

# Success Story

“Enosis leveraged its expertise in application development to de-skew large repository of electronic images”



## Business Scenario

Inecom Entertainment being a producer of historic films possesses a massive repository of scanned historic manuscripts, images and other forms of printed materials. Most of the electronic images generated by scanning pictures, photos, documents etc have skew angles as its tough to ensure perfect image alignment at the time of scanning. Inecom approached Enosis to develop an application that can facilitate the process of image archiving by detecting the skew angle and de-skewing the scanned images for both single and whole batch of images



**MAJOR CHALLENGES**

- The operations required to de-skew an image can only be performed on images in bitmap format
- All standard image processing algorithms are developed only for grey scale images
- The ratio of text to graphics vary widely for different images
- Considering the different orientations of the shapes found in an image, calculating the image angle becomes difficult
- The conversion time needed to be optimized since a large number of images were required to be de-skewed

**THE SOLUTION**

The application developed by Enosis first decrypts a JPEG image into bitmap format. All the necessary operations required to de-skew an image are performed on the image in bitmap format. After the image is decrypted, it is converted to grey scale as all standard image processing algorithms are developed only for grey scale images. After rotating the image in bitmap with anti-aliasing, it is encrypted back to its original format, which is JPEG.

The grey scale image is used for generating image histograms in order to determine the percentage of text and graphics present in an image. The pixel intensity of the image is found by generating image histograms. A proprietary algorithm had to be developed and implemented for determining the percentage, location, magnitude of concentration, etc. of texts and graphics present in the image, by analyzing the pixel intensity information.

Canny edge detection algorithm has been implemented for detecting the edges of the image being processed. Projection profiling algorithm has also been implemented for image projection profiling. A proprietary algorithm had been

developed & implemented for identifying the leading edges of individual shapes within an image.

