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EVALUATING MUSICAL SCORE DIFFERENCE
A TWO-LEVEL COMPARISON

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Goal: Have a diff tool for music scores, similar to the Unix diff utility

Why:
• Collaborative score editing
• Music transcription evaluation
• OMR evaluation

Issues:
• the line structure of a XML file does not reflect the its musical structure \(\rightarrow\) not meaningful to apply a text diff to XML scores.
• What exactly we evaluate? Graphical content or musical content?

Our Approach

Two comparison on two different objectives:
1. Syntactic level: the graphical content of the score (beamings, tuplets, dots, ties, etc.).
2. Semantic level: the musical content of the score (notes duration and pitch).

For both cases the output is:
• a list of the modifications to transform one score into the other,
• a value \(\Delta\), that evaluate the difference between the two scores.

Syntaxic difference

We model the graphical score with notation trees [5]:
- Beaming Tree
- Tuplet Tree

\[
\begin{align*}
1 \rightarrow 2: \Delta_SYN &= 0, \text{ small differences in beamings, noteheads, ties and tuplets } \\
1 \rightarrow 3: \Delta_SYN &= 32, \text{ all the score is different because of the longer C in the first bar }
\end{align*}
\]

Semantic difference

We model the score content with timelines (similar to MIDI files).
From each timeline we:
1. build a sequence of couples \(<\text{pitch}, \text{duration}>>\).
2. Compute an edit distance with the usual operations (insert, delete and update) [4]

This difference is feature-based:
• pitch only,
• durations only,
• both features.

\[
\Delta_SEM = \alpha \cdot \text{#UPD} + \beta \cdot \text{#INS} + \gamma \cdot \text{#DEL} \
\]
\[
\text{#events}
\]

where \(\alpha, \beta, \gamma\) are user-defined cost/weight values.

Implementation

Partial implementation in the digital music library NEUMA (neuma.huma-num.fr/).

Two REST API:
• Input: 2 midi files
• Input: 2 music-xml or MEI scores

A graphical representation with Verovio web library.

Example of the syntactic difference computation and visualization (with Verovio) on two monophonic scores. The edit operations are noted by different figures: square (insert), triangle (update), rhombus (delete).

REFERENCES

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