Vietnamese-German University

MUSIC SHEET UNDERSTANDING AND TONE MODULATION

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I Research team members

- Team Leader: Truong Minh Khoa
- Programmer: Dinh Cong Minh
- Programmer: Nguyen Tho Anh Khoa
- Writer/Editor: Huynh Minh Triet

II Disclaimer

This report is a product of our team's work, unless otherwise referenced. In addition, all opinions, results, conclusions, and recommendations are of our own and may not represent the policies or opinions of the Vietnamese-German University's Department of Engineering or the University as a whole.

III Abstract

IV Introduction

The topic of recognizing musical sheets, i.e., Optical Music Recognition (OMR), is not a novel field of research. The term OMR first appeared in a paper written by MIT scientists in the 60s. During the last three decades until now, OMR is an ever increasingly developing field and is capable of solving many problems that involves with music

More specifically, the current OMR systems of today are capable enough to recognize a printed musical sheet and digitize it. The resulting output could be a .midi file, or other types of sound files such as .way, .mp3. The vast majority of those researches are dedicated for the common user, even for users who are not educated on musical theory, but there is still a lack of product that can be used for professional or enthusiast musicians. In reality, a common problem that is encountered is the modulation of music tones, i.e., up or down semitone, tone for the whole music sheet. Currently in order to obtain a music sheet with a few tones higher or lower the musicsian has to manually retype the entire musical sheet by hand, which is labor intensive.

i Our solution

We propose an algorithm that can take in a pdf file or scanned music sheet, then translate the written note either by hand or computer drawn into a digital format. At which stage, the program can play the song or shift the song's tones or semitomes according to the musicians' need.

V Proposed Method

The process include first removing the lines on each staff for ease of musical note dectection. The second stage is translating the detected note and do note recognition to translate notes into a digital format. Finnaly the last stage is where an additional python function will modulate the tones of the song to give the final output.

i Line Removal

By using the method in Gomez and Sujatha [1] the staff's line removal algorithm will first grayscale the image then invert the color of the image, so that the lines are now white and the background is black. Finally, using a kernel of the form:

$$\begin{pmatrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix}$$

then run with the dilate() function built-in OpenCV, the horizontal lines will be expand so that its width is increasingly larger, and any white pixels, i.e., notes, that does not belong to the horizontal line, will be flipped to 0 and becomes the background thus eliminating notes.

for example:

Figure 1: before note removal

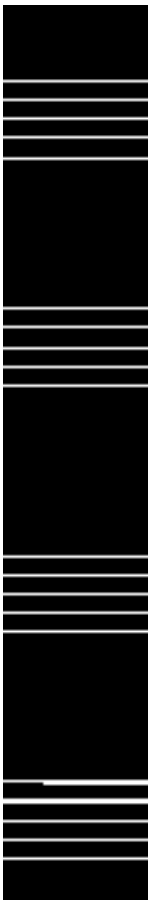

Figure 2: after note removal

Bibliography

[1] Ashley Antony Gomez and C N Sujatha. “Optical Music Recognition: Staffline Detectionand Removal”. In: 6.5 (2017), pp. 48–58.