

**ABSTRACT**

Image has become an important part of our life. The image inpainting is a technique of removing the unwanted part of image without disturbing its overall structure. The inpainting of the low resolution images are simpler than that of the high resolution images. In this system low resolution image is kept under different super resolution image inpainting methodologies and then results of all these methodologies are combined to form the highly inpainted image. For this reason our system uses the super resolution algorithm which is responsible for inpainting of single image.

**KEYWORDS-** Exemplar-based inpainting, single-image super-resolution

**INTRODUCTION**

Image has become useful phenomenon for many research field. In old days images are only used for capturing memories. But now images have changed their face. Images may be two-dimensional, or three-dimensional. They may be captured by optical devices – such as cameras, mirrors, and lenses. Today, images can be used for encryption, processing, authentication, sharing etc. purpose. But the main aim of image is still being preserve i.e. to store the memories. Sometimes useful images get discarded or deleted due to extra part or distortion in image. A super resolution (SR) algorithm is used to guess and fill in the lost image information to restored image or painting seems as natural as its original version. First the object in the required target area is removed by inpainting. Result gain is given as input to a super-resolution algorithm to recover details on missing areas. Exemplar-based inpainting is used to remove objects that are not required. A Super-resolution algorithm is more efficient since inpainting produces a low resolution image. Initially inpainting is used for scratch removal. The next applications include removal of object, text and other automatic modification of images. The object removal is a process to remove objects from images and fill the hole by taking information from the surrounding area pixels. The inpainting is process of replacing the corrupted part of the image by using the various effective image inpainting techniques which can able to fix and recover the small defects occurring inside the image. This technique do changes in the image which will not recognize by the observer. Here we introduce an algorithm

for automatic inpainting of digital image, and replicate the basic techniques used by existing restoration methods. The image inpainting technology play an important role in computer graphics and has many applications such as old films renovation, object removal in digital photos, coding image and transmission. This method restores lost/selected parts of an image using the background information in a visually possible way. So the use of image inpainting is not only to recover the original image, but also to create some image that has a close appearance with the original image.



*Figure 1. Before and after inpainting.*

The reason behind region completion varies from remove-undesired object to improve the quality of the image. The object removal starts with mask out the undesired object, making the area where the object previously occupies a hole. These hole will be filled using graphical pixel filling techniques.

The exemplar based SR, correspondences between HR and LR patches are learned from a group of HR-LR patches known as Dictionary and then applied to a low resolution image to recover its higher resolution version. SR method consider Super Resolution image reconstruction as a deblurring problem and solve the inverse problem using Bregman iterations. The HR image is estimated based on some prior knowledge about the image in the form of regularization. A new regularization method based on multi scale morphological filters is proposed.

### LITERATURE SURVEY

This section shows existing inpainting technique and their work. These techniques are separated into the diffusion based or the exemplar based techniques. It is having some limitation so it leads to the development of hierarchical approach of super-resolution based inpainting.

M. Bertalmio, G. Sapiro, V. Caselles, and C. Ballester, "Image inpainting,"

This paper shows that image inpainting is only used for filling the some loosed portion of the image. But this method is not suitable for high quality images. It uses patch based inpainting. The area at which the inpainting algorithm is to be apply is selected here manually by the user. Here this area is marked as the sigma notation. Masking on image is denoted by sigma.



*Figure 2. Traditional image inpainting.*

In this masking is removed by using Efros and leungs algorithm. This method is responsible for filling the losses inside the image but this feeling is not reasonable [1].

A. D. Tschumperlé and R. Deriche, "Vector-valued image regularization with PDEs: A common framework for different applications [2].

Here vector valued algorithm is used for eliminate the diffusion in image. The image is passed through

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three steps named as minimization of functions, expression divergence, and laplacians respectively. This uses mathematical formulae to inpaint the image, but it is not efficient to represent the flows of large image distortion.



*Figure 3. Image inpainting using PDE.*

B. T. Chan and J. Shen, "Variational restoration of non-flat image features: Models and algorithms,"[4]

Here author had states a novel exemplar based Image Inpainting method with an increased priority term which defines the filling sequence of patches in the image.

Inpainting method is based on patch generation by propagating the image patches from the source region into the interior of the target region patch by patch. This method uses a diffused PDE to constrain the processing order; so, it has a good linear structure preserving property. Here the size of exemplar is dynamically calculated by the local pixel information; the seams and block effects are removed by the PDE. Because the exemplar-based model could not be used for complex geometric structures completion, the novel model adopts a bi-directional diffused PDE to assist the completion procedure.

