

# Full Title\*

Subtitle†

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Transformations and musical patterns -> Haskell ->

Additional Key Words and Phrases: transformation, edit distance, musical patterns, evaluation, clustering, ...

## 1 INTRODUCTION

*Hierachical structures in music.* Music is known to have rich hierachical structures. We model the hierachy based on metrical positions of the notes in music.

*Fractal Geometry.*

*Musical features.*

*Pattern discovery based on features.*

*Our Methods.*

*Contributions.* - Based on fractal geometry and the hierachical structures in music, we propose a new feature that measures the complexity of melodic contours and polyphony shapes in symbolic music.

- Using the proposed feature, we present a toolset for music analysis and pattern discovery.

- We showcase the effectiveness of our system on various corpora and comparing the proposed feature with other existing features of music.

## 2 THE SIMILARITY DIMENSION

"Fractal Dimension":

$$-D = \frac{\log M}{\log s}$$

The Definition of "Mass":

$$M \propto s^{-D}$$

*Compute the features.* 1. split the music entry into m parts, n bars per part

2. perform the following actions for each bar

1) Create hierachy:

1. take the notes in the most important positions in the bar (for example, in a 4/4 bar, we have a importance grid of [5,2,3,2,4,2,3,2] in the resolution of a quiver; so only the notes on position of the first quiver will be taken)

2. take the notes in the most and the second most important positions in the bar (we have the positions of the first and the fifth quiver in this case)

3. repeat till we consider all the importance levels

2) Compute measurement (mass) on the hierachy

1. Calculate the mass within one note: = duration in quarter length

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- 2. Calculate the mass between two notes =  $\sum \sqrt{\Delta duration^2 + \Delta pitch^2}$  (eqv to the hypotenuse of the time and frequency difference)
  - 3. Sum up the mass (intuitively as the length of the line tracing through the notes in considerations)
  - 3) Take ratios and the log of the mass between the selected two hierachies:  $dim = \log_2(mass_{I1}/mass_{I2})$
- Interpreting the feature.*
- The similarity dimension on one piece.*

**3 EXPERIMENT SETTING**

**4 THE FRAGEM PACKAGE**

**5 RESULTS**

**5.1 Classification**

**5.2 Pattern discovery**

**6 DISCUSSION**

Summary.

Limitations:

Future work: Polyphonic

**A APPENDIX**

Text of appendix ...