Enhanced Framework For Secure Image Denoising System In Cloud Computing

J.Welbinleci[1], D.K.Kalaivani[2]
[1, 2] Dept of CSE
[1, 2] Udaya School of Engineering

Abstract- *Along with the rapid advancement of digital image processing technology, image denoising remains a fundamental task which aims to recover the original image from its noisy observation. With the explosive growth of images on the Internet, one recent trend is to seek high quality similar patches at cloud image databases and harness rich redundancy herein for promising denoising performance. Despite the well understood benefits, such a cloud-based denoising paradigm would undesirably raise security and privacy issues, especially for privacy-sensitive image datasets. In this work initiate the first endeavor toward privacy-preserving image denoising from external cloud databases. The design enables the cloud hosting encrypted databases to provide secure query-based image denoising services. Considering that image denoising intrinsically demands high quality similar image patches, my design builds upon recent advancements on secure similarity search, Yao's garbled circuits, and image denoising operations, where each is used at a different phase of the design for the best performance. Formally analyze the security strengths. Extensive experiments over real-world datasets demonstrate that my design achieves the denoising quality close to the optimal performance in plaintext.*

Keywords- Image processing, Encryption, Denoisin, Cloud database

I. INTRODUCTION

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies

Image denoising stillremains a challenge for researchers because noise removal introduces artifacts and causes blurring of the images. This work describes different methodologies for noise reduction (or denoising) giving an insight as to which algorithm should be used to find the most reliable estimate of the original image data given its degraded version. Noise modeling in images is greatly affected by capturing instruments, data transmission media, image quantization and discrete sources of radiation. Different algorithms are used depending on the noise model. Most of the natural images are assumed to have additive random noise which is modeled as a Gaussian.

Image Denoising has remained a fundamental problem in the field of image processing. Wavelets give a superior performance in image denoising due toproperties such as sparsity and multiresolution structure. With Wavelet Transform gaining popularity in the last two decades various algorithms for denoising in wavelet domain were introduced. The focus was shifted from the Spatial and Fourier domain to the Wavelet transform domain. Ever since Donoho's Wavelet based thresholding approach was published in 1995, there was a surge in the denoising papers being published.

The main purpose of deblurring and denoising is to recover a latent image from a degraded image that has been contaminated bythe blur process, noise,and other factors. In terms ofthe number of images required to perform reconstruction, the current approaches are usually divided into single image and multiple image reconstruction.

For single image reconstruction, the deblurring process can be either non-blind or blind. In the non-blind case, the kernel is known or estimated first, and then non- blind deconvolutions, such as the Richardson-Lucy(RL)and Forward methods, can be utilized. For blind deblurring, both the blur kernel and image are unknown, which presents a great challenge because the deconvolution is ill posed. To estimate the blur kernel and image, certain constraints must be introduced to produce a meaningful solution. In the past decades, many authors have attempted to develop classical approaches for deblurring and denoising images. The most popular approach is total variation (TV) regularization that was developed.

In doing so, the ill-posed problem becomes a well-posed one. For instance, a learned sparse domain is utilized to perform image deblurring, a nonlocal regularization is used to explore the nonlocal similarity in the natural images, and a group sparse representation is developed to exploit both local and nonlocal information for superior recovery performance. Multiple image deblurring was inspired by the framework, where the deblurring performance of using two motion blurred images is superior to that required for a single image. In exploring the information from multiple images, the cross-blur is first added as a regularization term. With this term, however, kernel estimation can be blurry, especially when the noise is high. To alleviate this issue, the sparse penalty on the kernel itself is introduced, and theresults show the improvements in recovering the latent image. In special cases, different types of images can be explored to recover the image.

This system is based on IES-CBIR, a novel Image Encryption Scheme that exhibits Content-Based Image Retrieval properties. The framework enables both encrypted storage and searching using Content-Based Image Retrieval queries while preserving privacy against honest-but-curious cloud administrators. A prototype of the framework, formally analyzed and proven its security properties, and experimentally evaluated its performance and retrieval precision. IES-CBIR is provably secure, allows more efficient operations both in terms of time and space complexity, and paves the way for new practical application scenarios.

II. LITERATURE SURVEY

A data-dependent denoising procedure to restore noisy images.Different from existing denoising algorithms which search for patches from either the noisy image or a generic database, the new algorithm finds patches from a databasethat contains relevant patches. I formulate the denoising problem as an optimal filter design problemand make two contributions. First, i determine thebasis function of the denoising filter by solving a group sparsity minimization problem. The optimization formulation generalizes existing denoising algorithms and offers systematic analysis of the performance. Improvement methods are proposed to enhance the patch search process. Second, i determine the spectral coefficients of the denoising filter by considering a localized Bayesian prior. The localized prior leverages the similarity of the targeted database, alleviates the intensive Bayesian computation, and links the new method to the classical linear minimum mean squared error estimation. I demonstrate applications of the proposed method in a variety of scenarios, including text images, multiview images and face images. Experimental results show the superiority of the new algorithm over existing methods.

