A Corpus-Based Analysis of Syncopated Patterns in Ragtime

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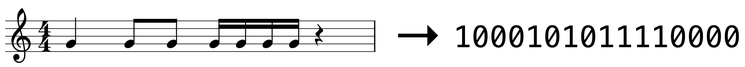
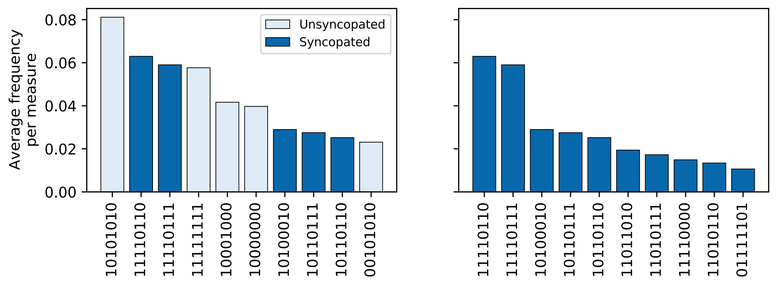
We analyzed ragtime music to find syncopated patterns.

- Analyzed the RAG-C dataset, which contains over 11,000 ragtime compositions.
- Built upon the work of de Haas, Koops, Odekerken, and Volk (2013, 2015, 2017) who first introduced and analyzed the RAG-C dataset.
- Used different strategies for composition identification, time signature identification, quantization, and melody extraction.
- Identified all solo piano compositions and transformed the melodies into **binary onset patterns**, which only consider rhythm, not pitch.



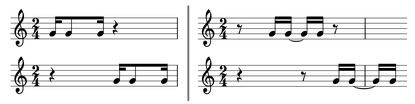
- Identified the most frequent binary onset patterns, and also analyzed the patterns by composer and era of composition.
- Categorized the patterns by amount of syncopation, calculated with the Longuet-Higgins and Lee (LHL) metric (1984).



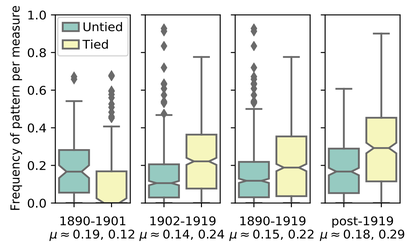
Left: the ten most frequent binary onset patterns overall, differentiating between unsyncopated patterns (LHL = 0) and syncopated patterns (LHL > 0). Right: the ten most frequent syncopated patterns.

Pattern usage varies between eras…

- Musicologists point to the "long-short-long" or "121" pattern as the prototypical ragtime pattern.
- Appears as ♪♩♪ in 2/2 and 4/4 time signatures, and as ♬ in 2/4 time.
- There are untied and tied versions of this pattern.
- Composers used more untied 121 patterns in the early ragtime era (1890–1901), and more tied 121 patterns in the late (1902–1919) ragtime era. These differences are statistically significant.
- In the modern era, the use of both patterns increased statistically significantly.

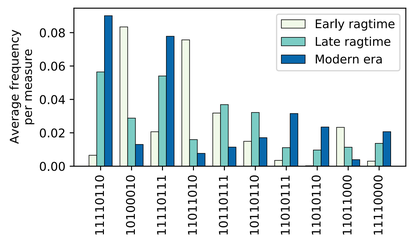


The two untied (left) and the two tied (right) versions of the 121 pattern.



Distribution of frequencies of 121 patterns per measure.

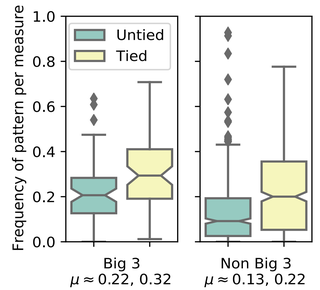
- Analyzed individual binary onset patterns by frequency within the early ragtime, late ragtime, and modern periods.
- Popular patterns in some eras become noticeably unpopular in others.



The most frequent syncopated (LHL > 0) patterns, categorized by era.

…and between composers.

- Musicologists agree that the "big three" composers Scott Joplin, James Scott, and Joseph Lamb best exemplify the ragtime genre.
- These three composers used the 121 pattern — both in untied and tied forms — more frequently than their contemporaries did.



Syncopation is not distributed uniformly throughout a composition.

- Examined all consecutive pairs of measures in the corpus and categorized the level of syncopation in each measure as either none, low, or high, using the LHL metric.
- Computed the probability that each type of measure would be followed by another measure of the same or different type.
- Compared actual probabilities versus expected probabilities under the null hypothesis that measure transitions resemble those done randomly.