

Robust Text Reading



STAR WARS
EPISODE II: ATTACK OF THE CLONES

Motivation

- Understanding images
- Supports annotation, indexing and structuring of images



Our Approach



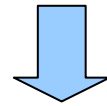
↓ Text detection



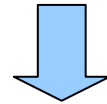
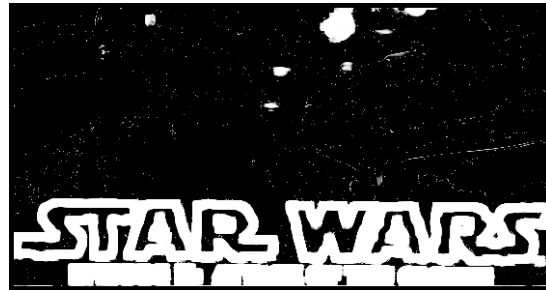
↓ Text enhancement



Text Detection



Classification using SVM



Post processing



Pattern Recognition with SVM

- Training
 - 100 images from ICDAR 2005 dataset
 - Randomly select 10 11x11 windows
 - 1000 training vectors
- Classifying a new image
 - For each 11x11 window
 - classify using SVM
 - scale output of SVM using sigmoid function

SVM Input



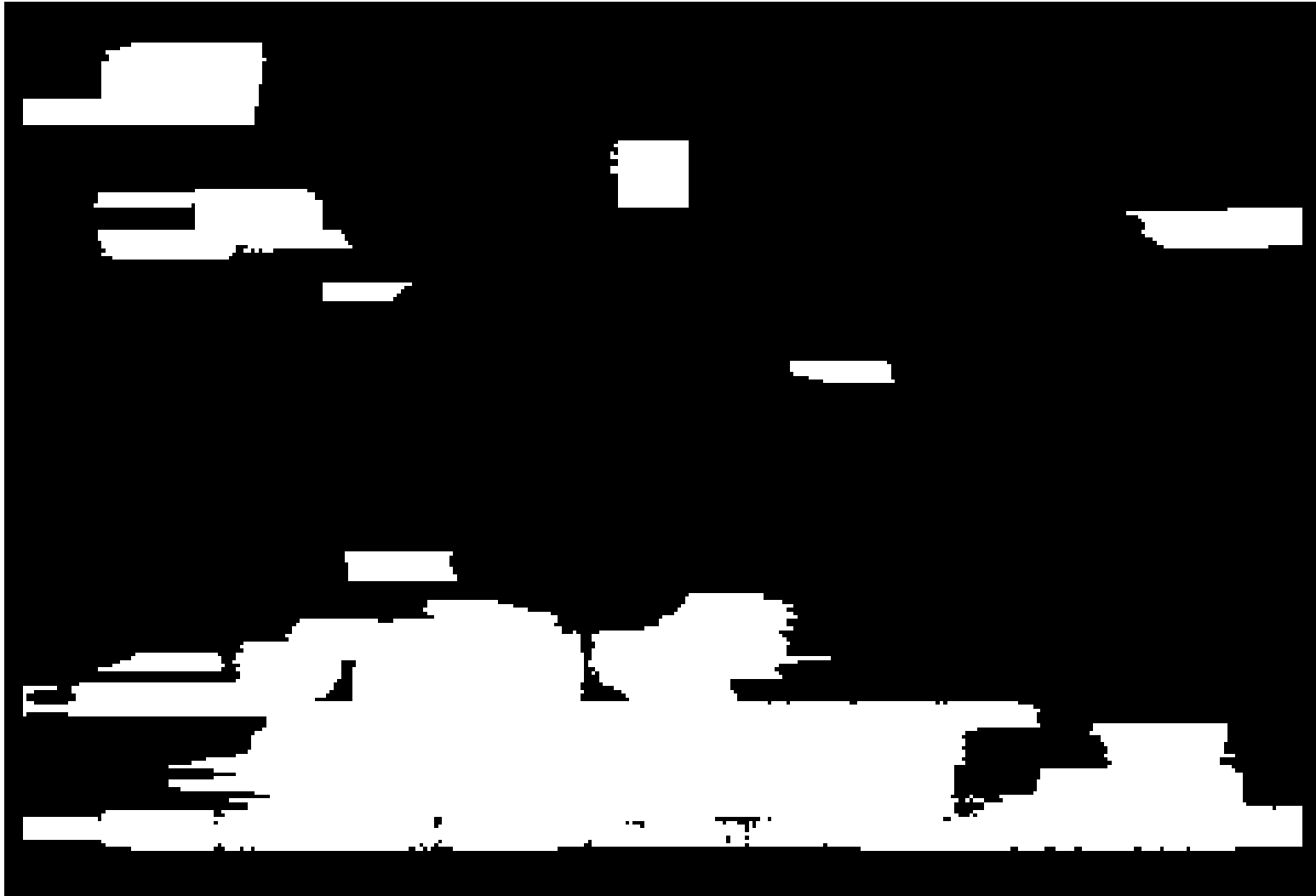
SVM Output



Post processing

- Convert to binary image
- Remove thin strokes
- Remove small components

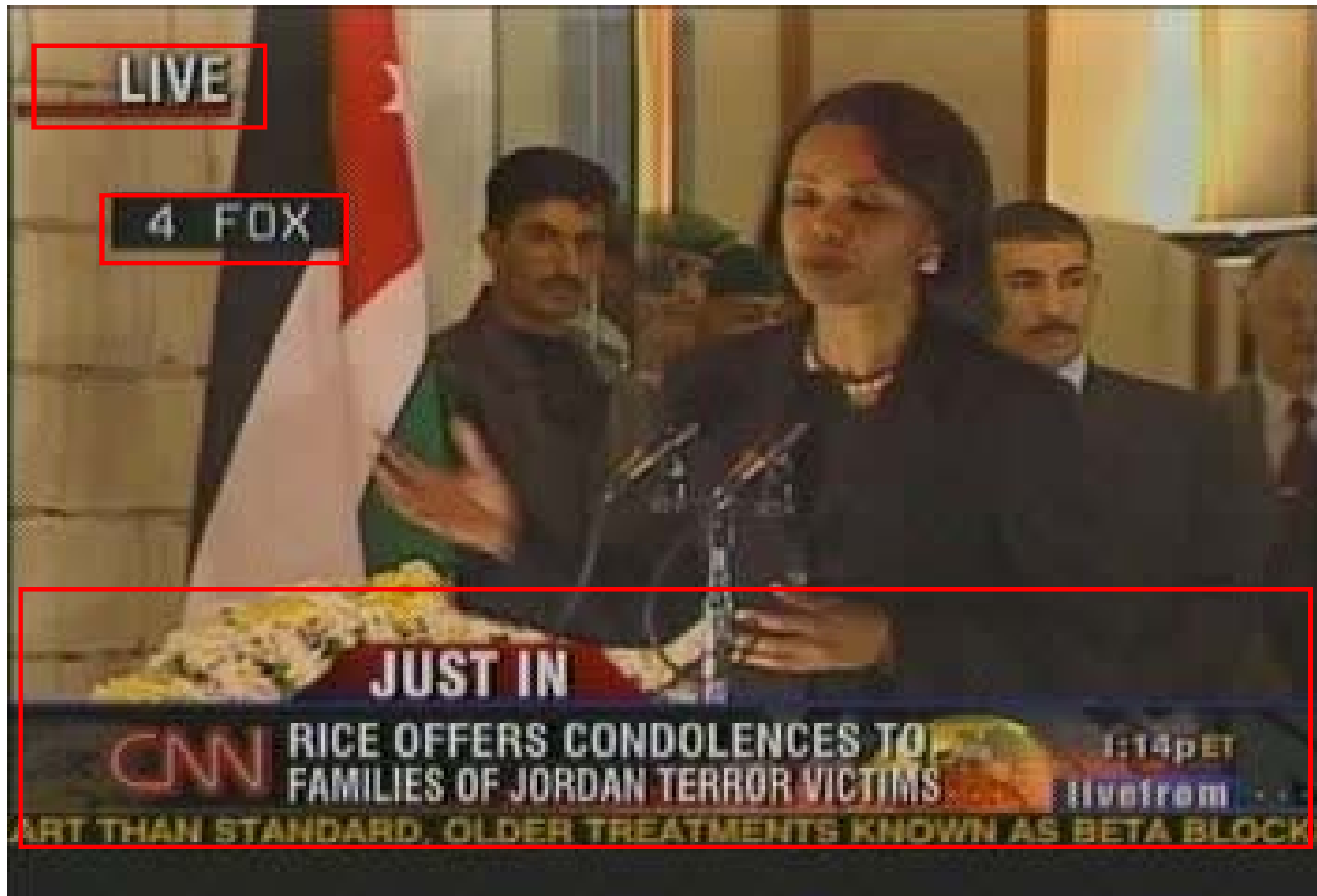
After post processing



Text Extraction

- Find connected components
- Reduce false positives, ensure
 - at least 1000 pixels
 - at least 50% text

Result of Text Detection



Our Approach



↓ Text detection



↓ Text enhancement



Text Enhancement

- Increase resolution
