DIG THAT LICK: EXPLORING MELODIC PATTERNS IN JAZZ IMPROVISATION

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EXTENDED ABSTRACT

Melodic patterns ('licks', 'formulas') form a crucial component of jazz improvisation [2, 5, 6], which gives rise to several research questions, e. g., the extent of pattern usage in improvisations, transmission of patterns between players over time, and style- and time-dependent pattern usage. The international project "Dig That Lick: Analysing Large-Scale Data for Melodic Patterns in Jazz Performances" (DTL) set out to investigate these questions using an interdisciplinary approach combining musicology, computer science, MIR, and jazz research. One of the main outcomes of the project is the "Dig That Lick Pattern Similarity Search" web application, which allows users to search for exact or approximate patterns in databases of jazz solos.

The web interface allows for finding patterns similar to a given query. The calculation of search results uses the Levenshtein distance (edit distance), utilizing the fast implementation of the algorithm of the underlying PostgreSQL database system. Edit distances have been shown (e. g., [4]) to be a good approximation to similarity judgements of melodies by human experts. The similarity search operates on three different pattern databases, each containing complete sets of pitch and interval n-gram instances with up to 20 elements.

The default is the "Dig That Lick" database, which is based on note tracks from more than 1,700 solo parts from over 1,000 audio tracks, automatically extracted using state-of-the-art machine learning technology [1, 3]. This database contains about 6 million instances of pitch n-grams and 5.6 million instances of interval n-grams. Metadata for this database was assembled using a bespoke ontology and is accessed via the Digital Music Lab [1] and SPARQL requests. The second pattern database is derived from the Weimar Jazz Database[2] (3.9M/3.7M pitch/interval n-gram instances, resp.), and the third one is derived from the Charlie Parker Omnibook (300,000 pitch and interval n-gram instances).

After entering a query pattern via a virtual keyboard or as a list of elements and choosing a representation (pitch or interval), similar n-grams will be retrieved from the selected databases. To further control the result set, the search interface provides options for parameters such as 'minimum similarity' (calculated using the Levenshtein distance), 'maximum length difference' (allowing for n-grams of differing lengths), or the preservation of melodic contour and pitch range. All searches can be refined using metadata filters for performers, instruments, recording years, etc.

Search results are presented in tabular form together with two kinds of graphical representation allowing for visual inspection: various n-gram network graphs (Fig. 1) and a timeline chart, both generated using the D3.js data visualization library[3]. The timeline chart depicts when and by which performer pattern instances were played. In the case of the network graphs, there are options to group n-grams utilizing a radial layout, e. g., by metadata attributes, by similarity to the query and by n-gram value. Additionally, two pattern explorers are available: the first one is a tree representation of all pattern instances (radial pattern tree), and the second is a pattern family explorer, which is a network representation of the similarities between all distinct n-gram values in the result set.

[1] http://dml.city.ac.uk/
[2] https://jazzomat.hfm-weimar.de/dbformat/dboverview.html
[3] https://d3js.org/

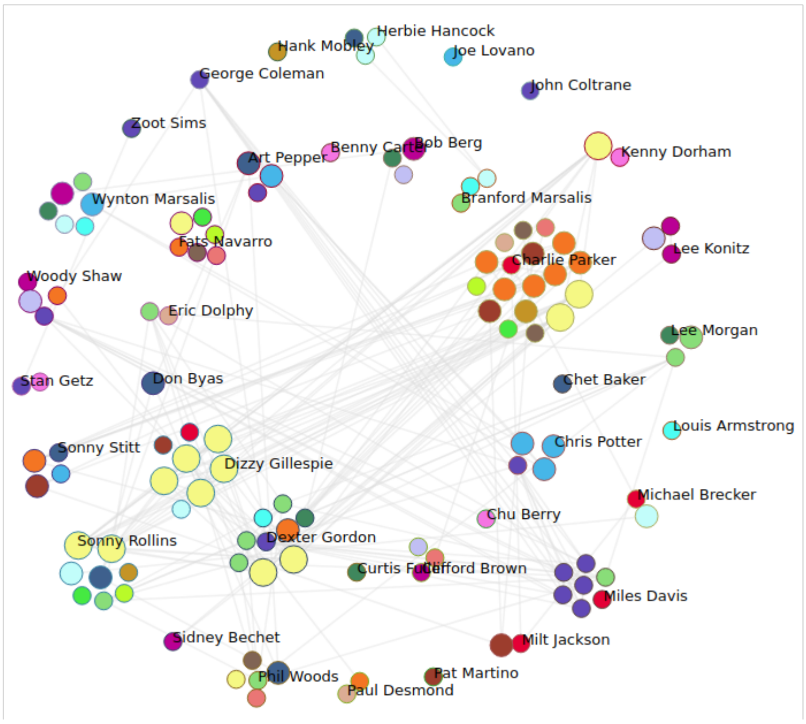

Figure 1. Network graph for interval pattern -1,-2,-1,3,3,3,-1,-2 grouped by performer; the largest clusters represent those patterns played by Charlie Parker, Dizzy Gillespie, Sonny Rollins, and Dexter Gordon. Node colours denote identical patterns, which are connected by edges. Node size represents the degree of similarity to the query, where larger means more similar.

All visualizations allow for the interactive exploration of the search results by playing audio snippets corresponding to the n-gram instances, and by displaying the metadata associated with each pattern instance.

In sum, the DTL Pattern Similarity Search is an example of an integrated MIR system, where automated melody extraction, metadata aggregation, data visualization, and symbolic retrieval techniques converge to provide novel surplus value for musicological research.

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