Optical Music Note Detection

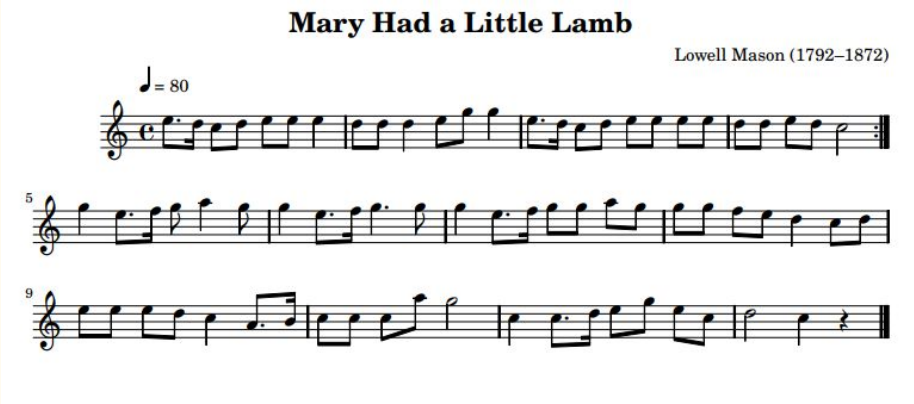
By Daozhen Lu, Anirudh Jhina, Michael Guo

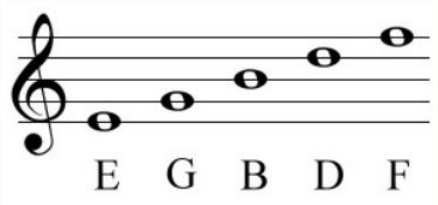
Goal

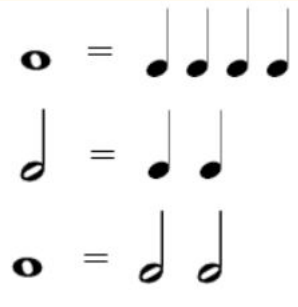
1. Detect objects written on a music sheet.

2. Recognize the detected notes and extract their information which includes the label and type of the notes.

3. Transform the note data into a midi sound file so that it can be played back through speakers.





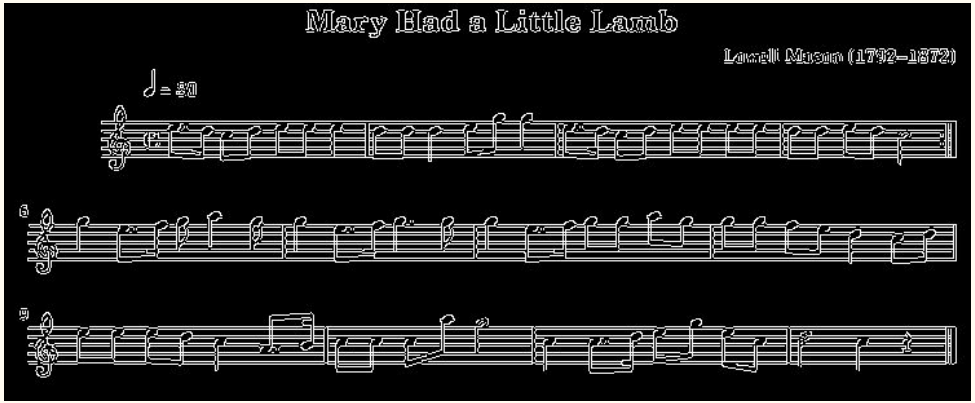


Agenda

- Review previous research papers.
- Perform Segmentation on music sheet image.
- Detect notes
- Convert notes to Midi

