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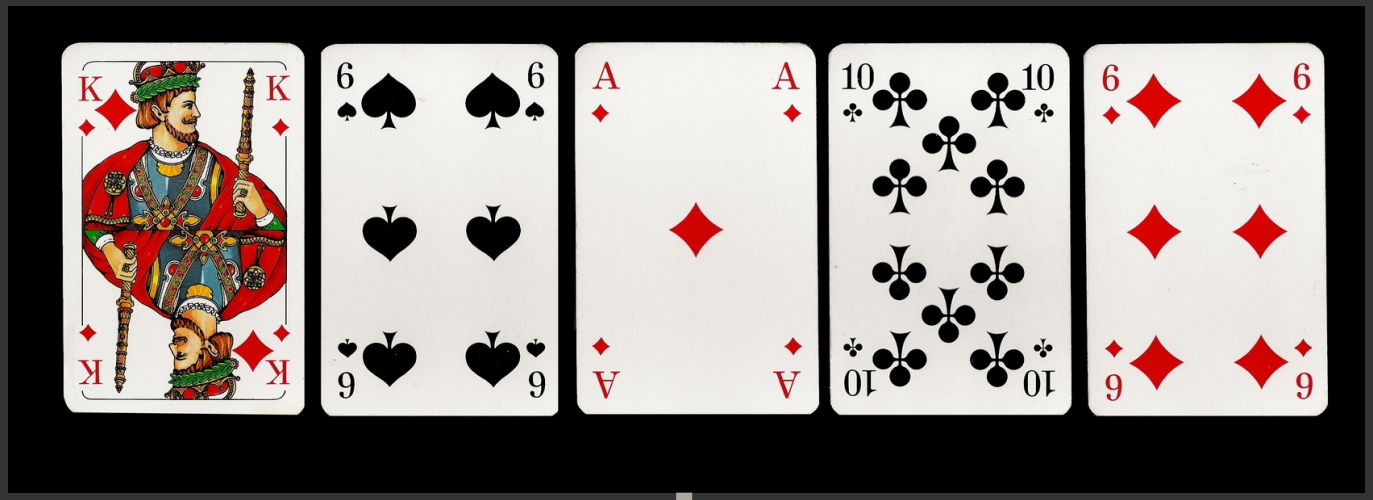
# Card Detector:
# Playing Card Recognition with Image Processing

