# Playing Card Detection in MATLAB

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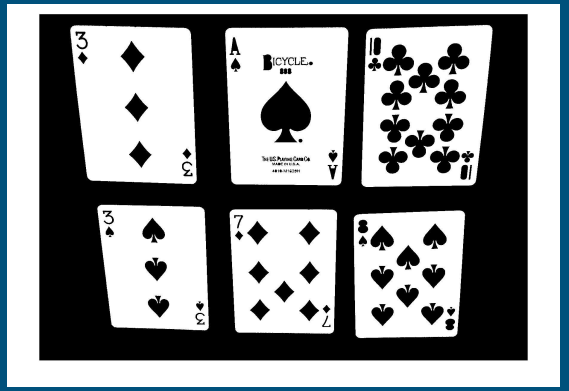
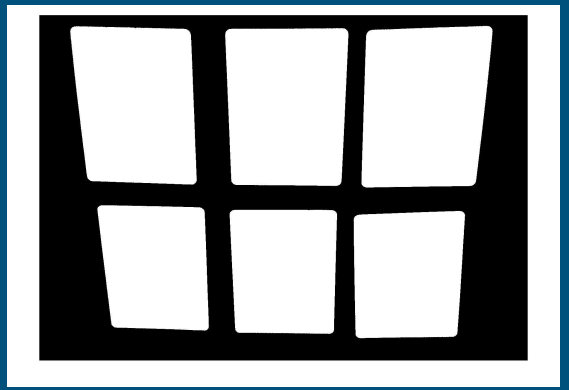
# Project Goals

- Detect playing cards in a photo
- Create orthophoto for each card
- Find value for each card
- Find suit for each card
- Output information in array

# Playing Card Detection

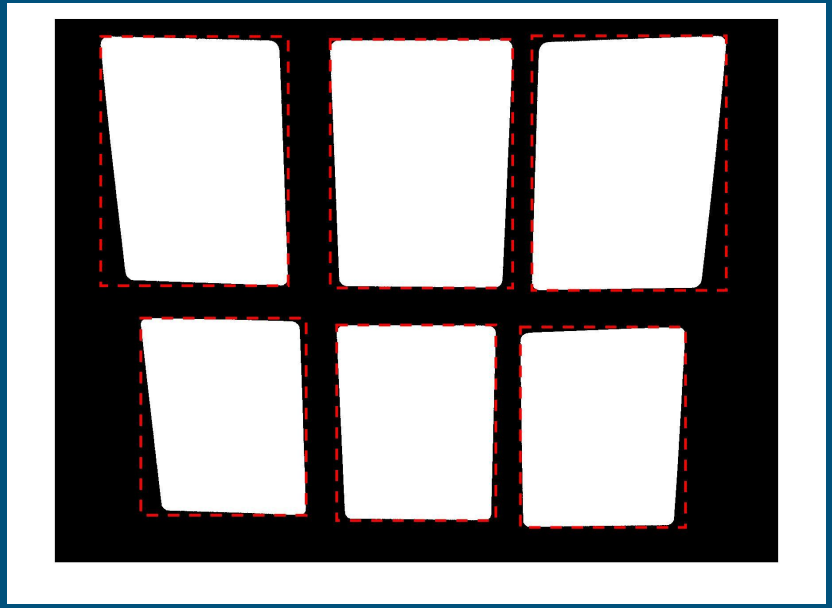
- Use bwareaopen to remove small connected areas
- Use imcomplement to remove different areas





