

1. Background

Wave Function Collapse (WFC)

- Procedural content generation algorithm based on constraint programming and inspired by quantum mechanics

Hierarchical Wave Function Collapse (HWFC)

- Hierarchical structure proposed by Varga and Bidarra [1] involving canvases and inherited constraints throughout the layers



2. Research goal

Research question

- How do we convert arbitrary music into a representation that our model can use?
- What music representation format will we support?
- From a given piece of music, can we translate it to the hierarchical structure and infer the constraints that the piece adheres to?

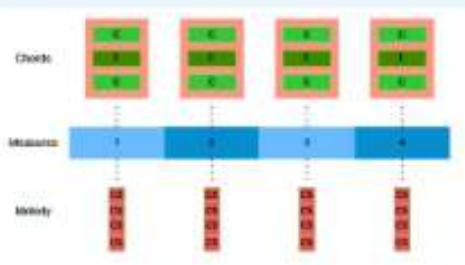
3. Methodology

Proposed new structure

- Separates Chords from melody and instead links them through measures

MidiAnalyser

- Allows users to infer select constraints that they wish to infer from a given piece of music represented in MIDI format



4. Results

Constraints analysed

- Melody in range: given a range of notes, is the melody in the range?
- Ascending/Descending Melody: are the melody notes of the measure ascending/descending?
- Melody/Chord in key: Is the melody/chord in a specific musical key?

Measure	In range	Melody desc	Melody asc	Melody in key
1	✓	✓	✓	✓
2	✓	✓	✓	✓
3	✓	✓	✓	✓
4	✓	✓	✓	✓
5	✓	✓	✓	✓
6	✓	✓	✓	✓
7	✓	✓	✓	✓
8	✓	✓	✓	✓
9	✓	✓	✓	✓
10	✓	✓	✓	✓
11	✓	✓	✓	✓
12	✓	✓	✓	✓
13	✓	✓	✓	✓
14	✓	✓	✓	✓
15	✓	✓	✓	✓
16	✓	✓	✓	✓
17	✓	✓	✓	✓
18	✓	✓	✓	✓
19	✓	✓	✓	✓

References:

[1] Varga, P. P., & Bidarra, R. (2023). Procedural mixed-initiative music composition with hierarchical Wave Function Collapse

5. Discussion

Limitations:

- Currently, constraints that rely on a chord being played at the same time are not compatible
- Separating chord and melody notes relies on external library and might not perform reliably on music with many short notes

Conclusion

- This research explored the possibilities for the inference of pre-defined constraints on arbitrary music pieces by improving upon a model based on HWFC