# IDEA



Input

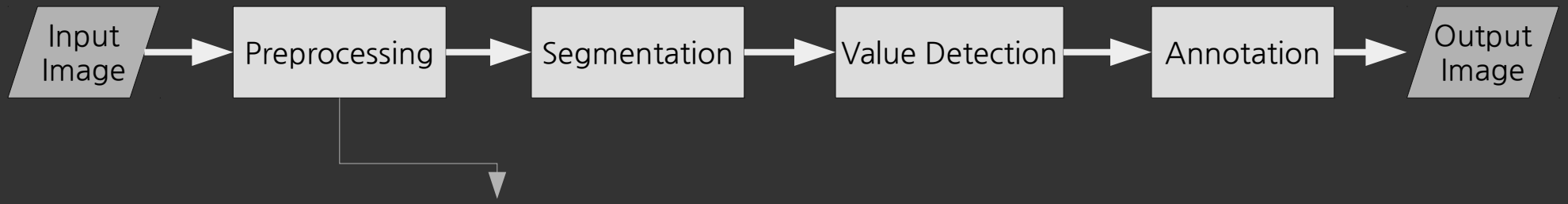
card detection


Output

# PRECONDITIONS

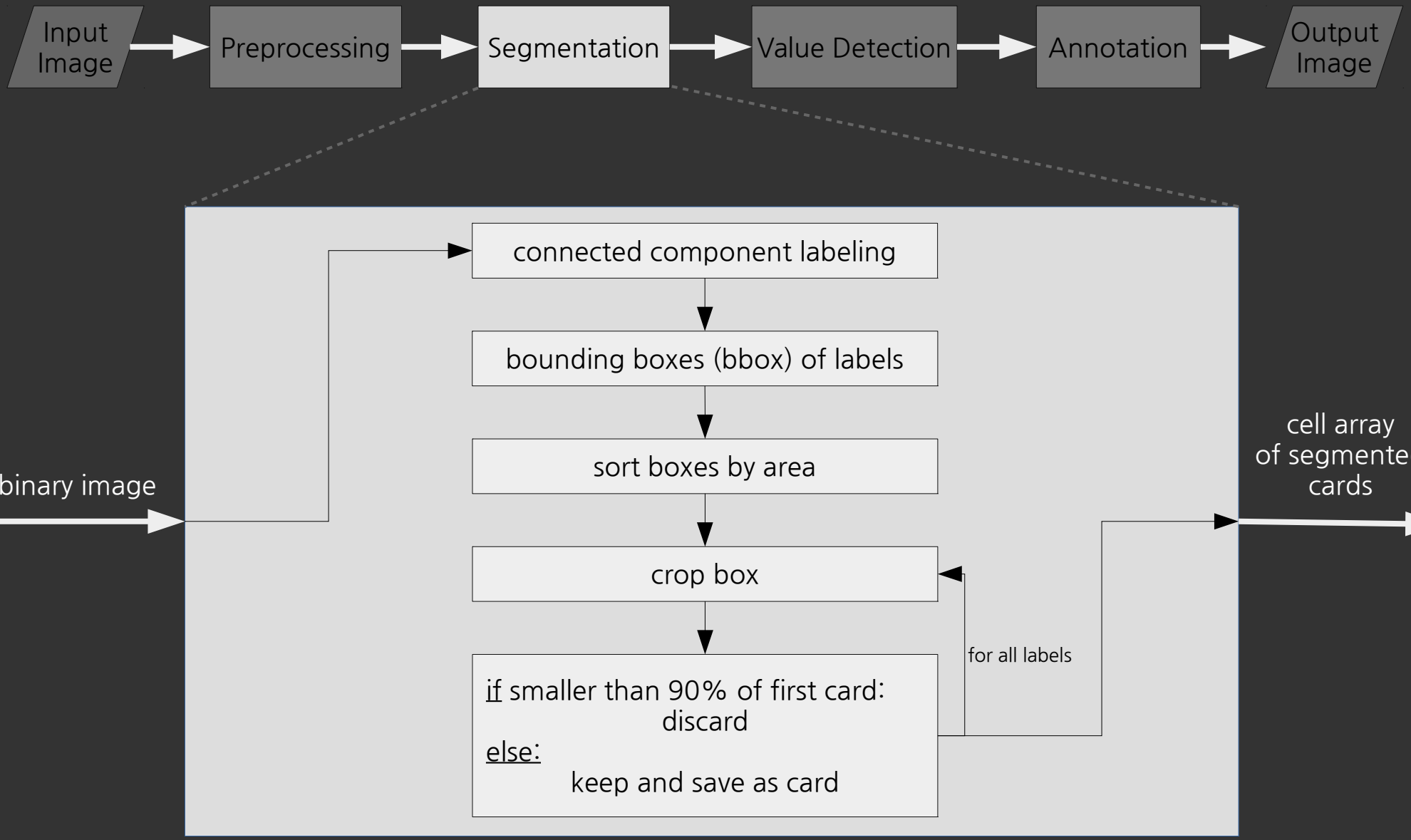
- card deck (french suite):
  - colors: Clubs, Spades, Hearts, Diamonds
  - ranks: Ace, 2-10, B, D, K
  - symmetrical around middle (up-down)
  - color and rank at least in upper-left/lower-right corner
- background uniform colored and not white
- view from above (no perspective distortion)
- card edges parallel to image edges (any orientation)
- no overlapping of cards

