Procedural music generation with Hierarchical Wave Function Collapse: Visualizing HWFC-generated music and "locking in" parts of the output for later reiteration

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Background

The Wave Function Collapse (WFC) is a procedural content generation algorithm effective for generating randomized patterns and maps that resemble an input sample.

This algorithm was extended upon by Varga and Bidarra [1]. Their model uses a hierarchical approach capable of generating a music output consisting of chords and melody notes.

Motivation & Goal

Creating music is an iterative process, where producing a satisfactory piece requires multiple versions that slightly improve on one another.

We propose an extension to Varga and Bidarra's model [1], that will allow the composer to keep selected parts of the output for later generations, eliminating the need to start from scratch after each one.

Method

- Survey music visualization techniques and compare their usability for our goal

- Explore user interface interaction methods that allow the composer to most efficiently select desired parts of the output

- Design a model based on our findings

- Implement and incorporate our designed model into the existing application developed by Varga [2].

Design

We based our design on the piano roll layout, with horizontal axis representing a notes duration, and vertical its pitch. The composer can select elements by dragging their cursor across the canvas or by pressing section labels.
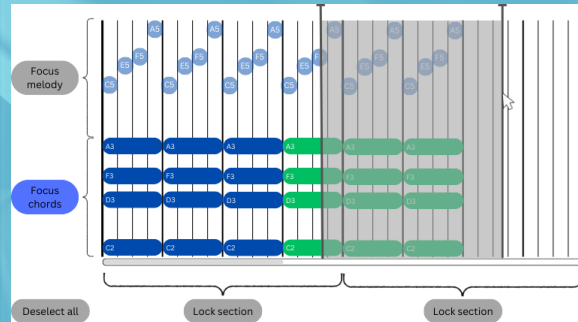
Implementation

Conclusion

Our model enhances the user experience and allows for creating a much more sound and complete piece of music.

By enhancing the mixed-initiative approach, it broadens the amount of control the user has over the generated piece and reduces the reliance on the algorithm.

Limitations

Our implementation is on a separate page of the application to not interfere with the rest of the UI but would be much better incorporated into the main page.

Conducting a user study would significantly enhance our research by providing empirical evidence on the usability and effectiveness of our design.

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References

[1] Pál Patrik Varga and Rafael Bidarra. 2024. Harmony in Hierarchy: Mixed-Initiative Music Composition Inspired by WFC. Submitted for publication.
[2] Pál Patrik Varga and Rafael Bidarra. 2023. ProceduraLiszt Repository. https: //github.com/ProceduraLisztDevs/proceduraliszt