Cardiff University School of Computer Science

One Semester Individual Project
Initial Plan

CM3203 – 40 credits

Visualisation of music

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Introduction

Art and music are forms of expression which we as people rely on in order express or understand a mood or a feeling. This project will combine music, art and computer science to create a visual language of music in the form of a static image. The research will involve analysing the structure of a piece of using a digital version of pieces of music derived from the Sibelius package. The analysis of the music will include the subject or theme, their development, their repetition, key and tempo of different parts of the music. The visualisation of the music piece will represent and reflect the intended or possible moods of the music.

It is evident that music contains certain patterns and sequences, the visualisation of these will likely be represented through a combination of geometrical shapes, already existing sequences such as Fibonacci sequence, sacred geometry and visual representation of chords as waves. My research will involve the analysis of sequences and patterns of both art and music to generate a visual language which explains a piece of music.

Python is my choice of language to analyse musicXML files as it contains libraries such as music21 to read, and write musical sheets which are compatible with the Sibelius package. The programme will take a musicXML file as input and will output an image file (jpeg, png). The programme will read the XML file, and analyse music for chords, patterns, tempo etc. This will then be linked to certain shapes, colours and visualisation methods which best represent the music and the mood it creates. By using machine learning methods the programme will predict and automatically generate shapes, colours depending on the genre of music. E.g. if the music is analysed as jazz, there may already be a certain rhythm or pattern that this genre follows, the programme will then generate shapes, colours etc which fit best with the genre.

The programme will require a basic understanding of how to read and write music, an understanding of colours, shapes and how these can be used to create a certain feel. Therefore research on musical concepts and how it varies between different genres, such as jazz, pop, rock will be essential. A basic understanding of how to write music and if distinct combinations of notes and patterns to generate a piece of music will allow me to create an automated recognition system. An understanding of colours, how contrasting or combining certain shapes and colours can be used to create a feeling will be needed to create an accurate visual language of a piece of music

Aims and Objectives

The overall aim of the project is to create an image which reflects the structure and mood of a piece of music.

- Research on how music has previously been visualised.
  - o Software such as Magic Music Visuals and how they work.
  - o Artists for inspiration.

- Understanding basic musical concepts.
  - Understanding basic musical concepts.
  - How music is written.
  - What patterns can be found in different genres of music.
- Sketches.
  - Combining methods of visualisation and music and sketching ideas by hand.
- Music, Art: mood and feelings.
  - Research on Art/ music:
    - How colours, shapes and patterns may affect moods and feelings.
    - How music affects mood.
- Algorithm: Automatic learning and pattern recognition/ segmentation methods.
  - Research on Machine learning methods e.g. clustering, to separate parts of music e.g. Chorus, bridge, verse.
  - Automatically learn and generate visuals by recognising patterns in musical notes.
- Sibelius package, MusicXML and Python (Music21).
  - Research to understand how Sibelius package uses MusicXML to generate scores of music.
  - Research how MusicXML is written to understand and read the XML file using Python.
  - Research to understand how Pythons music analysis tool Music21 is used to read and analyse MusicXML files.
- Implementation.
  - Write code for Automatic pattern recognition.
  - Write code to read MusicXML using Music21.
  - Create visual output using Python Graphics.

Work Plan

A weekly work plan on fulfilling my objectives. This work plan is subject to change depending on general progress, newer and better methods of implementation and unexpected problems. (SM) – indicates when I will meet with my supervisor to discuss progress and ideas. I am not limiting myself to simply these as I may request to meet with my supervisor depending on my progress.

Week 1:

- Initial plan.
- Research on past ways of visualising music.

Week 2-4:

- Further research on ways to visualise music. (SM)
- Understanding basic musical concepts. `
- Understanding patterns in music (Milestone).

Week 5:

- Visualising through sketches

- Research on how music and art represent mood and feelings.(SM)

Week 6-8:

- Create algorithm to automatically recognise patterns through machine learning
- Understand Sibelius package, musicXML and implementing it using python Music21 (Milestone). (SM)

Week 9 - 11:

- Implement Algorithm with understanding of Sibelius package to create static images using python. (Milestone).

Week 12:

- Continue developing features. (SM)

Week 12- 15:

- Final Report(SM)

Gantt chart

Tasks:
- Initial Plan
- Patterns in music
- Musical Concepts
- Visualisation techniques
- Sketches
- Moods and feelings
- Machine learning algorithm
- MusicXML
- Music21
- Implementation
- Continue developing
- Final Report

Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 | Week 13 | Week 14 | Week 15

01/02/2016 08/02/2016 15/02/2016 22/02/2016 29/02/2016 07/03/2016 14/03/2016 21/03/2016 28/03/2016 04/04/2016 11/04/2016 18/04/2016 25/04/2016 02/05/2016 Deadline 6/5/2015

Easter 19/03/2016 - 10/04/2015

(SM) Milestone

KEY

(SM) = Supervisor Meeting