

EE-451: Image Analysis and Pattern Recognition

Group 17:

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STEPS :

1. Load data
2. Preprocess data
3. Segmentation and object detection
4. Assign cards/dealer to players
5. Classifying Suites
6. Classifying Numbers
7. Results

Loading data

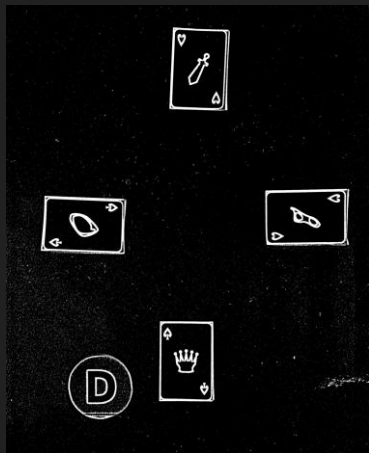
The whole implemented process is done iteratively. For each game, we iterate over the rounds images and apply our methods:

- 1) Adaptive thresholding
- 2) Contour detection
- 3) Object labeling
- 4) for each card we extract suite and number

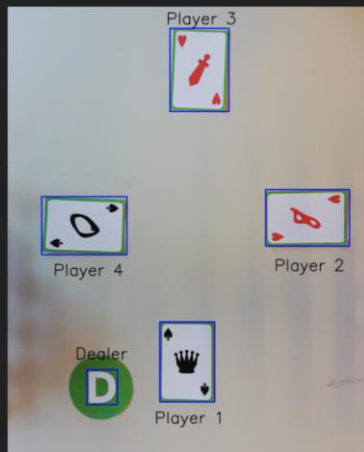


Original image game 1 round 1

Pre-processing, segmentation and object labeling



First, we apply adaptive thresholding and inverse the result

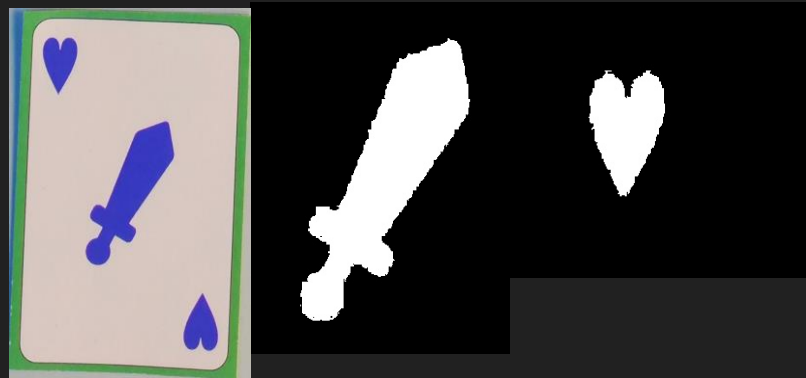
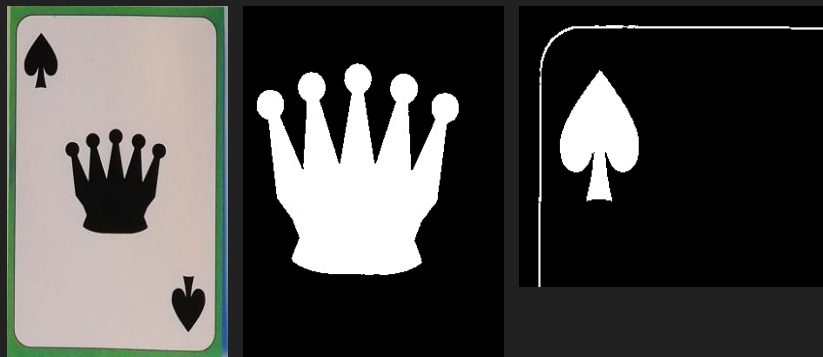


