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Improve Image Quality in Fast in Painting with Segmentation Base Approach

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Abstract – The process of removing the particular object or area or repairing the damage dare a in an image is known as image In painting. Image in painting is the art of restoring lost and selected parts of an image based on the background information in such away so that the change is not observed by the observer. The filling-in of missing information is a very important technique in image processing. If some part of image is lost then instead of using common retransmission query protocols, In painting aim store construct the lost data using correlation between the lost block and its neighbors. Removing a target object and filling the missing regions of an image is the basic technology generally applied to image restoration.

Image In painting use various techniques for restoring image. According to survey found several techniques which are advantageous on specified applications of this technique include the restoration of old photographs and removal of super imposed text like dates, sub titles, cracks in photographs or scratches and dust spots in film or to add or remove elements in the damage image. In these paper works on advance segmentation base approach for detect and identify segmentation base allow specific content only and remove unwanted object and content using region base and morphological operator in image processing.

Keywords: In painting, Segmentation, Region Base Approach, Morphological Operator.

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1. INTRODUCTION

Image Processing is a process of taking an image as an input, perform some operations on it, in order to manipulated the image which include enhancing, reducing rotating etc. or extracting some useful information from it and producing the desired output.

Digital in painting, the technique of reconstructing small damaged portions of an image, has received considerable attention in recent years. In painting helps in removing undesired object in an image and reconstructing them based on the spatial information of the neighboring pixels i.e. filling the hole by using the information extracted from the surrounding region of the same image.

Most in painting methods work as follows. First, the image regions to be in painted are selected, usually manually. Next, color information is propagated inward from the region boundaries, i.e., the known image information is used to fill in the missing areas. In order to produce a perceptually plausible reconstruction, an in painting technique should attempt to continue the isophotes (lines of equal gray value) as smoothly as possible inside the reconstructed region. In other words, the missing region should be in painted so that the in painted gray value and gradient extrapolate the gray value and gradient outside this region.

One of the requirements of image in painting is to have a mask which locates the places of an image where in painting is needed that is done manually by the user and there are no mathematical equation involved.It would like to create the original image but it is not viable without the prior knowledge of that image. This technique can be applied to real life photos also. very simple in construction using a Fast In painting, it is to identify only the meaningful content, and particular area which is hidden behind some object. Fast In painting consist of a Image segmentation technique is used to partition an image into meaningful parts having similar features and properties image segmentation technique is used for assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

This algorithm is a direct extension of a recently developed image decomposition methods called

MCA (morphological component analysis) and Edge detection.

Morphological filtering simplified segmented images by smoothing out object outlines using filling small holes, eliminating small projections.It pursues the goals of removing these imperfections by accounting for the form and structure of the image. with the help of edge detection technique can extract the exact edge line with good orientation.Here we are using Sobel and Canny edge detection techniques.

The Sobel detect the edges at those points where the gradient is highest. The Sober technique performs a 2-D spatial gradient quantity on an image.

The Canny edge detection technique is one of the standard edge detection techniques.It find edges by separating noise from the image before find edges of image.

With DIBR, information contained in a gray-level (luminance intensity) depth map is used to shift pixels in the 2D image to generate a new image as if it were captured from a new viewpoint.

2. IMPLEMENTATION DETAILS

The whole process of image in painting with Fast Digital Image In painting approach could be stated as follows:

Step 1: Load input image from the current location.

First of all we load the input image from the CBIR Image database.

Figure 1- Original Image

Step 2: Read and display an RGB image, and then convert it to grayscale.

The input image is RGB Colour image, so we converts the true color image RGB to the grayscale intensity image by eliminating the hue and saturation information while retaining the luminance.

Figure 2- Grayscale Image

Step 3: Load the mask image.

In image in painting, which removes and restores unwanted regions in images, we draw masks to specify the regions. Here we in painting the mask image to the 2D converted grayscale image.