- Adaptive thresholding

Increasing resolution

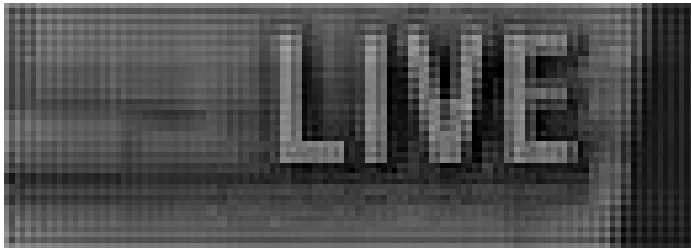
- The input image is in low resolution which will be difficult for OCR to recognize
- We experimented with Shannon interpolation and bicubic interpolation

Shannon Interpolation

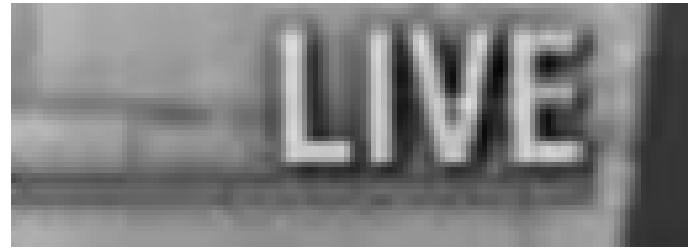
- Remove all frequency components above a given bandwidth and leaves the low frequencies alone
- Doubles the resolution of the image using sinc function

Bicubic

- Interpolates using cubic function
- Better result compared to Shannon interpolation



