From Humming to Soundtrack: Melody Extraction and Style-Transfer Music Generation

2526-S1 Audio Processing and Indexing

Houhua Ma; Xiaobin Tang; Xiangyu Li; Xijie Cao

Universiteit
Leiden
The Netherlands

Problem Description

From Raw Melody to Usable Music:

Imagine a game developer who comes up with a catchy tune while walking home.

They record it on their phone, but the sound is messy and rough.

How can that simple humming be transformed into a polished soundtrack?

Key Points:

- Raw audio (especially humming) contains **noise and unstable pitch**.
- Requires **melody extraction**, **pitch tracking**, and **feature representation**.
- Must **retain melodic similarity** while enabling **style transfer**.
- Integrates **signal-level processing** with **generative modeling**.
- Links **audio indexing** (for melodic retrieval) and **music generation**.

Challenges & Novelty

Challenges:

- Extracting accurate pitch contour and rhythm from noisy or vocal recordings.
- Preserving melodic similarity while changing musical style.
- Evaluating “similarity” between original and generated melodies in a perceptually meaningful way.

Novelty:

- Combining **audio processing and indexing** with **music generation**.
- Using pre-trained models (e.g., *CREPE* for pitch tracking, *MusicGen / Mubert / Riffusion* for style transfer).
- Creating a workflow that bridges *humming input → cleaned melody → regenerated track*, which is practical for creative applications (e.g., indie games, short films).

Goal for Final Project

Goal and Expected Outcome:

- Functional prototype (Jupyter/GUI) demonstrating the full pipeline.

- Example outputs showing “before → after”

  (original melody via record or upload

  vs.

  multiple denoising style-transferred music).

Team Division

Houhua Ma:

- Handle audio preprocessing, including noise reduction and pitch stabilization, especially for raw humming recordings.

Xiaobin Tang:

- Focus on melody extraction, pitch tracking, and feature representation to accurately capture the musical content.

Xiangyu Li:

- Integrate signal-level processing with generative modeling for synthesis and further analysis.

Xijie Cao:

- Write the project report, optimize and debug the code, and ensure overall system performance.

Thank you for your attention~

Universiteit
Leiden
The Netherlands

Discover the world at Leiden University