

INF573

Image Analysis and Computer Vision

Detection of Piano Keys Pressed in Video

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Introduction

Introduction

The image is a composite of two parts. The top part displays a musical score with four staves and a key signature of one sharp. The bottom part shows a person's hands playing a piano keyboard. The keys being played are outlined in red. The video player interface at the bottom includes controls for navigation, search, and refresh.

Online
Popular
PIANO SCHOOL
with Hugh Sung

Introduction



Potcharapol Suteparuk. 2006.

Detection of Piano Keys Pressed in Video. stacks.stanford.edu

<https://www.semanticscholar.org/paper/Detection-of-Piano-Keys-Pressed-in-Video-Suteparuk/75d75a3fe7796fe9b3003ea73252de58d93d60dc>

Method

- Piano keys
- Sheet music
 - Staff
 - Black notes
 - White notes
 - Highlight on tempo
- Hands and keys pressed
- Combination

Piano keys

Goal: Determine and label the keys regions



Figure 1: Original keyboard

Piano keys

Goal: Determine and label the keys regions



Figure 2: Sobel transform

Piano keys

Goal: Determine and label the keys regions



Figure 3: Detection of key regions

Piano keys

Goal: Determine and label the keys regions



Figure 4: Reassignment of region labels

Piano keys

Goal: Determine and label the keys regions

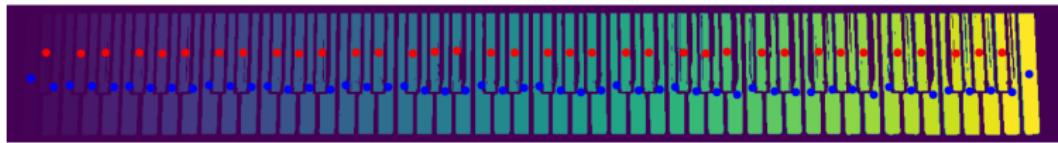


Figure 5: Determination of centroids

Piano keys

Goal: Determine and label the keys regions

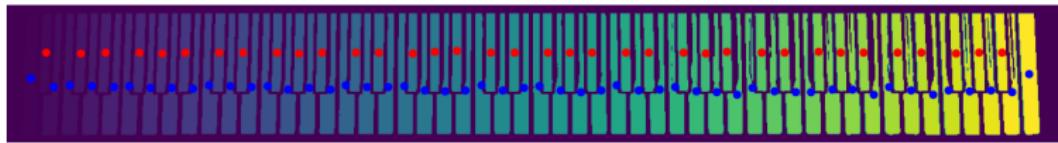


Figure 6: Filling of convex hulls of black keys

Piano keys

Goal: Determine and label the keys regions



Figure 7: Detection of groups of black keys

Piano keys

Goal: Determine and label the keys regions

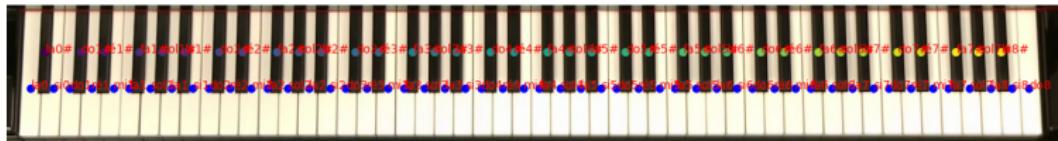


Figure 8: Keys named

Sheet music

Goal: Read the sheet music



Figure 9: Original keyboard

Sheet music

Goal: Read the sheet music

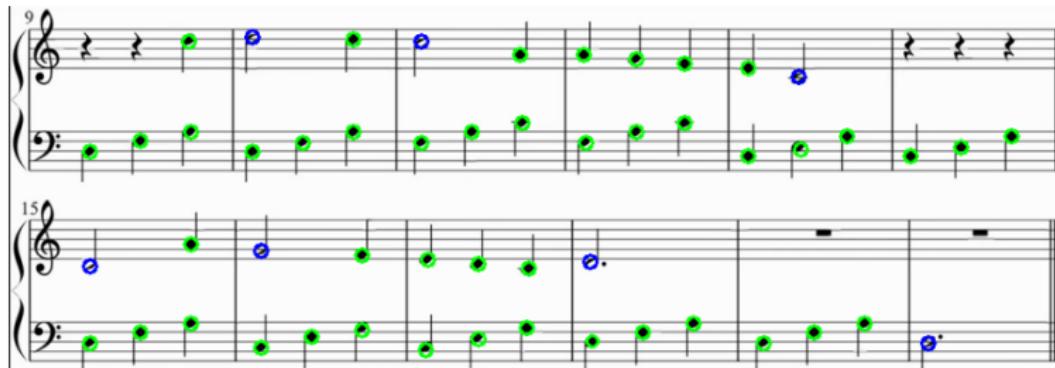


Figure 10: Notes obtained

Staff

Goal: Find the staff



Figure 11: Strong horizontal erosion

Staff

Goal: Find the staff

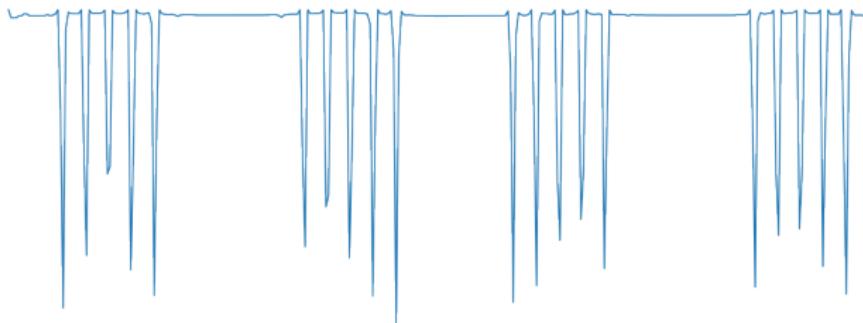


Figure 12: Mean depending on the ordinates

Black notes