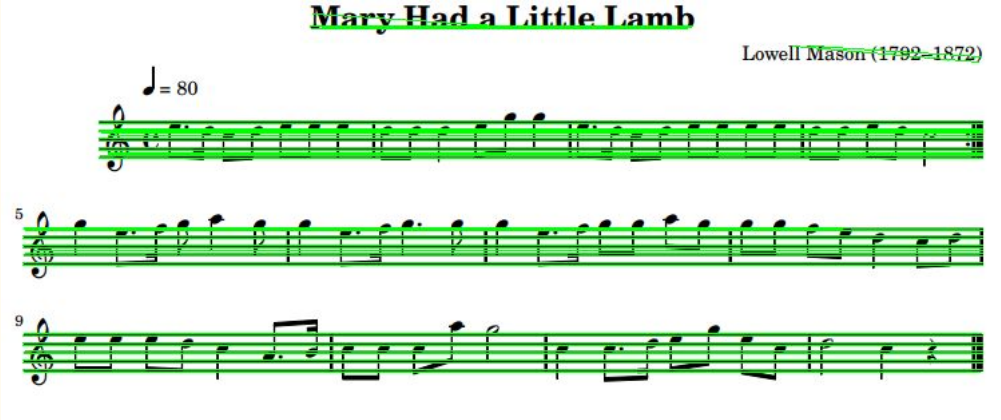
Edge Detection

- Convert the sheet music image into gray scale for processing.
- Apply Canny edge detection to the image to binarize the image and isolate the edges.



Line Detection

- Apply probabilistic Hough transform on the binary edge image.
- There are many inaccuracies in the line detection.



Line Detection

- Define parameters for the staff lines such as distance between the lines of the staff to improve on the detected lines in the image from the Hough transform step.
- In the graph shown in figure 1, the region circled in yellow denotes an entire staff and the valleys circled in red denote the horizontal lines in the staff. The peaks circled in green denotes the halfway point between two staffs.

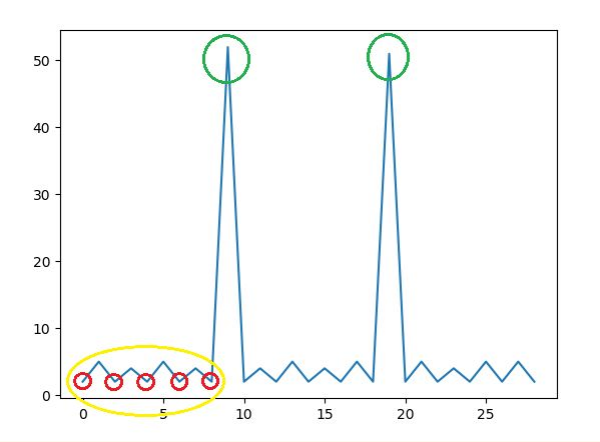


Figure 1

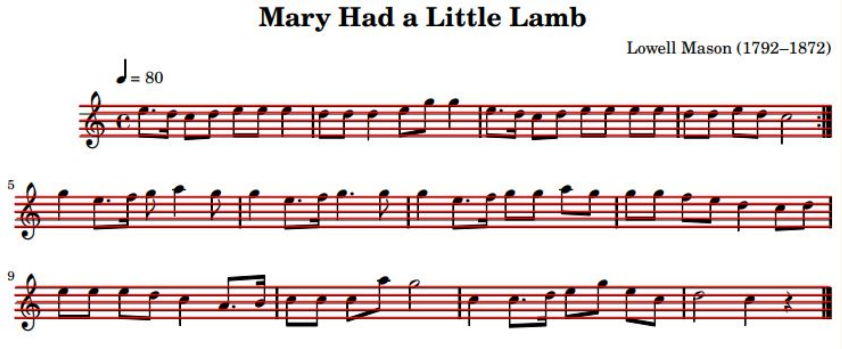


Figure 2

Line Detection

- Alternate method to detect lines with less automation through thresholding sum of row pixel values.