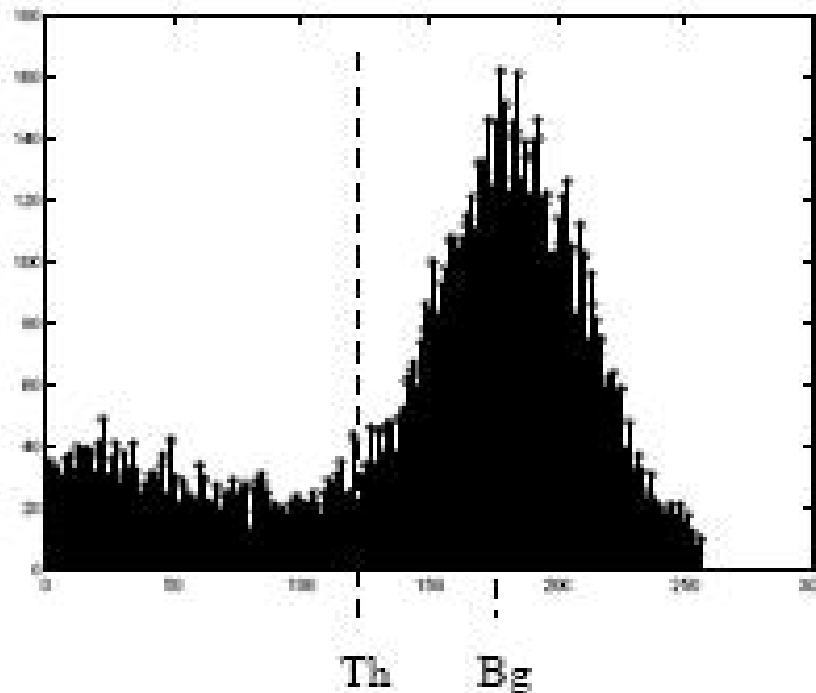
Shannon interpolation



Bicubic interpolation

Adaptive Thresholding

- Find a threshold value for each pixel, in order to figure out the text part



Adaptive Thresholding

- Use Niblack's method to compute the threshold value
- Niblack's method varies a threshold over the image, based on the local mean, m , and local standard deviation, s , computed in a small neighborhood of each pixel.

Adaptive Thresholding

- A threshold for each pixel $T = m + k * s$, where k is a user defined parameter
- Black pixels indicate the text area and white pixels indicate the background area

Results (News)



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Results (News)



Kara Beth Borden

Kara Beth Borden

Kara Beth Borden

David G. Ludwig

David G. Ludwig

David G Ludwig



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Results (News)



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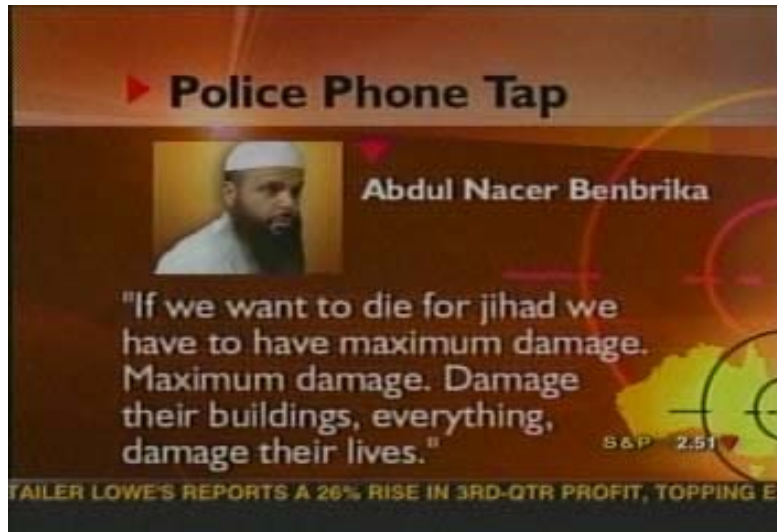


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Results (News)



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"If we want to die for jihad we have to have maximum damage. Maximum damage. Damage their buildings, everything, damage their lives."

"If we want to die for jihad we have to have maximum damage. Maximum damage. Damage their buildings everything damage their lives"

Police

Phone

Abdul Nacer Benbrika

Police

Phone

Abdul Nacer Benbrika

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Phone

Abdul Nacer Benbrika

"If we want to die for jihad we have to have maximum damage. Maximum damage. Damage their buildings everything (damage their lives"

Results (News)



LIVE

LIVE

LIVE

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IA DOUBLE SLAYING AND KIDNAPPING TAKEN INTO CUSTODY IN IND

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Results (Outdoor)



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CLUB

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Results (Outdoor)



precaution before passion

precaution before passion

precaution before passion



precaution before passion

Results (Outdoor)



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Results (Outdoor)

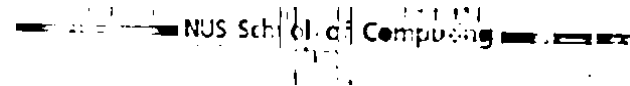


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Results (Outdoor)



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