Optical Character Recognition for Musical Notes and Playback

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***Abstract*—OCR for music recognition and playback aims to address the problem of music data acquisition. It accomplishes this by using OCR to recognize the music score and converts it into MusicXML file format. MusicXML file is the industry standard way of representing western musical notation. The conversion of the recognized symbols to MusicXML file format enables the user to store, edit, play and share his music. The main motivation behind the project is to develop software like "Cam Scanner" for musical score sheets that can be used by learners, professional musicians and publishers with ease. The character recognition has been implemented through template matching using normalized cross correlation. The Music table of recognized symbols with (x,y)coordinates, staff number, duration, stem, octave, step and alter is generated, which will be helpful to test the correctness of the recognized symbols. Currently 10 different instruments such as guitar, violin, mandolin, melodica, banjo, koto, kazoo, electric guitar, sitar, mezzo-soprano are supported for music playback by using Muse Score software. The implementation was done through in Matlab(version R2014a - 8.3.0.532).**

***Keywords*—OCR, MusicXML, Cam Scanner, Template matching, Normalized cross correlation, Matlab.**

I. Introduction

A. Subsection Heading Here

II. MusicXML

MusicXML (Music Extensive Markup Language) is a digital sheet music interchange and distribution format. The goal is to create a universal format for common Western music notation, similar to the role that the MP3 format serves for recorded music.

The musical information is designed to be usable by notation programs, sequencers and other performance programs, music education programs and music databases. It is designed from the ground up for sharing sheet music files between applications and for archiving sheet music files for use in the future. MusicXML files are readable and usable by a wide range of music notation applications. MusicXML complements the native file formats used by several musical score writing programs, which are designed for rapid and interactive use. MusicXML files are the standard for sharing interactive sheet music. Using MusicXML, users can create music in one program and share the results back and forth with people using other programs.

MusicXML was based primarily on two academic music formats:

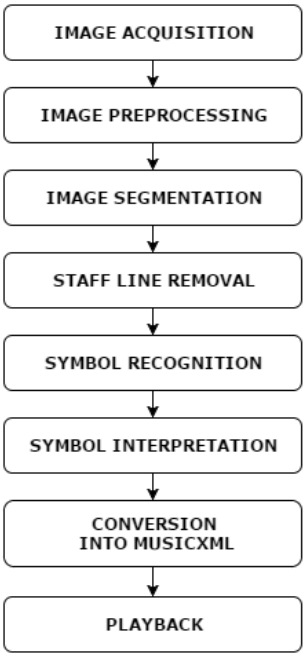
- The MuseData format, developed by Walter Hewlett at the Center for Computer Assisted Research in the Humanities (CCARH), located at Stanford University .
- The Humdrum format, developed by David Huron, based at Ohio State University.

III. Software Requirements

The input image acquired has to be subjected to various processing operations for recognising the characters in the music score sheet. Thus, the platform used for the implementation should support image processing operations. Matlab has extensive support for image processing operations through Image Processing Toolbox". Matlab also has Data and File Management Toolbox which can be used to read, write and generate XML files. MusicXML being one of the types of XML file, the toolbox will be able to handle it's basic operations also. Hence Matlab becomes a good choice for implementation. Matlab version R2014a - 8.3.0.532 has been used for the implementation of the algorithm. For reading MusicXML files MuseScore can be used. MuseScore is a free and opensource score writer software with rich features.

IV. Implementation

This section presents the steps involved in converting the captured image of a score sheet into MusicXML file.



APPENDIX A
PROOF OF THE FIRST ZONKLAR EQUATION

Some text for the appendix.

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