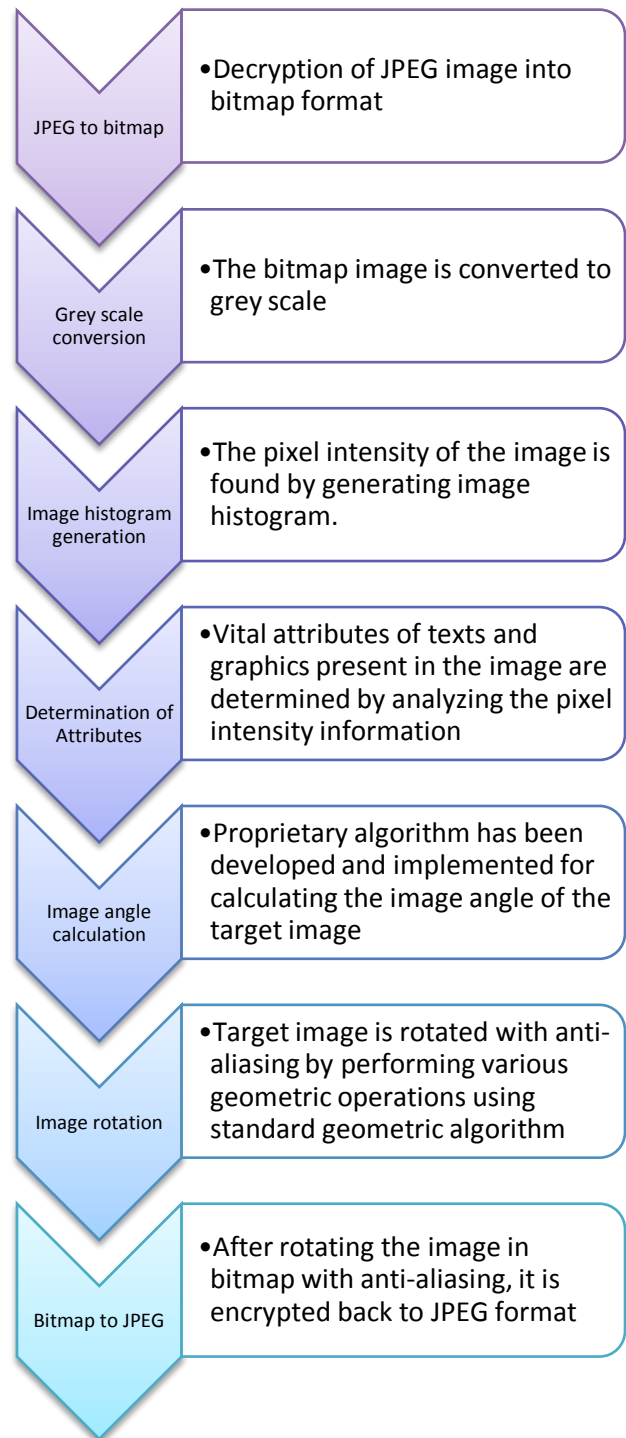
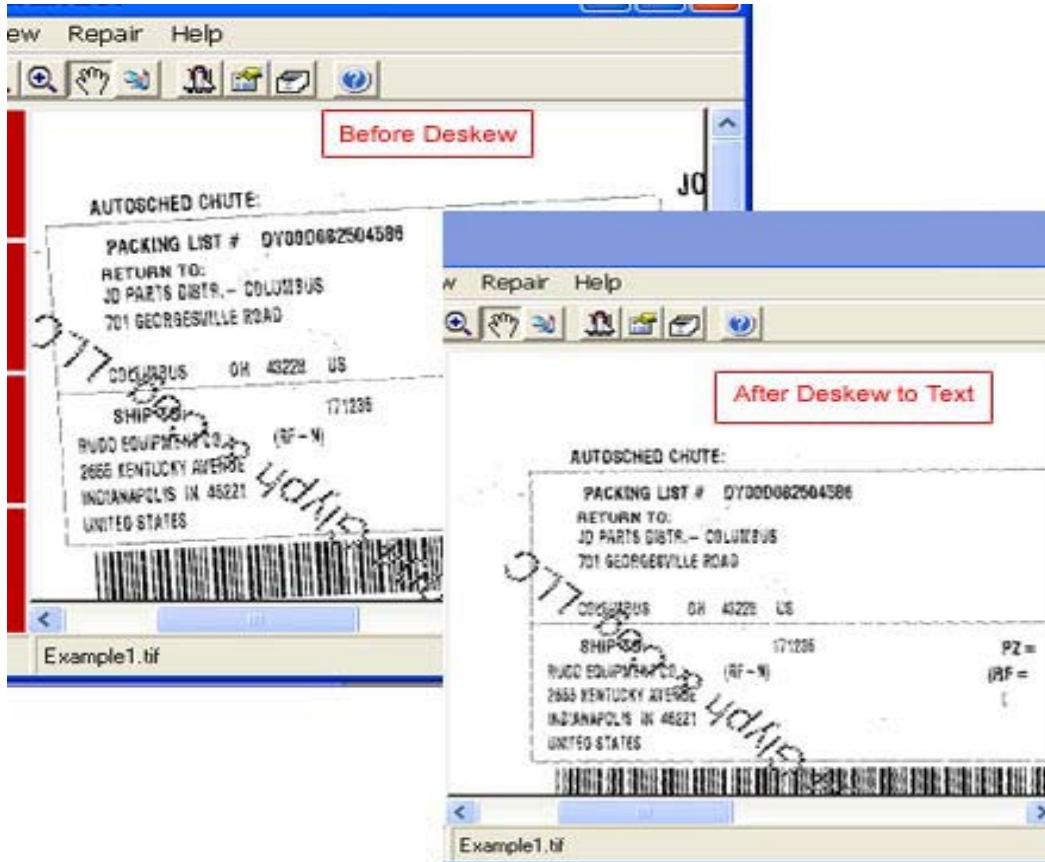


Image de-skew workflow



Different statistical methods have been used for determining the gradient of the identified leading edges. Using several statistical models, a proprietary algorithm has been developed and implemented for calculating the image angle of our target image. Gradients of the leading edges, projection profiling histograms and orientation of individual shapes within the target image are the parameters used for determining the image angle. This algorithm comprises of two individual algorithms, one for the images where text is dominant and the other one for graphics dominant images.

Using the image angle, the target image is rotated with anti-aliasing by performing various geometric operations using standard geometric algorithms.

### MAJOR BENEFITS

- Its capable of handling very large images
- The application requires minimum hardware resource usage for the efficient algorithms and their optimized implementation
- Capable of processing very large batches of images back to back.
- The image de-skewing process stated above is completely automated.
- The conversion process requires minimum execution time for its optimized implementation
- No user interaction is necessary at the time of execution

### TOOLS & TECHNOLOGIES

Visual C++