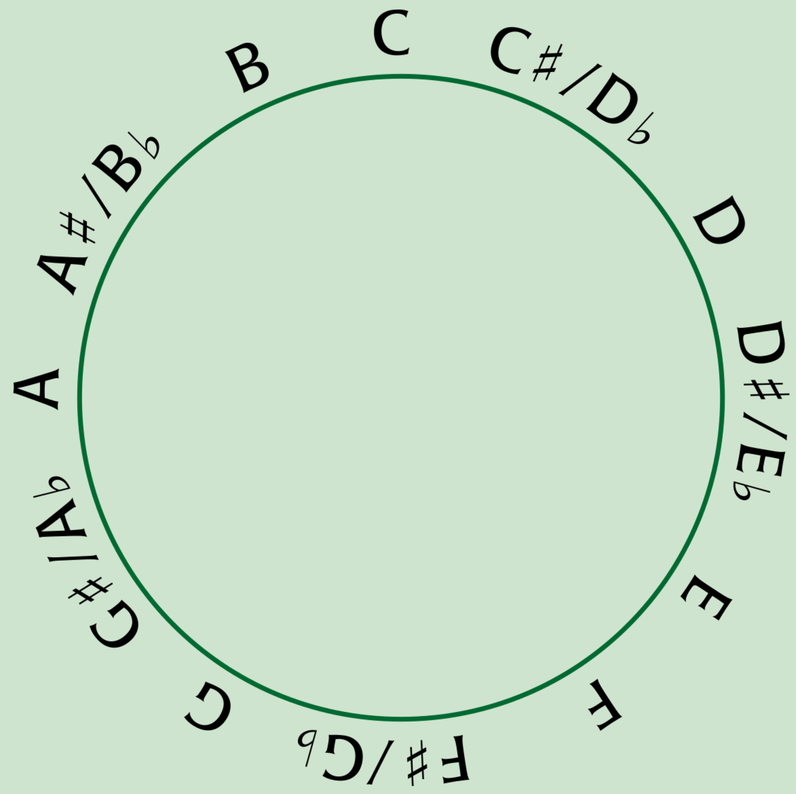
From Pitches to Harmony: Developing a Computational Language for Music Theory

Introduction

The study of music theory and analysis has traditionally relied on human interpretation and manual exploration of musical structures (pitches, intervals, chords, scales and harmonies). As the field of computational musicology grows, there is an increasing need for robust tools that can systematically model, analyze, and generate these complex musical elements.

Objective

This research project presents a specialized Python library, called the **pitchtypes** library, created to solve these issues by offering a comprehensive framework for representing and manipulating musical structures computationally.



Features:

- Comprehensive framework for musical structure representation
- Detailed modeling of musical concepts
- Efficient computational processing
- Music generation capabilities

Challenges	Applications

Challenges:
• Versatility: Allow for the creation of any musical structure
• Performance: Overcome Python's performance limitations
 	
Solutions:
• Flexible Architecture:
  ◦ Start with basic musical elements (e.g., pitches, intervals) and create more complex structures (e.g., chords, harmonies)
• Efficient Design:
  ◦ Optimized data types to reduce computational overhead
  ◦ Ensure maintainability for future development
	• **Research:** Tools for studying and analyzing music
	• **Computational Modeling:** Facilitate music creation and modeling
	• **Music Generation:** Tools for harmonic and melodic composition
	
	Advanced Uses:
	• Integration with AI for automated composition and analysis
	• Cross-cultural music analysis
	• Real-time analysis in live performances

Conclusion

In conclusion, the goal of this library is to provide an **efficient** and **versatile** tool for the analysis, modeling and generation of musical structures. As the library continues to be developed, it will play an important role in advancing the field of computational musicology.

Author and Acknowlegdments

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References

This research project is an implementation and elaboration of the following paper:

Hentschel, Johannes, et al. Towards a Unified Model of Chords in Western Harmony. Universidad de Alicante, 2022.