A novel stochastic approach based on Markov-Chain Monte Carlo sampling is investigatedforthepurposeofimagedenoising.Theadditiveimage denoisingproblem is formulated as a Bayesian least squares problem, where the goal is to estimate the denoised image given the noisy image as the measurement and an estimated posterior. The posterior is estimated using a nonparametric importance-weighted Markov-Chain Monte Carlo sampling approach based on an adaptive Geman-McClure objective function. By learning the posterior in a nonparametric manner, the proposed Markov- Chain Monte Carlo denoising (MCMCD) approach adapts in a flexible manner to the underlying image and noise statistics. Furthermore, the computational complexity of MCMCD is relatively low when compared to other published methods with similar denoising performance. The effectiveness of the MCMCD method at image denoisingwas investigated using additive Gaussian noise, and was found to achieve state-of-the- art denoising performance interms of both peak signal-to-noise ratio(PSNR) and mean structural similarity (SSIM) metrics.

In this work propose a denoising method motivated by my previous analysis of the performance bounds for image denoising. Insights from that studyare used here to derive a high-performance practical denoising algorithm. I propose a patch-based Wiener filter that exploits patch redundancy for image denoising. My framework uses both geometrically and photometrically similar patches to estimate the different filter parameters. I describe how these parameters can be accurately estimated directly from the input noisyimage. My denoising approach, designed for near-optimal performance (in the mean-squared error sense), has a sound statistical foundation that is analyzed in detail. The performance of my approach is experimentally verified on a variety of images and noise levels. The results presented here demonstrate that my proposed method is on par or exceeding the current state of the art, both visually and quantitatively.

Classical image denoising algorithms based on single noisy images and generic image databases will soon reach their performance limits. In this paper, i propose to denoise images using targeted external image databases. In contrast to the existing methods, the proposed algorithm requires only a few targeted images in the database. Moreover, the proposed algorithm offers two new insights into the denoising problem. Formulating denoising as an optimal filter design problem, i utilize the targeted databases to (1) determine the basis functions of the optimal filter by means of group sparsity; (2) determine the spectral coefficients of the optimal filter by means of localized priors. For a variety of scenarios such as text images, multiview images, and face images, i demonstrate superior denoising results over existing algorithms.

Image denoising is a central problem in image processing and it is often a necessary step prior to higher level analysis such as segmentation, reconstruction or super-resolution. The non-local means (NL-means) perform denoising by exploiting the natural redundancy of patterns inside an image; they performa weighted average of pixels whose neighborhoods (patches) are close to each other.it might over- smooth low-contrasted areas or leave a residual noise around edges and singular structures. Denoising can also be performed by total variation minimization – the ROF model – which leads to restore regular images, but it is prone to over-smooth textures, staircasing effects, and contrast losses. I introduce in this paper a variational approach that corrects the over-smoothing and reduces the residual noise of the NL means by adaptively regularizing non-local methods with the total variation. The proposed regularized NL means algorithm combines these methods and reduces both of their respective defaults by minimizing an adaptive total variation with a nonlocal data fidelity term. Besides, this model adapts to different noise statistics and a fast solution can be obtained in the general case of the exponential family. I develop this model for image denoising and we adapt it to video denoising with 3D patches.

III. PROPOSED SYSTEM

The basic service model targeted design is illustrated in Fig. 1. At the core, it contains three parties: the service provider (SP), the user, and the cloud. The SP outsources an encrypted database of image patches to the cloud, and wants to offer some secure "query" based image denoising service to authorized users. The user can issue encrypted "queries" to the cloud, hoping to find high quality similar patches for image denoising and/or ask the cloud to further perform as many operations as possible over the encrypted search results. At certain points, the cloud may interact with an extra server which belongs to separate administrative domain.

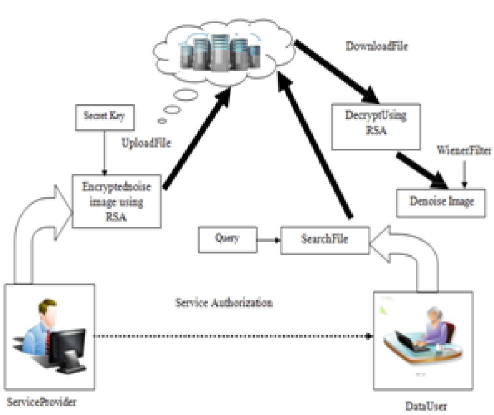

Fig 1. System Architecture

At the core, it contains three parties: the service provider (SP), the user, and the cloud. The SP outsources an encrypted database of image patches to the cloud, and wants to offer some secure "query" based image denoising service to authorized users. For example, online image sharing websites may construct a database with their collected images, and deploy its encrypted version at the public cloud to provide image denoising.