# PROCESS

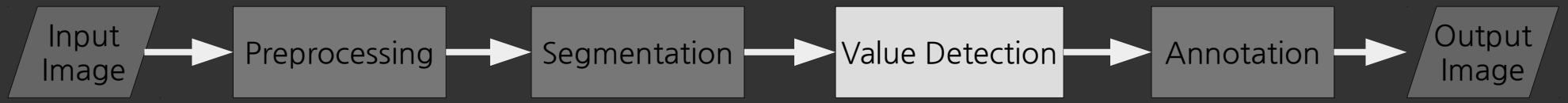


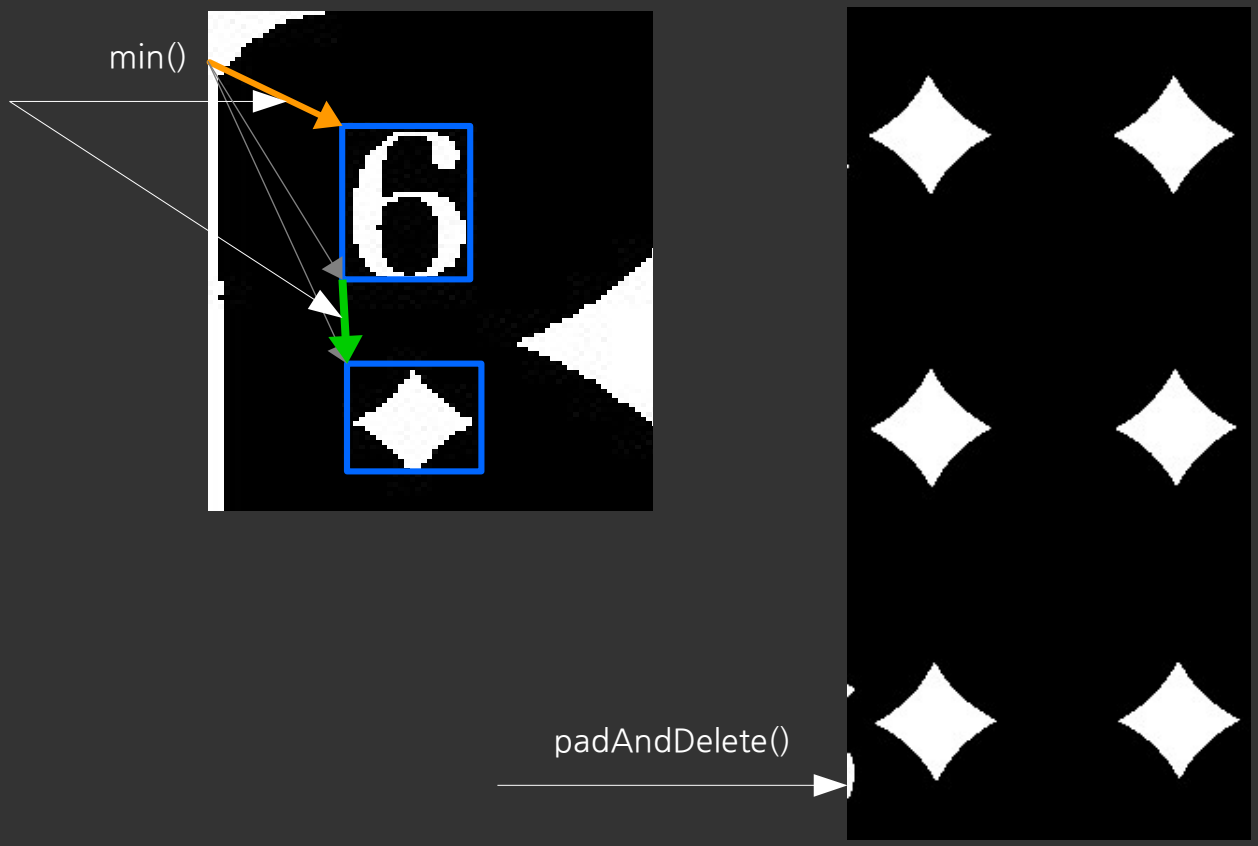

- check input and arguments
- smooth input image (gauss)
- binary image with Otsu threshold