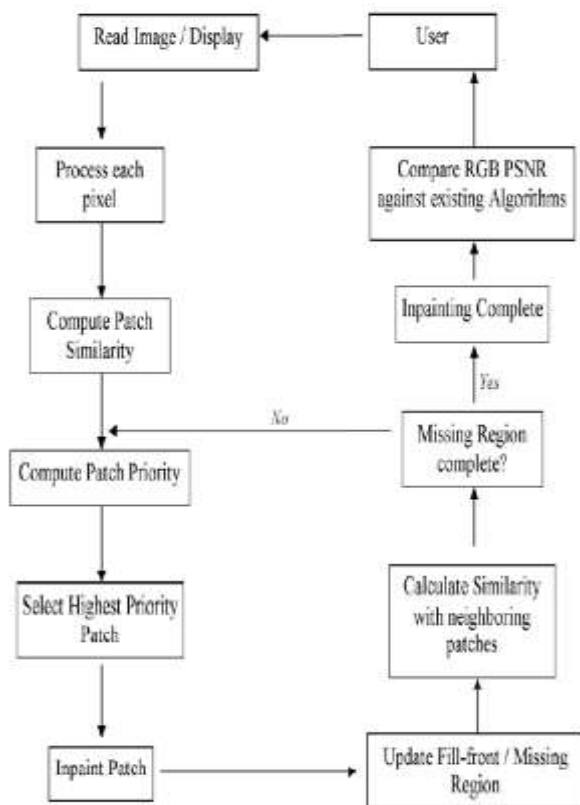


Figure 4. Exemplar based inpainting

C. I. Drori, D. Cohen-Or, and H. Yeshurun, "Fragment-based image completion,"[5]

This method is used for image completion that interleaves a smooth approximation with detail completion by example fragments. Our method iteratively approximates the unknown region and fills in the image by adaptive frames. It fills the image by a combination of fragments under combinations of spatial transformations. It follows the principles of figural simplicity and figural familiarity. Thus, an approximation is generated by applying a simple smoothing process in the low guessing areas. It is a classification of the pixels to some underlying structure that agrees with the parts of the image for which we have high confidence.



Figure 5. Algorithm for fragment based inpainting.

This paper present an iterative process that interleaves smooth reconstruction with the synthesis of image fragments. It iteratively generates smooth reconstructions to guide the completion process.

**PROPOSED SYSTEM**

Here we are going to apply several number of technique on input image. Finally the combination of all the result is generalized to produce output. Then the output produced is pass under separate super resolution method. Super resolution algorithm takes two values as input either dictionary values or adjacent values. The values which are store in the database during the scanning of the input image are known as dictionary values. And values which are calculated by the analysis of the all the adjacent pixel to that pixel to be examine are known as neighborhood values. The super resolution algorithm search for pixel which can be best fit into the lossy area of the image which results to the efficient method output.

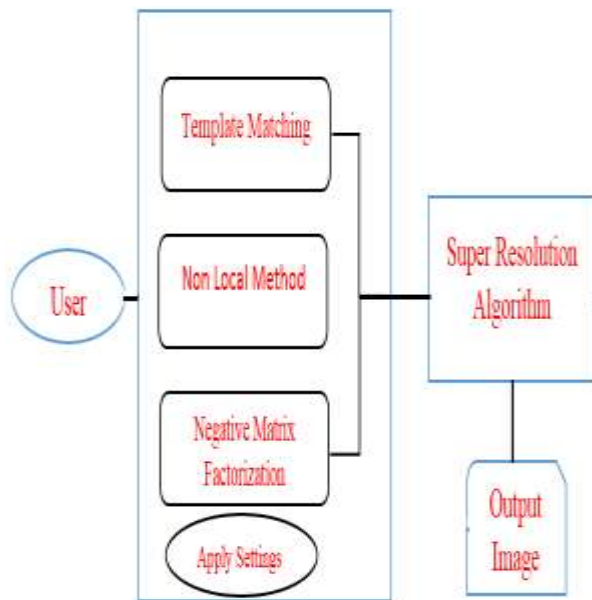


Figure 6. System Architecture

The propose methodology is combination of three basic techniques. Template matching, non-local method, negative matrix factorization. Template matching is a technique in digital image processing for finding small parts of an image which match a template image. Non-local means is an algorithm in image processing for image de-noising. Which take the mean value of a group of pixels surrounding a target pixel to smooth the image.

## CONCLUSION

The inpainting method included in this paper is able to give better output and it has ability of overcoming the limitations of the all existing work done by previous authors. It uses the super resolution algorithm to fills the gaps in the image by finding exact match of the pixel. Here we are combining multiple Image inpainting techniques so it can result in better and efficient output.

## ACKNOWLEDGMENT

Author would like to take this opportunity to express our profound gratitude and deep regard to my (Project Guide name), for his exemplary guidance, valuable feedback and constant encouragement throughout the duration of the project. His valuable suggestions were of immense help throughout my project work. His perceptive criticism kept me working to make this project in a much better way. Working under him was an extremely knowledgeable experience for me.

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