Then, find contours and assign each card to the corresponding player



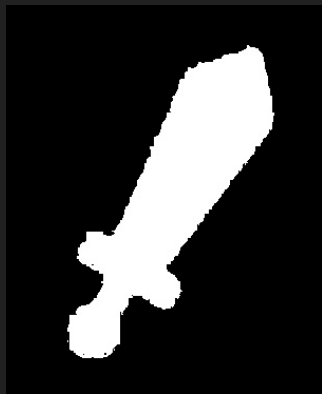
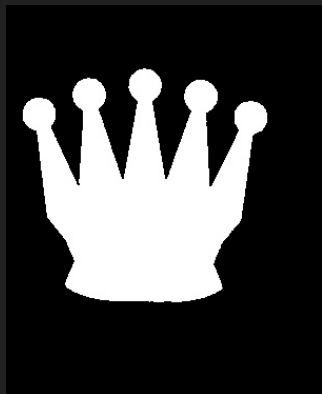
Finally, we crop the image and apply filter to classify red and black cards

Extracting suites and numbers



We rotate the card when needed, then crop it to extract the number and the suit

Classifying Numbers



Object descriptors:

- The output of a Convolutional Neural net that was trained on the MNIST dataset
- The magnitude of 10 Fourier descriptors (the 2nd to the 11th).

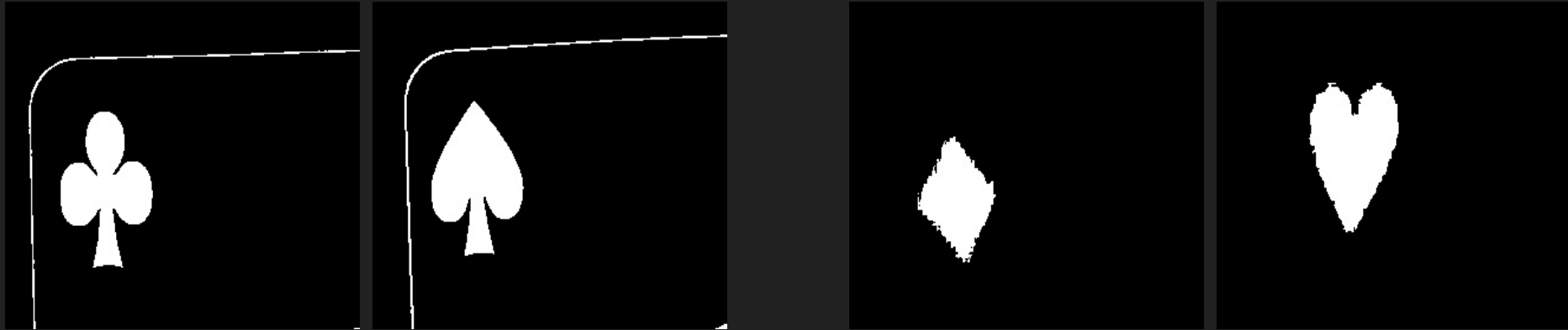
Model:

- XGBoost (Extreme Gradient boost) trained on the concatenated descriptors as features

Evaluation:

- 5-Fold cross validation yielded an accuracy of 93.5%

Classifying Suites



We find apply morphological operations (opening then closing) and find contours, then depending on the area we classify our suite.

- For Black suites : Spade if $\text{area} \geq 4900$ else Clubs (95% accuracy)
- For Red suites : Heart if $\text{area} \geq 4065$ else Diamond (98.9% accuracy)

Results for game 1

Predictions

P1	P2	P3	P4	D
QS	8H	JH	0S	1
5S	JS	9C	KD	1
1D	3H	7C	3D	1
1S	JD	4S	4C	1
0D	6S	3C	2C	1
8S	9D	3S	KC	1
4D	7H	7D	6H	1
0C	KC	9S	8C	1
5D	5H	1H	7S	1
QH	QC	6D	9H	1
4H	2D	JC	QD	1
6C	8D	2H	KH	1
1C	5C	0H	2C	1

Ground truth

P1	P2	P3	P4	D
QS	8H	JH	0S	1
5S	JS	9C	KD	1
1D	3H	7C	3D	1
1S	JD	4S	4C	1
0D	6S	3C	2C	1
8S	9D	3S	KS	1
4D	7H	7D	6H	1
0C	KC	9S	8C	1
5D	5H	1H	7S	1
QH	QC	6D	9H	1
4H	2D	JC	QD	1
6C	8D	2H	KH	1
1C	5C	0H	2S	1

Players points (standard): [2 6 2 5]

Players points (advanced): [7 3 2 1]

Model's accuracy is:

Standard=1.000

Advanced=0.969