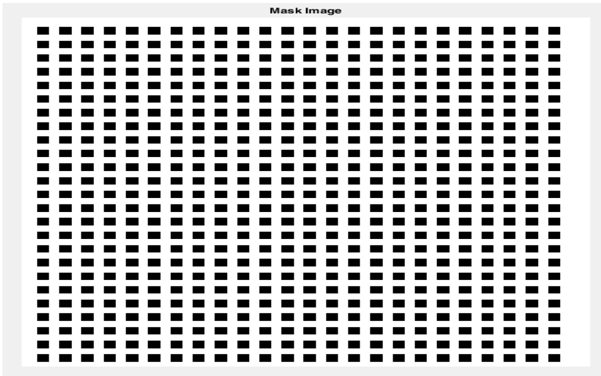


Figure 3- Mask Image

Step 4: Findout boundary and target region using region of interest.

Initialize the target region. This is generally performed separately from the In painting process and requires the use of an additional image processing tool. This is performed by marking the target region in some special colour. Without any loss of generality.

To findout boundaries we apply 100 iterations with the lowest thresould value.Iteration is the repetition of process in order to findout boundary of our target or region of interest.

Step 5: Identify patch polarity and Find the best exemplar.

The patch-based approach divides the original image into small patches for replacing a patch containing masked region with a similar patch only containing source region. with the help of patch polarity we can find out the best exemplar.

Find a patch from the image which best matches the selected patch, ψp. This matching can be done using a suitable error metric. We use the Mean Squared Error to find the best matching patch.

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

where I(i,j) represents the element of the patch ψp and K(i,j) represents the elements of the patch for which MSE is to be calculated. n is the total number of elements in the patch.

Step 6 :Use depth based In painting (examplar)with edge detection for identify depth of image.

Edge detection technique is its ability to extract the exact edge line with good orientation.

Here we are using Sobel and Canny edge detection techniques.

The Sobel detect the edges at those points where the gradient is highest. The Sobel technique performs a 2-D spatial gradient quantity on an image.

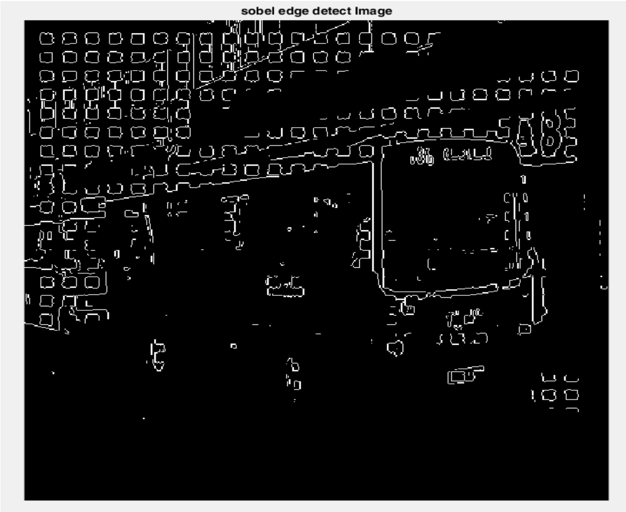


Figure 3- Sobel edge detection

The Canny edge detection technique is one of the standard edge detection techniques. It find edges by separating noise from the image before find edges of image.

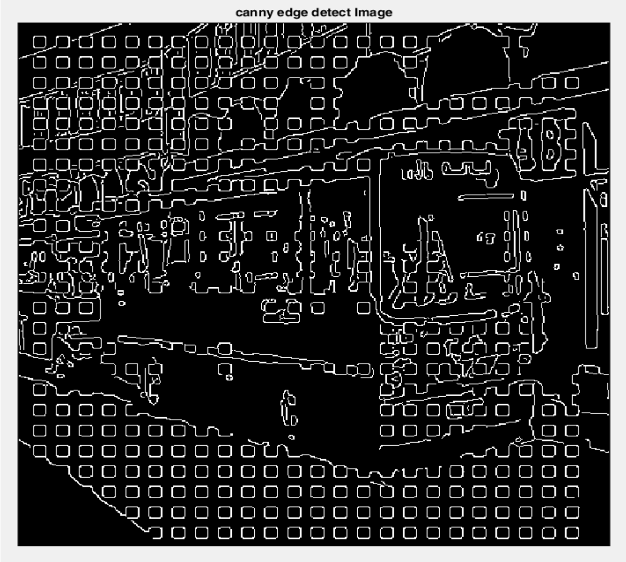


Figure 4- Canny edge detection

Step 7: Update patch till end of the image.