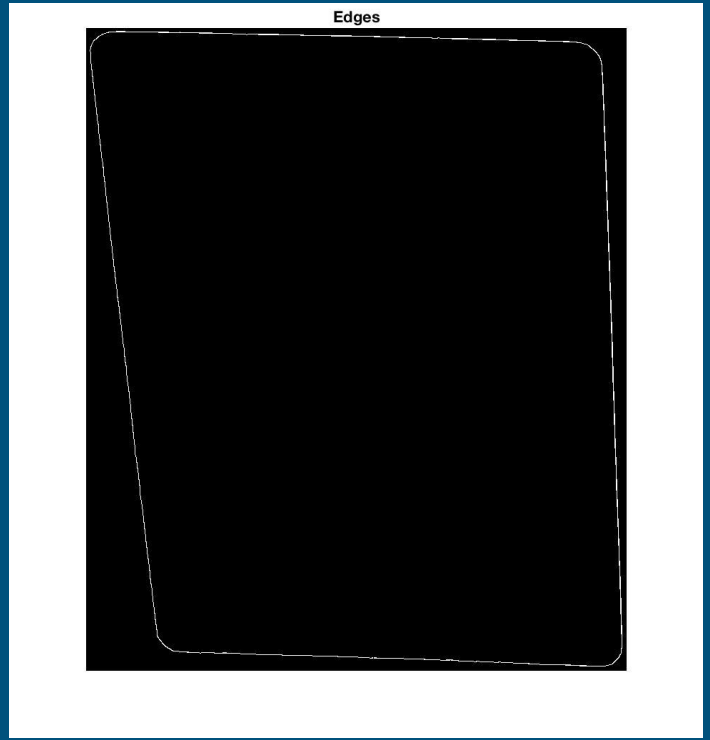
# Playing Card Detection

- Use ‘reigonprops’ to find each card
- Draw bounding box for each card
- Generate a subimage for each card
- Detection is near-perfect



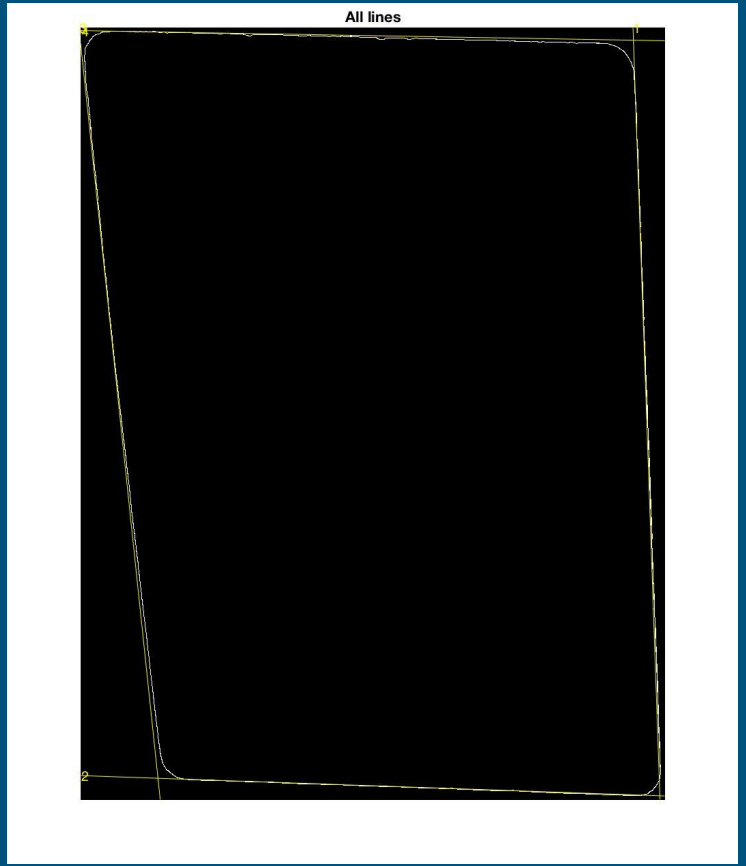
# Orthophoto Generation

- Have isolated card, now must find orthophoto
- Generate edges from images
- Use Canny edge detection method
- Now find lines