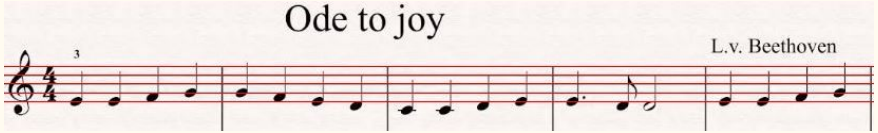
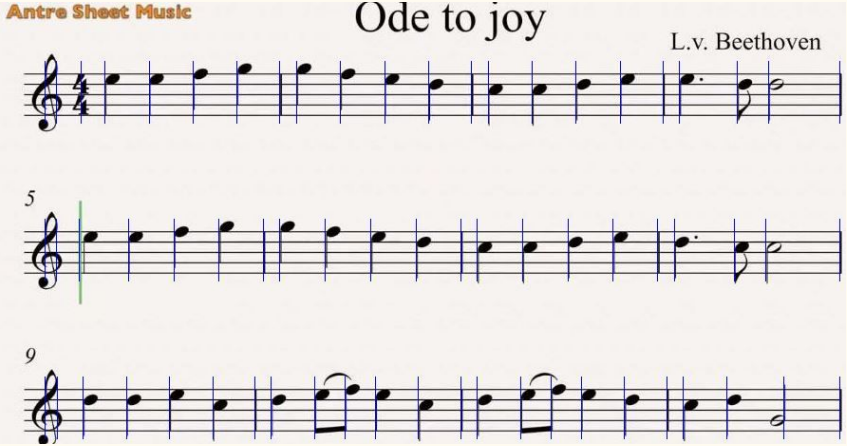
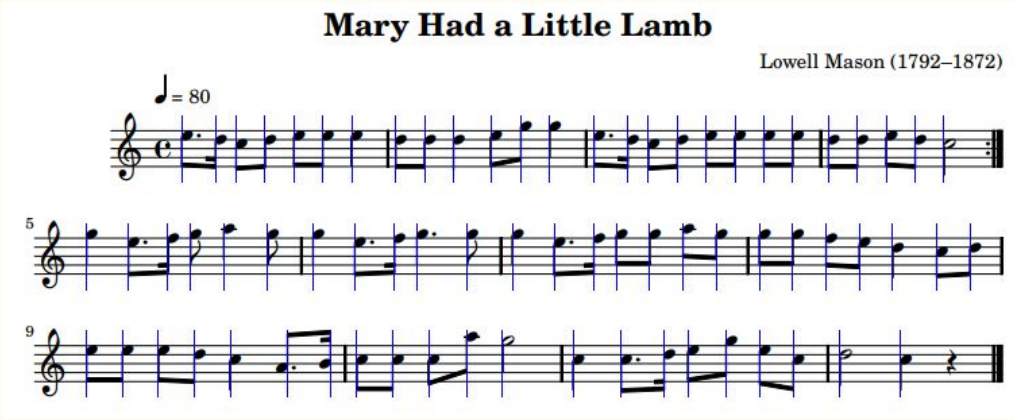


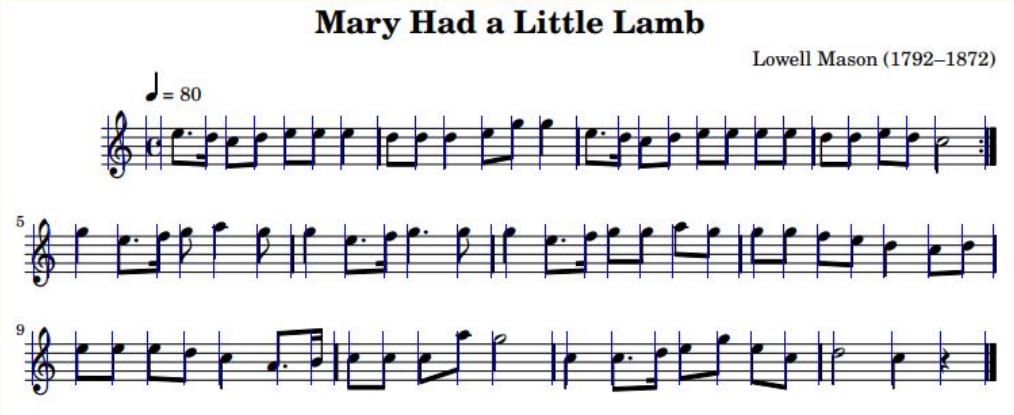
Figure 1

Note Detection

- Find the position of each note by the vertical tail of the note.

