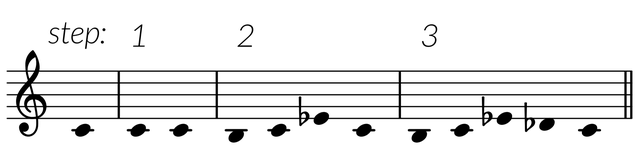
Ist das Kunst oder kann das weg?
Ein Experiment zu KI-generierten Chorälen

Jason Ackermann, Ricarda Ernsperger, Adam Möslein, Hendrik Weiß, & Fabian C. Moss

Institut für Musikforschung -- Julius-Maximilians-Universität Würzburg

Basic Principles

Melodies of ālāp performances can be understood as the result of **recursive elaboration** *of* **notes** *and* **intervals**.

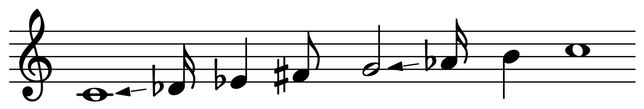


A melody derived in three steps.

Elaborations of notes include **duplication** *(1) and left or right* **neighbors** *(2). Interval elaborations include* **passing notes** *(3) and* **linear fills**.

Modes and Tonal Hierarchy

A mode is a scale together with a **hierarchy of stability** *among the scale degrees and restrictions on their* **movement direction**.

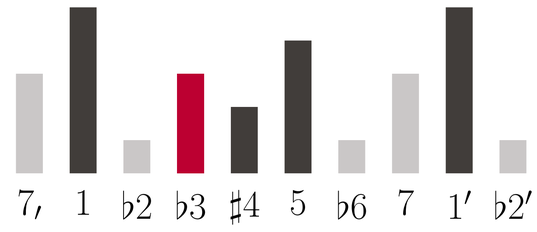


The tonal hiearchy of rāga Multānī.

pitch	*1*	*♭2*	*♭3*	*♯4*	*5*	*♭6*	*7*
direction	↕	↓	↕	↕	↕	↓	↕
stability	*4*	*0*	*2*	*1*	*3*	*0*	*2*

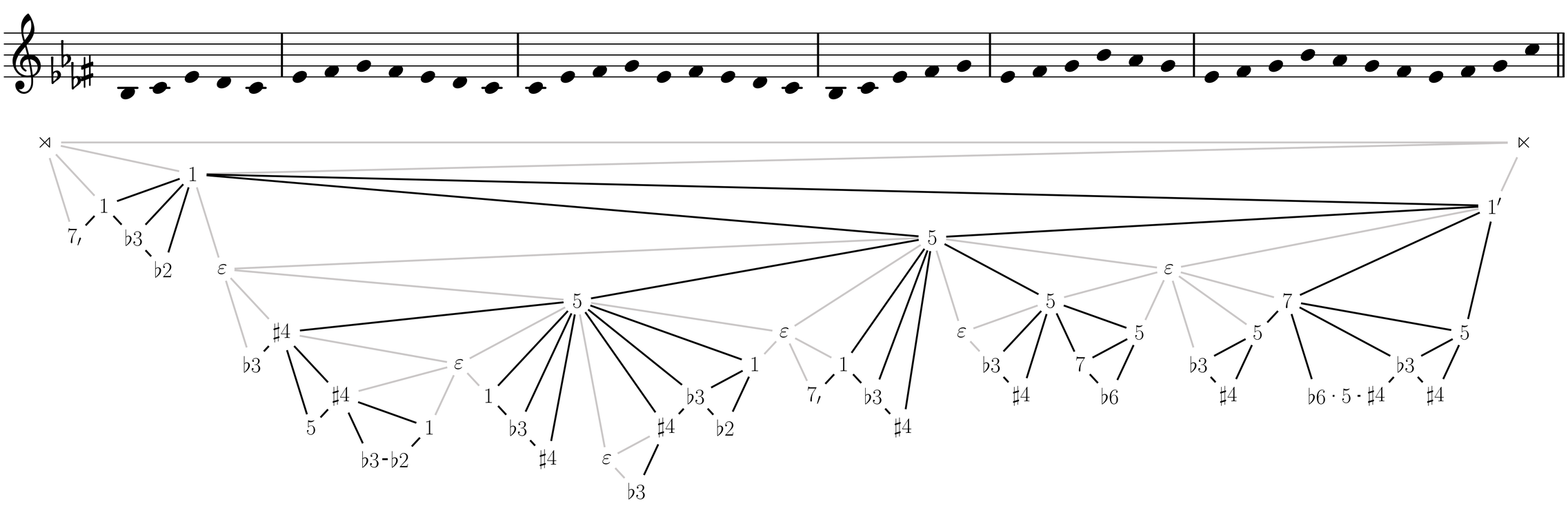
Distant Neighbors

Neighbors and passing notes can be **non-adjacent** *if they respect the tonal hierarchy of the mode.*



The generalized neighbors of ♭3 (dark).

A pitch p_n is a **generalized neighbor** *of some pitch p if no pitch between p and p_n is more stable than p and p_n.*



Selected phrases, in order of performance, from the ascending part of an ālāp in rāga Multānī, recorded by the sitarist Dharambir Singh.

Formal Representation

Since both notes and intervals are elaborated, melodies are represented as graphs with **notes as nodes** *and* **intervals as edges**. *The elaboration operations then form an edge-replacement* **graph grammar**.

Interval elaborations replace an edge with a new subgraph:

$$(n_1 \to n_2) \longrightarrow (n_1 \to n' \to n_2)$$

Note elaboration also replace edges but consider only one of the nodes:

$$(n_1 \to *) \longrightarrow (n_1 \to n' \to *)$$

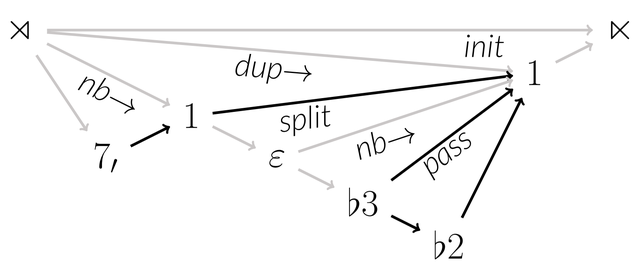
Independent parts of the graph can be separated explicitly by introducing an **empty node**:

$$(n_1 \to n_2) \longrightarrow (n_1 \to \varepsilon \to n_2)$$

Another advantage of graphs is that they can capture more complex structures such as **polyphonic networks**.

Graphical Notation

Since the graph of a monophonic melody is linear, its derivation can be visualized by an **outerplanar graph** *[1], where each polygon represents an edge replacement.*



Indepencene is indicated by ε-nodes. Adjacent edges are shown in light gray, revealing the differences between note and interval elaborations.

References

[1] *J. Yust. "The Geometry of Melodic, Harmonic, and Metrical Hierarchy". In: Mathematics and Computation in Music. Ed. by E. Chew, A. Childs, and C.-H. Chuan. Communications in Computer and Information Science. 2009, pp. 180–192.*

Link to the Experiment

`http://fabianmoss.github.io/ai-chorales`

Dieses Experiment ist im Rahmen des Seminars ``Themen der Digitalen Musikforschung'' (Wintersemester 2025/26) am Institut für Musikforschung entstanden.

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