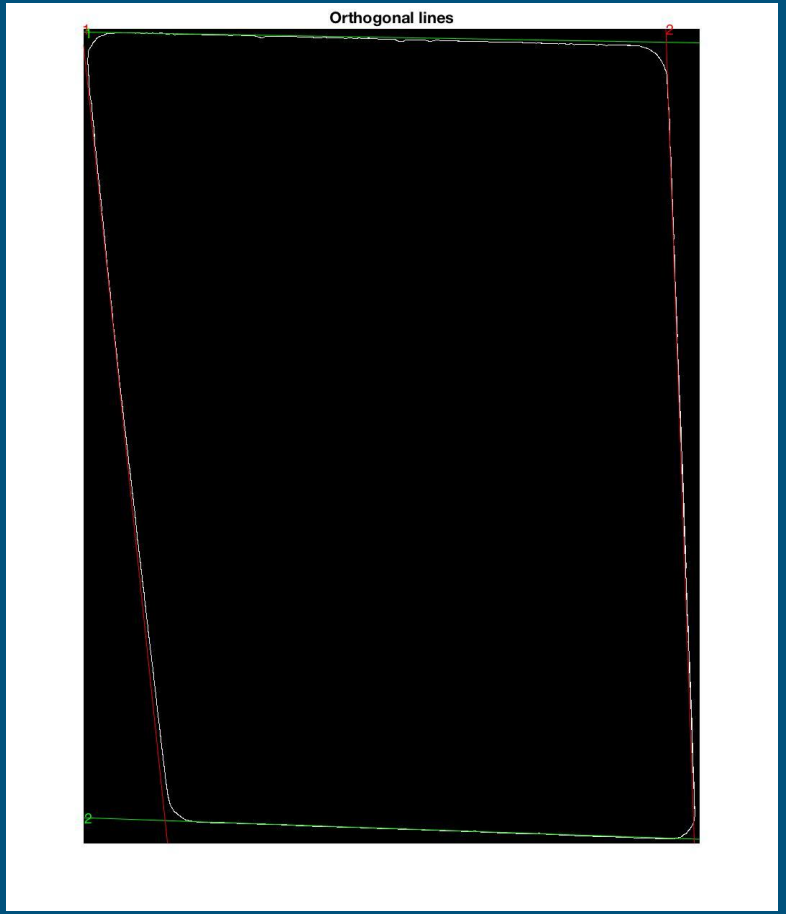
# Orthophoto Generation

- Use Hough transform to find lines
- Select rho and thetas from Hough peaks
- Threshold: 20% of max peak



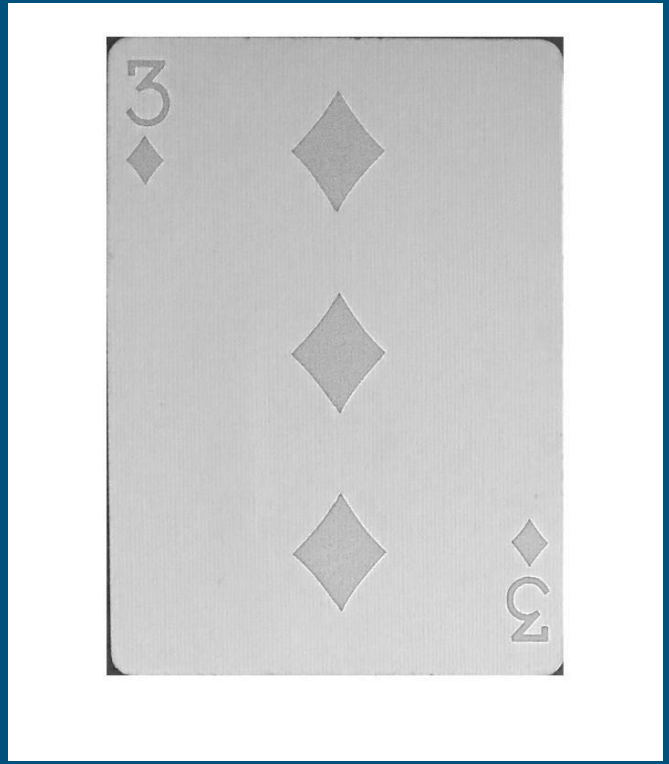
# Orthophoto Generation

- Check for orthogonality
- Find intersections, create corners
- Correlation if necessary



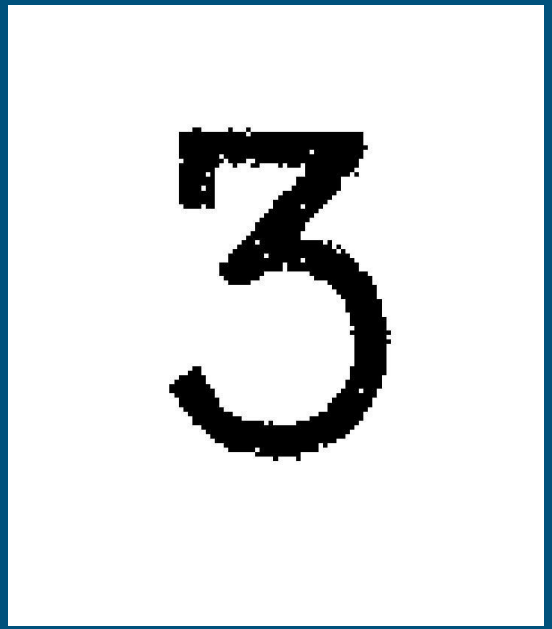
# Orthophoto Generation

- Corners found, use projective transform
- Playing cards are 5”x7”
- Generate 500 x 700 pixel image