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Note that although some public image datasets are available, they may not be necessarily suited to accommodate various kinds of image denoising applications and could be limited for practical use. Our proposed design allows the SP to either construct a generic database of patches extracted from a very comprehensive set ofself-own images,thus with very rich structures, or customize a targeted database which is made from self-own images that are relevant to noisy images On another hand, even if public image datasets are deployed for denoising, it is of paramount importance to protect user's query images against the cloud. Therefore, an encrypted service design would still be desirable and necessary.

MODULES

- Service Provider
- Data User
- Image Denoising
- Cloud Server

Service Provider

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well protected. The most cloud service providers are well-established and they are unlikely to collude with each other in order to maintain their own reputation and financial interests.
First, the extra server produces an asymmetric key pair of a public-key encryption scheme. Then, the public key is used by the SP to encrypt the database patches. In addition, the SP and the user are assumed to be trustworthy. The SP is responsible for user authorization, so that the user can directly generate legitimate queries.

Data User

The proposed method which enables the user to securely obtain high quality similar patches from the encrypted cloud database. With such a privacy-preserving design, users should be able to use the query-based image denoising services at cloud while being worry-free. Ideally all data leaving from and arriving at the users' local device should always be encrypted. The first trivial one is to let the cloud directly return the candidate patch cipher texts, then the user decrypts them, computes the distances, and further evaluates which candidate patches satisfy the distance metric. In this solution, the returned patch cipher texts only need to be protected under symmetric encryption, yet the transmission of a large number of patch cipher texts could incur cumber some bandwidth cost and undesirable post-processing. Instead of returning encrypted patches for user-side filtering, the second possible way is to let the cloud return encrypted distances to the user, who then performs decryption and distance evaluation.

Image Denoising

Image denoising is a fundamental task which aims to recover the original image from its noisy observation. So the first endeavor toward privacy-preserving image denoising is from external cloud databases. The median is more robust compared to the mean. Thus, a single very unrepresentative pixel in a neighborhood will not affect the median value significantly. Since the median value must actually be the value of one of the pixels in the neighborhood, the median filter does not create new unrealistic pixel values when the filter straddles an edge. For this reason the median filter is much better at preserving sharp edges than the mean filter. These advantages aid median filters in denoising uniform noise as well from an image.

It enables the cloud hosting encrypted databases to provide secure query-based image denoising services. The service benefits bring an emerging trend toward increasingly deploying various kinds of image services at cloud. The external databases at cloud often provide much more information due to the large volumes of images, and thus have larger potential to yield more promising denoising. With such a privacy-preserving design, users should be able to use the query-based image denoising services at cloud with worry-free.

Provide users with seemingly unlimited storage services. In addition to providing efficient and convenient storage services for users, the cloud can also provide data sharing services. However, the cloud has the characteristic of honest but curious. In other words, the cloud will not deliberately delete or modify the uploaded data of users, but it will be curious to understand the content soft he stored data and the user's identity.

ALGORITHM DESCRIPTION

Building the Encrypted Database for Outsourcing

Input: Secret key:K={K_g,K_p}; Public Key:pk_g; patch set: P= {P_1,P_2,…P_N}, where N is the total number of database patches.
Output: Encrypted database ϵ={[P],[P],D}

Initialize ageneric dictionary D and the LSH value at G; For all $p\epsilon P$ do
g={$h_1(p)\|1,\ldots,h_1(p)\|l$}where$g_i$=$h_i(P)\|$

$G.put(g)$;