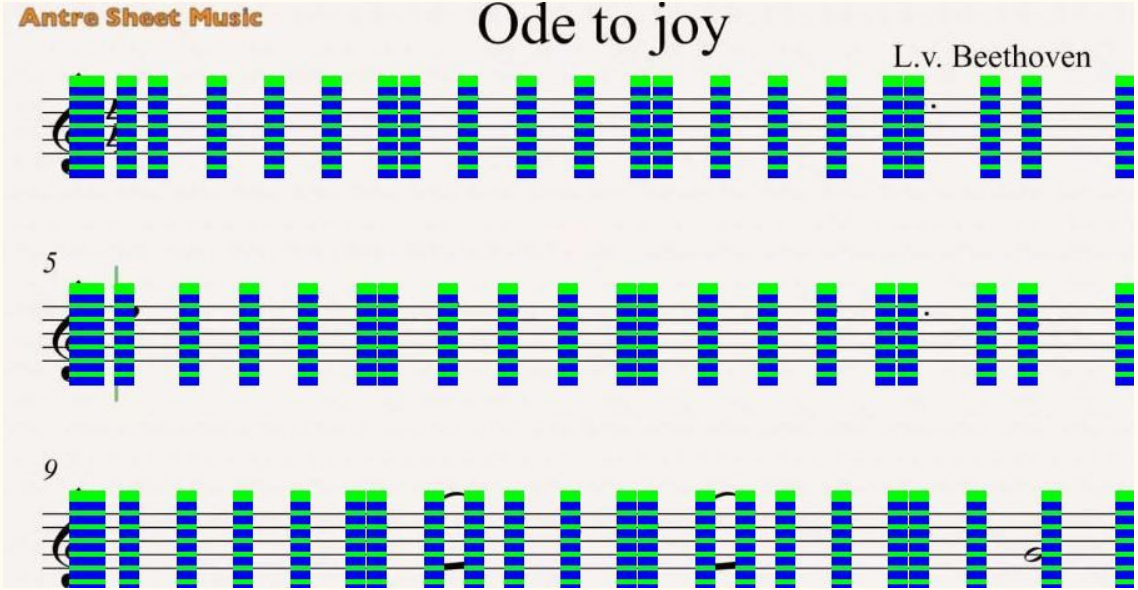






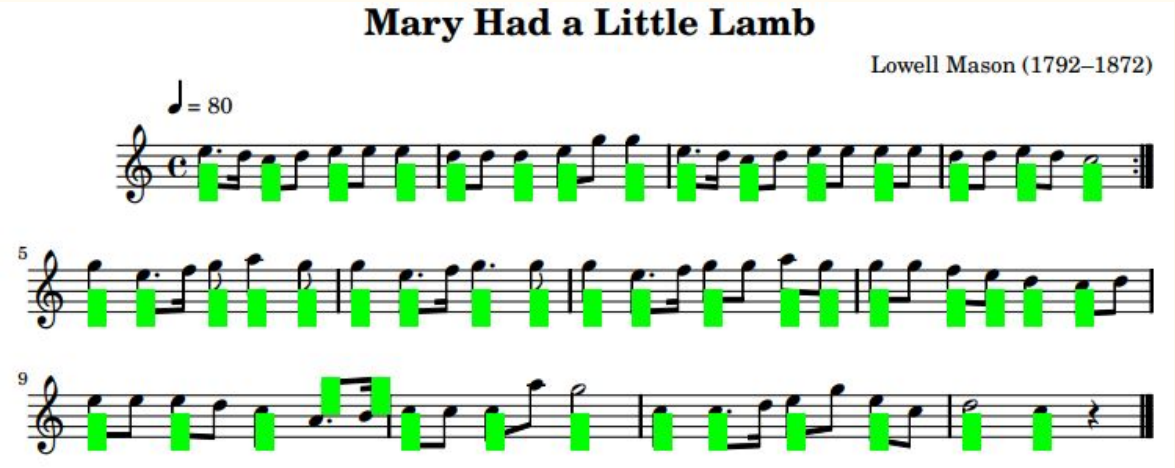
Note Detection

- For each detected note, scan vertically through each staff line and gap between staff line to determine if there is a note



Note Detection

- To determine the length of the notes, the same vertical scan method is applied.



Convert notes to music

Mapping the notes we recognized from the music sheet into the parameters that can be save as music file in python. Then we can save the file.

Further Improvements

- Improve on consistency between images
- Recognize chords.
- Recognize other musical symbols such as rests and pitch modifiers.

Member Contributions

Daozhen Lu:

-Created the first working implementation of our music detection algorithm in the “project.py” file.
-Fixed and updated midi mappings for the output of our algorithm.
-Use see if two notes are connected algorithm and detect ⅛ notes.
-Make 1/16, 3/16 notes detection for mary song.
-Made edits and adjustments on the final report.

Michael Guo:

-Improved on the original implementation in the “project.py” file by adding additional features and detection heuristics to allow detection on different music sheets.
-Generated all images for the final report as well as wrote up wall sections of the final report aside from section 3.4.
-Explored and attempted various other algorithms such as hough circles, and orb with no success.
-Generated and labeled limited note images and attempted to train them in the neural network.

Anirudh Jhina:

- Initially tried experimenting with the image pre-processing using adaptive mean & gaussian thresholding with canny edge detection and hough line transformation
- Implemented the notes to midi file conversions