# Value Detection

- Generate subimage for value
- Bounding box from 1st object in ‘reigonprops’

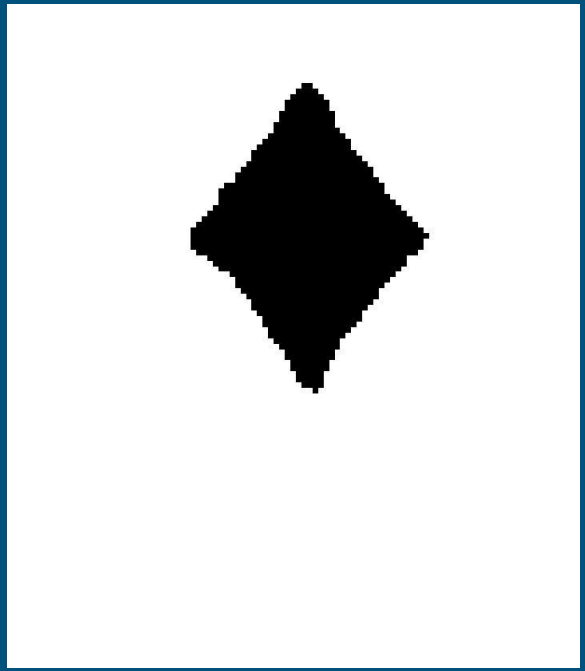


# Value Detection

- Clean up using disk dilation
- Use MATLAB’s OCR function
- Character recognition limited by RegEx

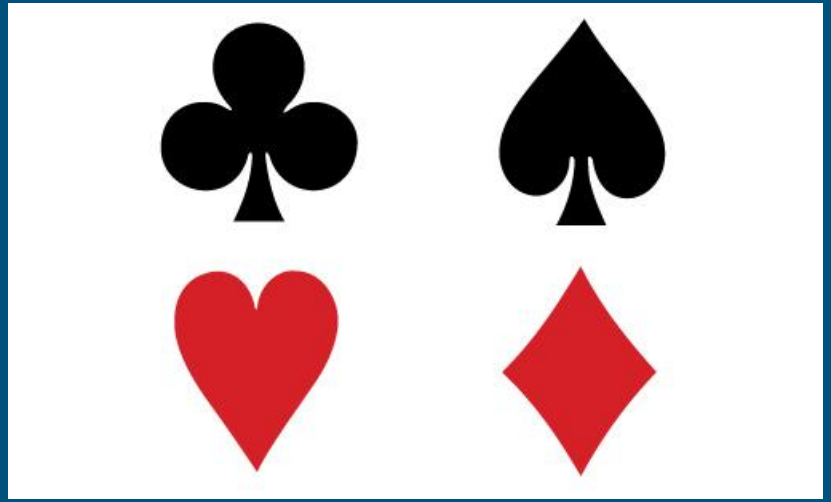
# Suit Detection

- Similar approach as value detection
- Create subimage
- Bounding box from 2nd object in ‘reigonprops’
- ‘bwareaopen’ to remove unwanted areas
- Disk dilation to clean up



# Suit Detection

- Use Fourier transforms with cross power multiplication
- Compare with template images for best fit
- Compute cross power spectrum
- Compare x and y origin



# Experimentation

- Varying distances from cards
- Varying playing surfaces
- Varying orientations
- Varying resolutions

# Results

- ~80% success rate in value recognition with sufficient resolution
- ~95% success rate in suit detection with sufficient resolution
- 3, 5 and 10 are prone to false detections with OCR

# Limitations

- Shadows, poor contrast break methodology
- Very high resolution images needed (3264 × 2448 or higher)
- Distances can break card recognition
- Only tested on Bicycle™ decks
- Computationally expensive

# Questions?