# PROCESS/SEGMENTATION



# PROCESS/VALUE DETECTION

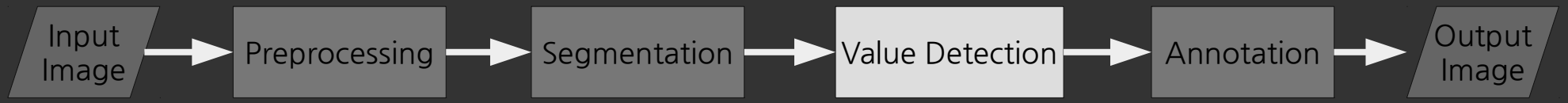



1. value bbox
2. symbol bbox

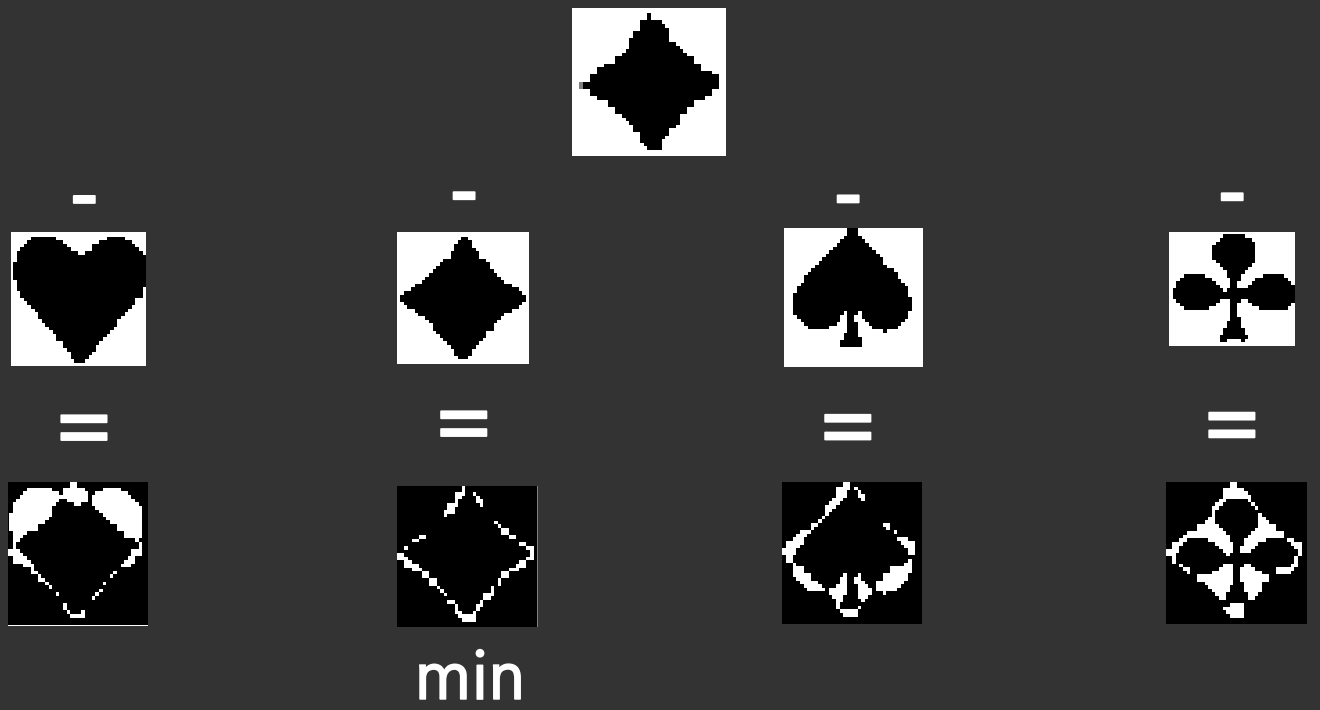
$$\min\left(\left\|\begin{pmatrix} x_{vbox} \\ y_{vbox} \end{pmatrix} - \begin{pmatrix} x_i \\ y_i \end{pmatrix}\right\|\right)$$

