AN OPENSOURCE WEB-BASED PATTERN ANNOTATION FRAMEWORK - PAF

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EXTENDED ABSTRACT

We present a web-based annotation framework for musical patterns - PAF (Pattern Annotation Framework). The PAF tool visualizes the score on which an annotator can annotate patterns in a music sheet by selecting the beginning and the end of the desired segment. A pattern is a set of events, usually exactly or inexactly repeated multiple times within the observed music piece. In the PAF tool, the score can also be played back for additional aid to the annotator. Besides the annotated patterns and the annotator's background data, the tool tracks the time durations of the annotation process (time elapsed between the patterns).

Our motivation for the development of the annotation tool lays in the time-consuming and error-prone process of gathering annotations in a physical form. Recently, Ren et al. [2] performed a study, focusing on the agreement between 12 annotators, who annotated six music excerpts in the HEMAN (Human Estimations of Musically Agreeing Notes) dataset, which is based on the previous work by Nieto and Farbood [1]. They analysed the annotations and found considerable disagreement between the annotators. The annotators provided their annotations in a physical form—on a piece of paper. The results were later digitized. The digitization of annotations introduced a variety of problems, starting with the significant time needed to complete the digitization before any analysis could be done. Also, the hand-written annotations could be difficult to read, while the annotators could also make a mistake when entering the data.

The PAF tool attempts to overcome the aforementioned challenges. With a web-based platform, the annotators can deliver responses regardless of their location. The tool also automatically collects the data in a digitized form, overcoming the problem of readability and digitization mistakes. Moreover, the online tool offers user tracking by collecting the data about the annotation process itself, which can unveil additional information about the annotated patterns in terms of relevance and complexity. Overall, the PAF tool significantly decreases the time needed to distribute and collect annotations.

The annotation tool[1] was developed using the Python framework Django, the MIDI Player library[2] for audio and the Verovio[3] library for visual representation of the music scores. The usage of the framework requires user registration[4], where the user enters their basic data (email, password), as well as additional background information—currently gender and age, the number of years of playing a music instrument and attending music theory classes, and the information about their University and study programme.

The tool, shown in Figure 1, consists of a single layout, visualizing a music score. The user can annotate the music patterns by clicking on the beginning and the end of the desired range in the score and set the relevance (1–3) of an individual annotated pattern. To aid the annotator, the displayed score can be played (synthesized piano sound). While playing the score, the nearest note in the score is marked. While developing

[1] Tool available at http://framework.musiclab.si
[2] https://github.com/rism-ch/midi-player
[3] https://www.verovio.org
[4] The registration includes a consent about the usage of their provided data for this type of analysis (GDPR compliance)

the framework, we focused on the responsiveness of the layout to accommodate different screens and devices (mobile, desktop). In case of a smaller display size, the score is split into multiple sheets.

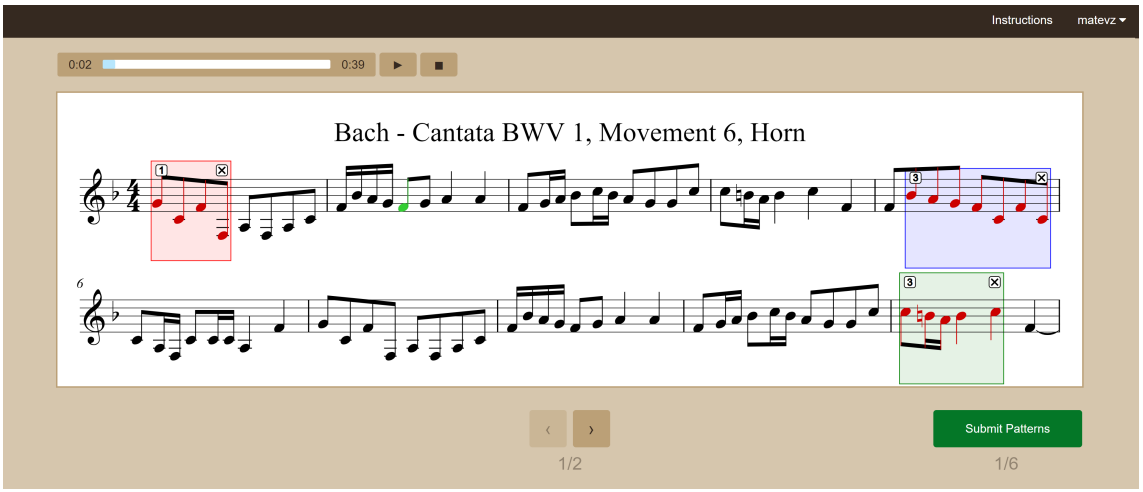

Figure 1. The annotation tool interface. The patterns are annotated using click operations. Pattern relevance is shown in the top left corner for each annotation independently, it changes when clicked. Patterns can be deleted using the X button (top right corner). The interface is responsive and adjusts the portion of the music sheet to the size of the screen, splitting the rest into a page-like workbook (bottom middle arrow keys). The player in the top left corner of the screen plays the shown score. While playing, the position of the currently played note is marked in green.

The PAF tool collects the data about the annotator and the annotation process, to enable analysis of relations between the user's experience/background and the annotations. The tool tracks the user's actions, such as the start and end time of an individual annotation and its changes, midi player actions and other.

To test the annotation tool, we performed an annotation experiment using the HEMAN dataset [3]. We gathered the annotations of 13 annotators. Our analysis focused on the consistency between the annotators and the potential influence of the music education background on the annotations. In addition, the usability of the PAF tool was analyzed, which indicated few drawbacks, such as vagueness of the pattern importance marker (which included 3 levels with the first being selected as default instead of an undefined state) and the lack of an index page with an option to choose the order of music pieces for annotation. In the future, we plan to extend the PAF with better user tracking, improved user experience and additional active (pattern relevance argumentation, automation of repeated patterns annotations) and passive statistics of data gathering (automatic analysis of the time spent for individual patterns, the number of corrections per pattern etc). By open-sourcing the tool (available at: `https://bitbucket.org/ul-fri-lgm/patternannotationframework`), we hope to aid other researchers in the MIR field dealing with pattern-related data gathering, and to invite the interested researchers to contribute additional features to the PAF tool.

REFERENCES

[1] Oriol Nieto and Morwaread M. Farbood. Perceptual evaluation of automatically extracted musical motives. In *Proceedings of the 12th International Conference on Music Perception and Cognition*, pages 723–727, 2012.

[2] Iris Yuping Ren, Hendrik Vincent Koops, Anja Volk, and Wouter Swierstra. In Search of the Consensus Among Musical Pattern Discovery Algorithms. In *Proceedings of the International Conference on Music Information Retrieval (ISMIR)*, pages 671–678, Suzhou, China, 2017.

[3] Iris Yuping Ren, Oriol Nieto, Hendrik Vincent Koops, Anja Volk, and Wouter Swierstra. Investigating Musical Pattern Ambiguity in a Human Annotated Dataset. In *Proceedings of the International Conference on Music Perception and Cognition*, pages 1–6, 2018.