Update the image information according to the patch found in the previous step.

Step 8: create in painting image.

Figure 5- In painted Image

3. PARAMETERS

PSNR : Peak signal-to-noise ratio, often abbreviated PSNR, is an engineering term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale.

PSNR is most easily defined via the mean squared error (MSE). Given a noise-free m×n monochrome image I and its noisy approximation K, MSE is defined as:

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

The PSNR (in dB) is defined as:

$$
\begin{aligned}
PSNR &= 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right) \\
&= 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) \\
&= 20 \cdot \log_{10}(MAX_I) - 10 \cdot \log_{10}(MSE)
\end{aligned}
$$

Here, MAX_I is the maximum possible pixel value of the image. When the pixels are represented using 8 bits per sample, this is 255. More generally, when samples are represented using linear PCM with B bits per sample, MAX_I is 2^B-1.

SSIM: is used for measuring the similarity between two images. The SSIM index is a full reference metric; in other words, the measurement or prediction of image quality is based on an initial uncompressed or distortion-free image as reference. SSIM is designed to improve on traditional methods such as peak signal-to-noise ratio (PSNR) and mean squared error (MSE).

The SSIM index is calculated on various windows of an image. The measure between two windows x and y of common size $N \times N$ is:

$$\mathrm{SSIM}(x,y) = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$

with:

- μ_x the average of x;
- μ_y the average of y;
- σ_x^2 the variance of x;
- σ_y^2 the variance of y;
- σ_{xy} the covariance of x and y;
- $c_1=(k_1L)^2$, $c_2=(k_2L)^2$ two variables to stabilize the division with weak denominator;
- L the dynamic range of the pixel-values (typically this is $2^{\#bits\ per\ pixel}-1$);
- $k_1=0.01$ and $k_2=0.03$ by default.

The SSIM index satisfies the condition of symmetry: $SSIM(x,y) = SSIM(y,x)$

FSIM: We separate the feature similarity measurement between $f1(\mathbf{x})$ and $f2(\mathbf{x})$ into two components, each for PC or GM. First, the similarity measure for $PC1(\mathbf{x})$ and $PC2(\mathbf{x})$ is defined as,

$$\mathrm{FSIM} = \frac{\sum_{\mathbf{x}\in\Omega} S_L(\mathbf{x}) \cdot PC_m(\mathbf{x})}{\sum_{\mathbf{x}\in\Omega} PC_m(\mathbf{x})}$$

► **Measured parameters:**

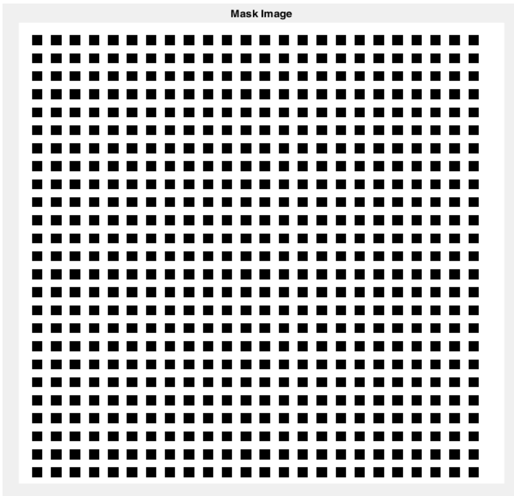
Table 1- Parameters value

IMAGES	PSNR	FSIM	SSIM
a	30.4063	0.9820	0.9744
b	38.2797	0.9812	0.9774
c	40.2277	0.9852	0.9831
d	42.4928	0.9862	0.9899
e	43.2132	0.9895	0.9910
f	42.3019	0.9870	0.9900
g	42.5795	0.9876	0.9829
h	37.3868	0.9764	0.9718

Image b:

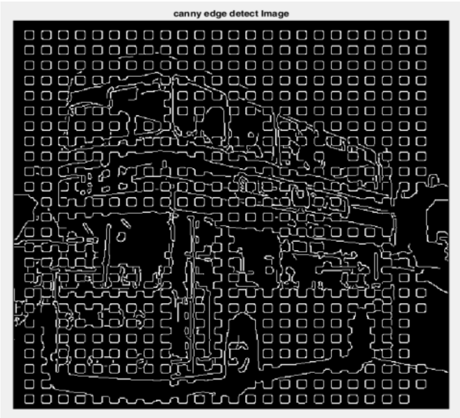
Step 1: Original Image

Step 2: Grayscale Image

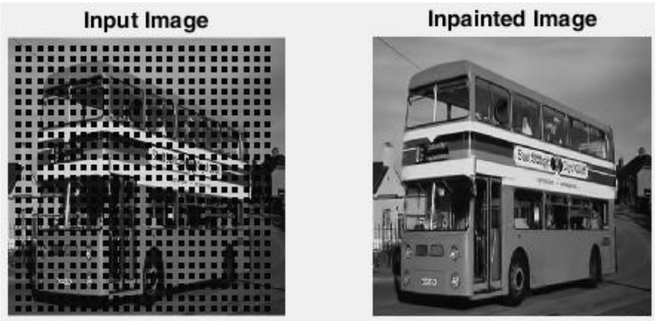


Step 3: Mask Image

Step 4: Sobel edge detect Image



Step 5: Canny edge detect image

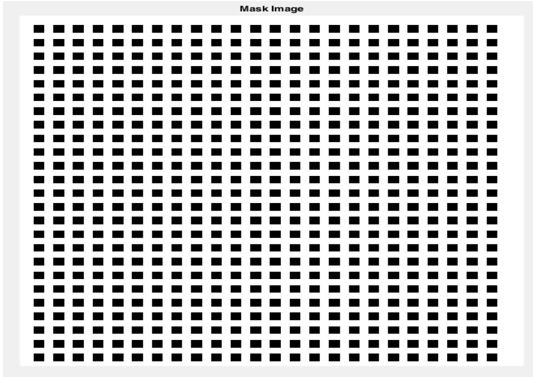


Step 6: In painted Image

Image c:

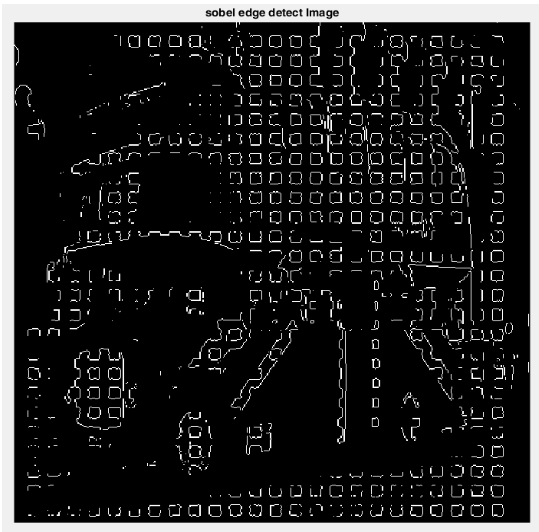
Step 1: Original Image

Step 2: Grayscale Image

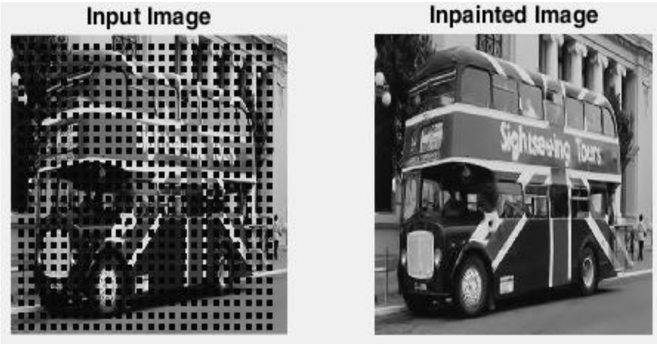


Step 3: Mask Image

Step 4: Sobel edge detect Image

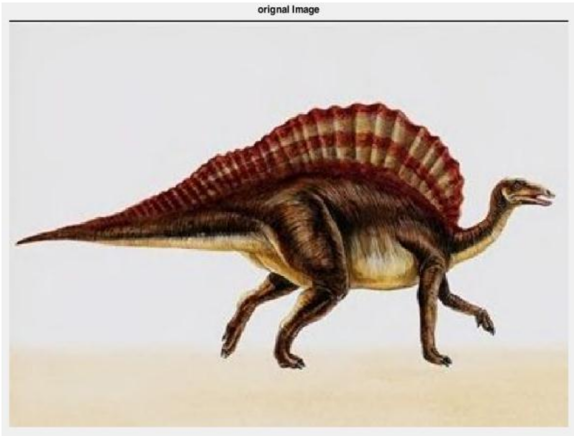


Step 5:canny edge detect image

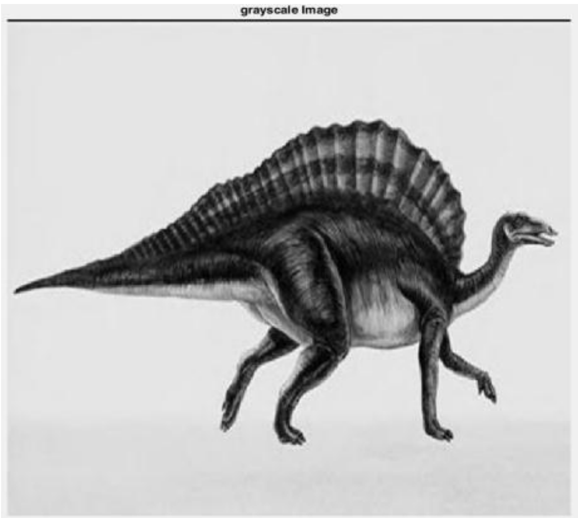


Step 6: In painted Image

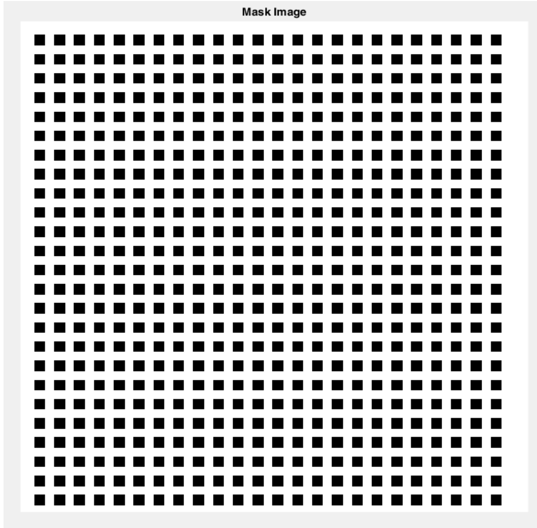
Image d:



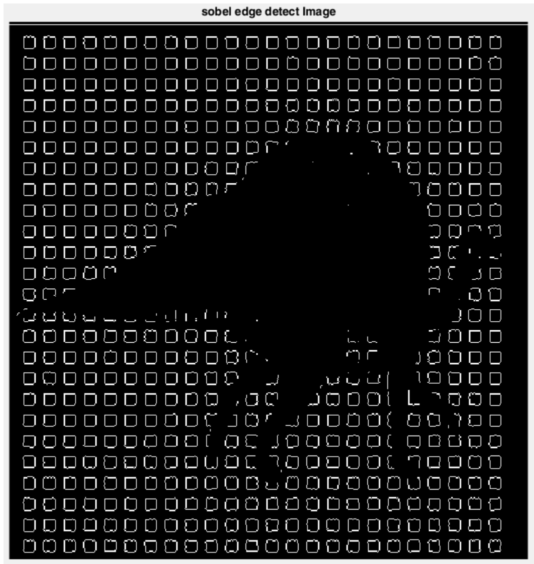
Step 1: Original Image



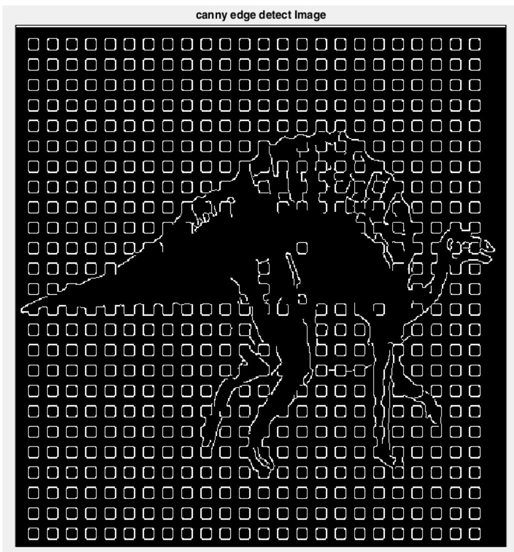
Step 2: Grayscale Image



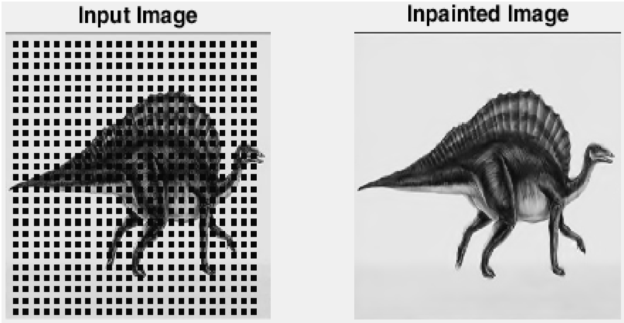
Step 3: Mask Image



Step 4: Sobel edge detect Image



Step 5:canny edge detect image

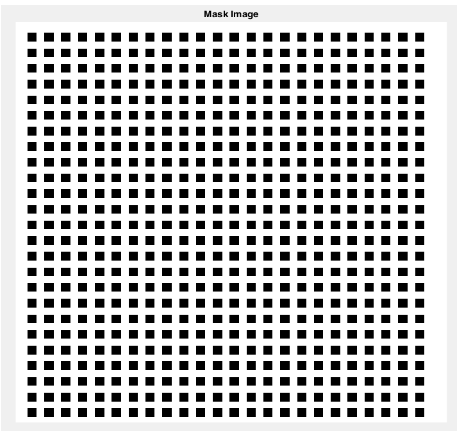


Step 6: In painted Image

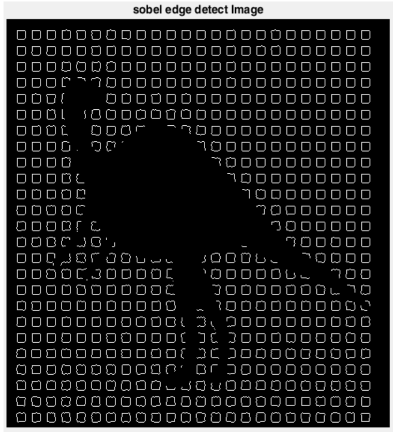
Image e:

Step 1:Original Image

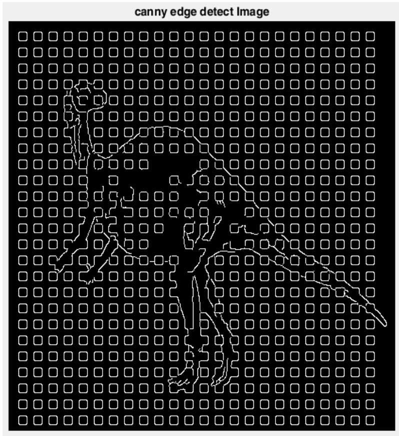
Step 2: Grayscale Image



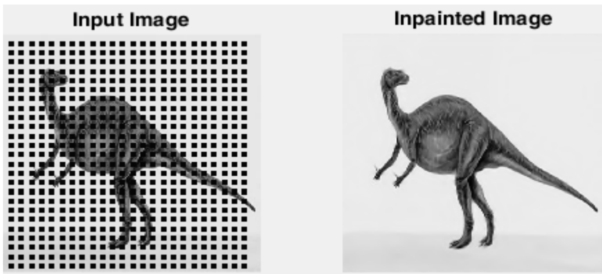
Step 3: Mask Image



Step 4: Sobel edge detect Image



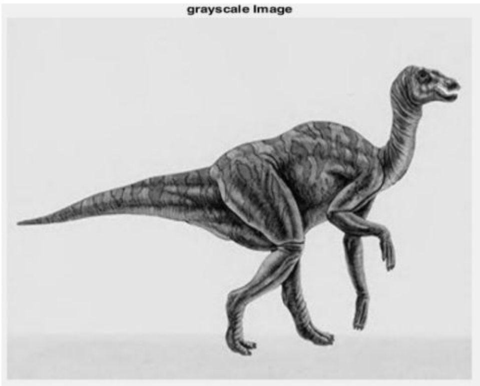
Step 5:canny edge detect image



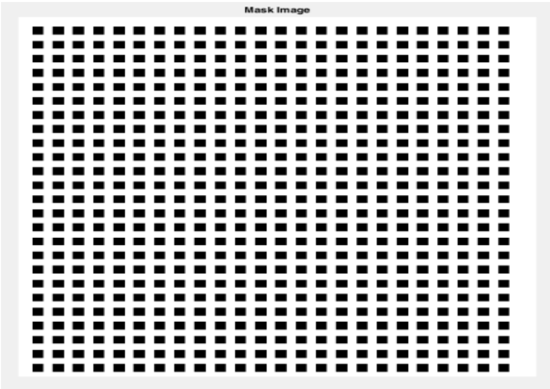
Step 6: In painted Image

Image f:

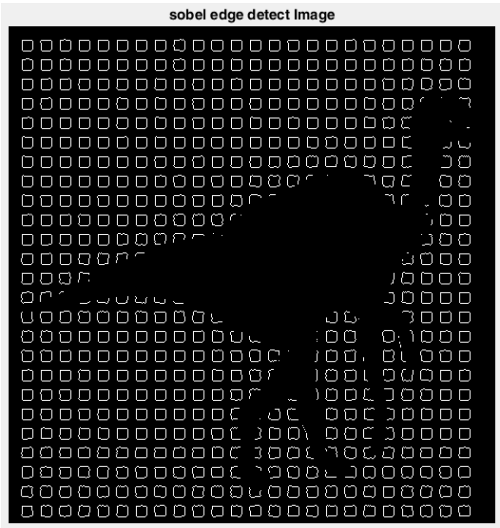
Step 1: Original Image



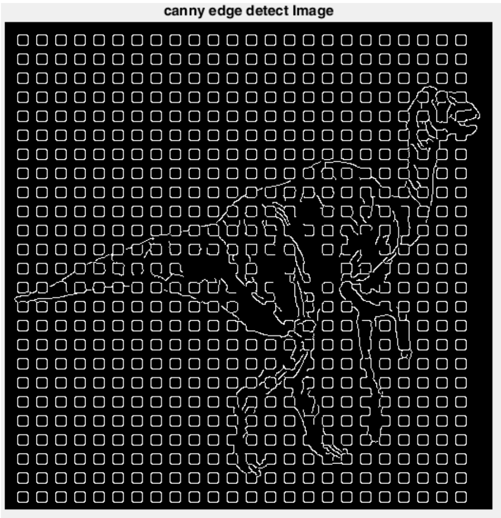
Step 2: Grayscale Image



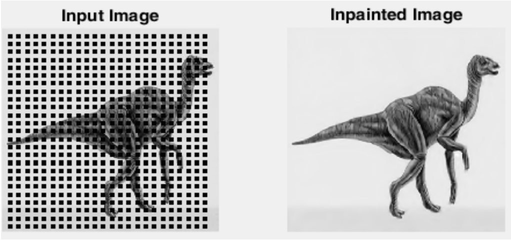
Step 3: Mask Image



Step 4: Sobel edge detect Image



Step 5:canny edge detect image



Step 6: In painted Image

4. CONCLUSION

The paper presents a comparative study regarding in painting techniques in order to evaluate different types of image restoration methods and to emphasize the advantages and disadvantages for each of the approached algorithms.

We have presented a new approach for image in painting or fast in painting using (egde and morphological operators) for allowing missing data and automatically filling-in missing pixels. It has been concluded that morphology and edge detection is having a significant importance in digital image processing and also work on other parameters SSIM, FSIM, PSNR & MSE

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