3. template matching
4. crop for symbol counting




TEMPLATE MATCHING:

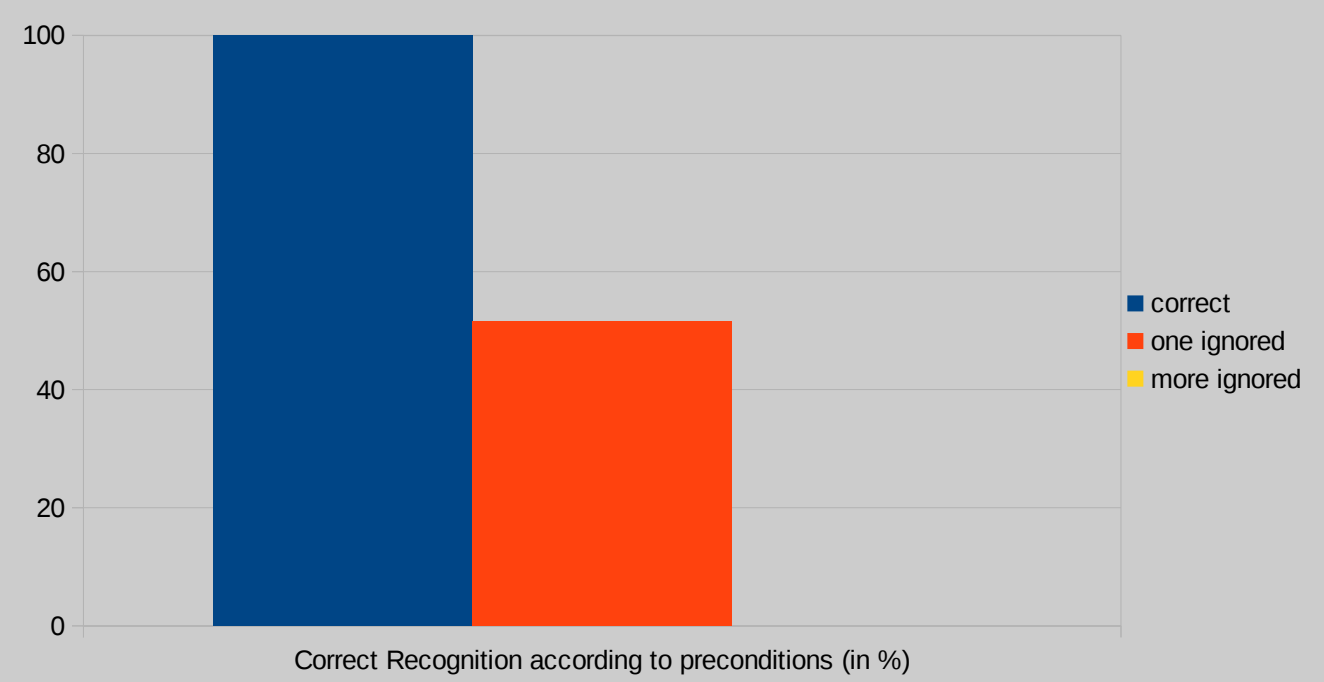
1. load predefined templates
2. difference of input symbol and each template
3. minimum of difference images is symbol



# PROBLEMS

- rotation only possible if 90° (others require knowledge about aspect ratio of card)
- self implemented functions extremely slow
- version handling (minor issues)

# EVALUATION


100
80
60
40
20
0
correct
one ignored
more ignored
Correct Recognition according to preconditions (in %)

PROBLEMS

- different card sizes (due to relative selection of first card)
- template matching (low res. symbols; different fonts)
- lighting conditions (reflection, different shades of white)
- limited number of stored cards (easily fixed)

RESULTS

- satisfying outcome
- preconditions became weaker
- evaluation based concerns may be fixed with more time