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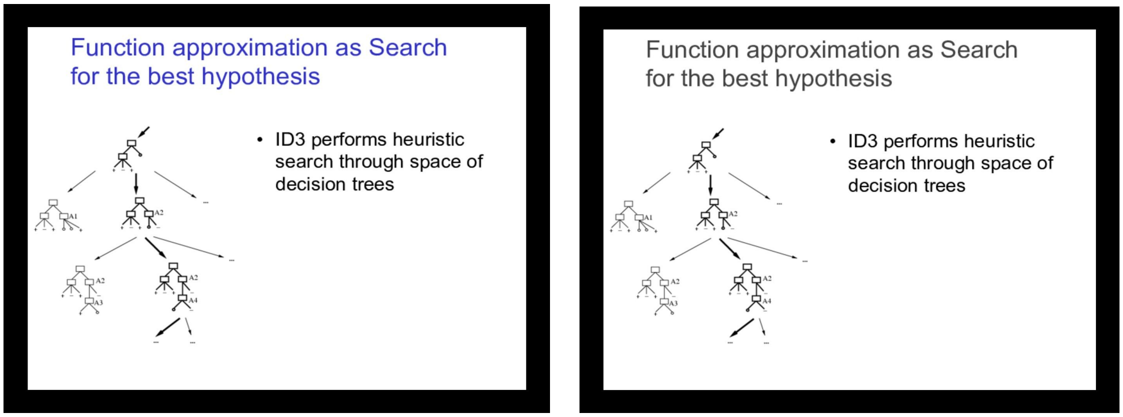
Automation of slide matching

Libraries Used:

1. Numpy
2. OpenCV

Implementation Details

- All the images are first converted to grayscale. This improves the efficiency and also helps in edge detection.



Function approximation as Search for the best hypothesis

- ID3 performs heuristic search through space of decision trees

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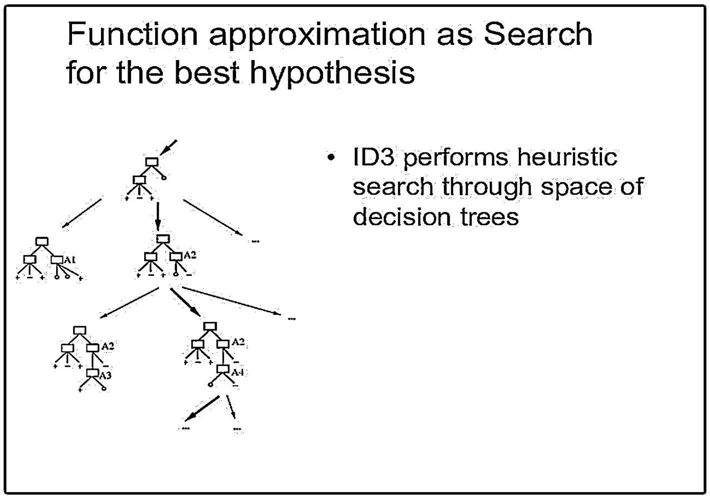
Original Image vs Grayscale Image

- Using Adaptive thresholding the image is converted into a binary image. This also removes noise from the images.



Function approximation as Search for the best hypothesis

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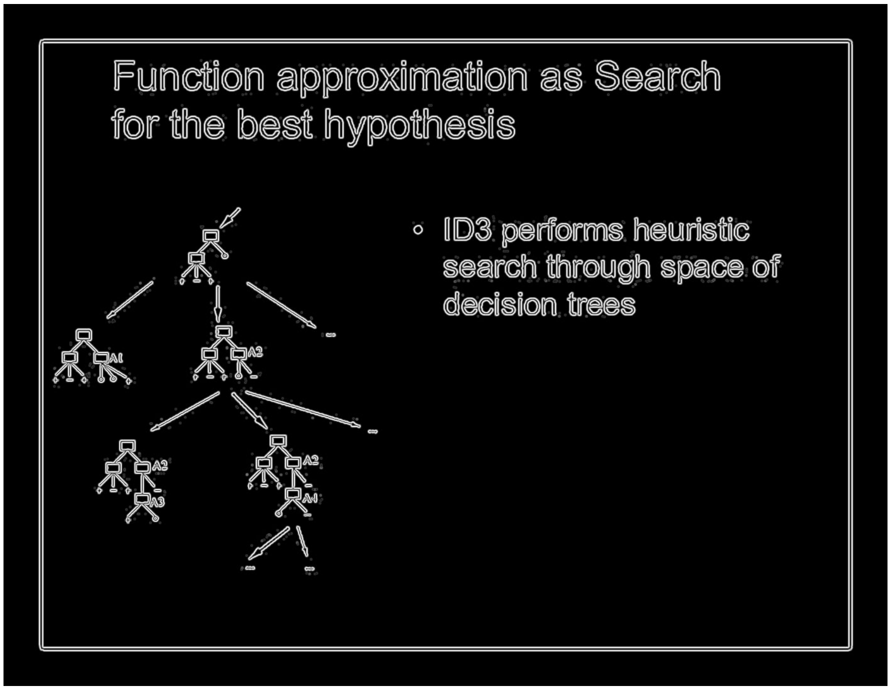
After Adaptive Thresholding

- The sobel operator differentiates the image along a given axis by convolving it with the kernel matrix.

  $Kernel\ along\ x - axis\ \ G_x = [-1\ 0\ 1;\ \ -2\ 0\ 2;\ \ -1\ 0\ 1]$

  $Kernel\ along\ y - axis\ G_y = [-1\ \ -2\ \ -1;\ 0\ 0\ 0;\ 1\ 2\ 1]$

  After finding derivatives along the 2 axes we find the magnitude (L2 Norm) of the derivative. This gives us the ‘edges’ of the image.



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After Applying Sobel operator (Twice)

- For finding the slide corresponding to a frame we iterate over all the slides and find the cross-correlation of the frame with them using the formula

$$CC = \frac{\Sigma\, frame(i,j) * slide(i,j)}{[\Sigma[frame(i,j)]^2 * \Sigma[slide(i,j)]^2]^{0.5}}$$ (where frame and slide are normalized)

The slide giving the maximum correlation with the frame matches the frame.