dataset. We have no ground truth to make a quantitative evaluation, so we can only proceed to qualitative comparison between our result, and MIDI output by score typesetting softwares.



Transcription by our method.



Transcription by MuseScore.

## REFERENCES

- [1] Manfred Droste, Werner Kuich, and Heiko Vogler. *Handbook of weighted automata*. Springer Science & Business Media, 2009.
- [2] Florent Jacquemard and Lydia Rodriguez-de La Nava. *Symbolic Weighted Language Models, Quantitative Parsing and Automated Music Transcription*. Springer, 2022.
- [3] Jon Gillick, Adam Roberts, Jesse Engel, Douglas Eck, and David Bamman. Learning to groove with inverse sequence transformations. In *International Conference on Machine Learning (ICML)*, 2019.

## LINKS

Link to `qparse` on gitlab:  
<https://gitlab.inria.fr/qparse/qparselib>

See more examples, and learn more about `qparse`:  
<https://qparse.gitlabpages.inria.fr/>