Goal: Get the circles corresponding to the black notes



Figure 13: Strong erosion

Black notes

Goal: Get the circles corresponding to the black notes



Figure 14: Dilation

Black notes

Goal: Get the circles corresponding to the black notes

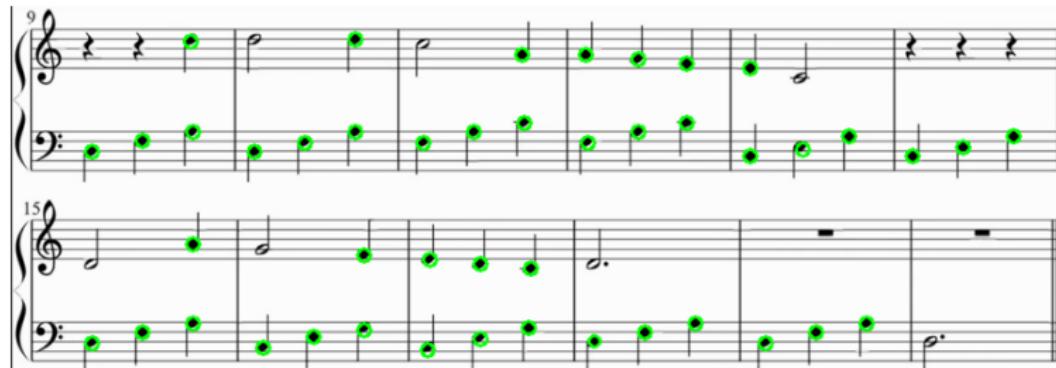


Figure 15: Circles obtained

Black notes

Goal: Get the circles corresponding to the black notes

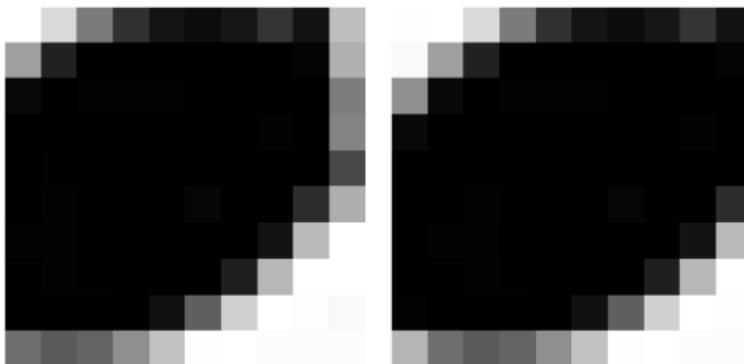


Figure 16: Refinement of the center (old at left, new at right)

White notes

Goal: Get the circles corresponding to the white notes



Figure 17: Inversion of gray image

White notes

Goal: Get the circles corresponding to the white notes



Figure 18: Circles obtained

White notes

Goal: Get the circles corresponding to the white notes



Figure 19: Determination of small components

Highlight on tempo

Goal: Highlight on tempo the sheet music and the keyboard



Figure 20: Strong vertical erosion

Highlight on tempo

Goal: Highlight on tempo the sheet music and the keyboard



Figure 21: Highlight of a beat on the sheet and on the keyboard

Hands and keys pressed

Goal: Detect the keys pressed



Figure 22: Hands region

Hands and keys pressed

Goal: Detect the keys pressed

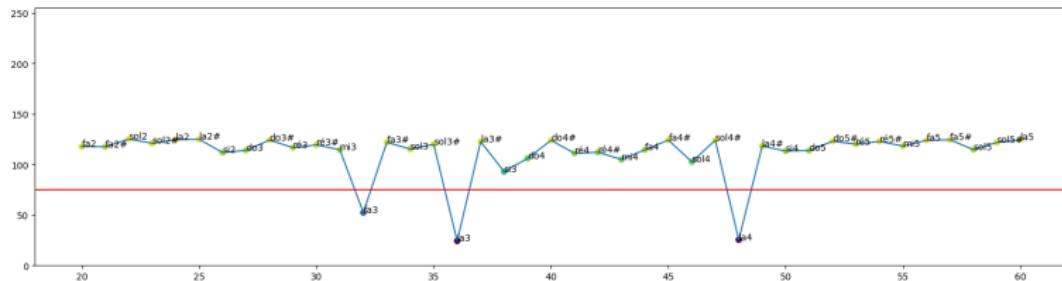


Figure 23: Study of the standard deviation

Hands and keys pressed

Goal: Detect the keys pressed



Figure 24: Corresponding keys pressed

Combination

Goal: Combine everything!



Figure 25: Combination with overlap

Combination

Goal: Combine everything!



Figure 26: Dilated mask of the hands

Combination

Goal: Combine everything!



Figure 27: Final combination

Conclusion

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The image is a composite of two parts. The top part is a musical score in 3/4 time with four staves. The bottom part is a video frame showing a person's hands playing a piano keyboard. A green rectangular box highlights a specific note on the score, which corresponds to a blue vertical bar on the piano keys. A red vertical bar is also visible on the piano keys. The piano has a dark wood finish. In the bottom right corner of the video frame, there is a logo for "Online Popular PIANO SCHOOL with Hugh Sung".