endfor

forall$g \in G$do

$K_1 \rightarrow F(K_g,1\|g)$,$K_2 \rightarrow F(K_g,2\|g)$

Initialize counter$ctr \rightarrow 0$

For all p associated with g do
$u \rightarrow F(K,ctr)$

$u \rightarrow SE.E(K_2,td)$,whereidistheuniqueidentifierofadatabasepatch

ctr++

$D.insert(u,v)$

IV. SCREEN SHOTS

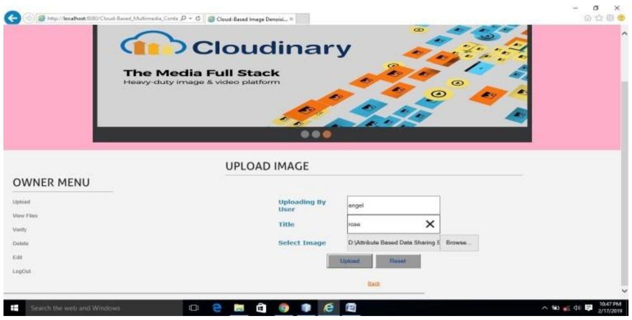

Fig 2. Upload Image

Fig 3.View Cloud Files

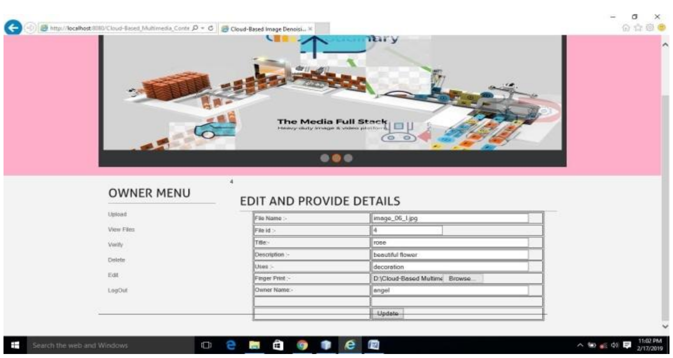

Fig 4. Edit Provide Details

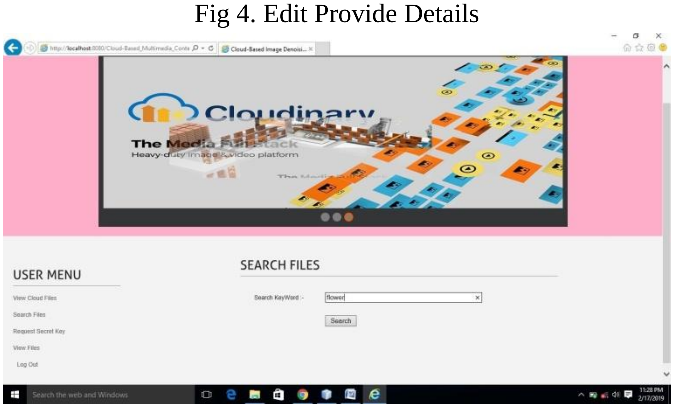

Fig 5. Search File

Fig 6. Request Secret key

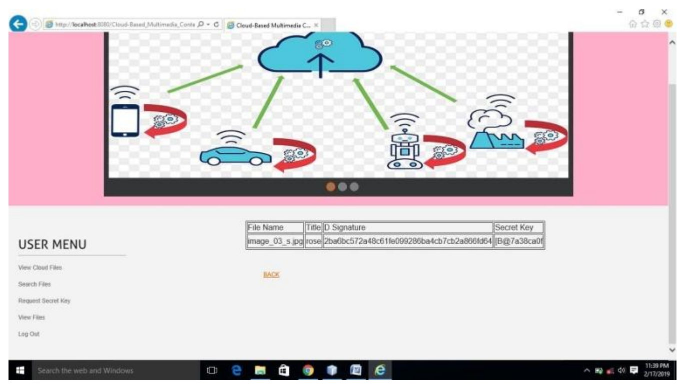

Fig 7. View Secret Key

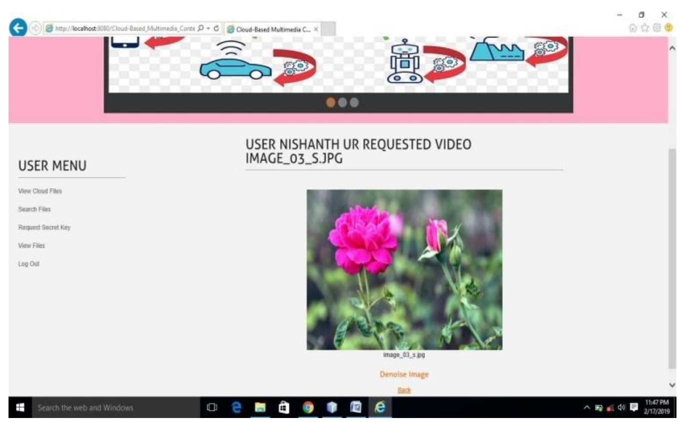

Fig 8. Denoise Image

V. CONCLUSION

The proposed design enables the cloud hosting encrypted databases to offer secure query-based image denoising services. In the digital world, the security of images has become more important as the communication has increased rapidly. Allthe techniques are in a real-time image encryption could only find a low level of security. Here, the image encryption algorithm proposed efficient and highly securable with high level of security and less computation. Image noise is usually unwanted, variation in brightness or color information is considered as a noise. The noise that is present in the image can degrade its quality. So in this work a new technique is proposed for the removal of the noise. The wiener filter is used for the filtration of the image so that the noise us removed. The results of the simulation show that the algorithm has advantages based on their techniques which are applied on images. Hence it is conclude that the techniques are good for image encryption and denoising also give security in the open network.

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