

Camera-based Document Image Scrambling for Security in Cloud Computing Environment

Nagesh Salimath, Satishkumar Mallappa, Jitendra Sheetlani

Abstract. To provide a security to the documents to prohibit from unauthorized access in the cloud is accomplished by scrambling document images is presented in this paper. For scrambling of the document image, we have considered the camera captured document images. As we know the utilization of multi-media devices and services are increased tremendously in the present scenario. Peoples are using more and more electronic gadgets like smartphones and those things embedded with high definition cameras, by using the cameras people captures the many different kinds of images. In those images, document images are also present. For the fragile document, there is a need to capture to save the document information. Here in this paper, the safety of the document image is taken consideration. The document image may store in cloud computing environment or that document image may send or receive from one place to another. For this purpose, one should need to give the security of the document image. To resolve this security issues with document images this experiment is carried out. Once, the image is scrambled then it may store or transport anywhere without a problem. For the scrambling of the camera based document image, we have considered the Quantum Hilbert Image Scrambling method. After scrambling the image one can store in the cloud computing environment for the safer store and access to the document image. For the experiment we have used two kinds of datasets, IUPR standard dataset and our own dataset. The obtained results from this method are encouraging.

Keywords: Scrambling, Descrambling, Quantum Hilbert, Document image, Cloud Computing.

I. INTRODUCTION

In the ancient days, peoples are used to sending the messages by sending the persons to other place and they are called the messengers. If someone captures the messenger then it is having the chance of revealing the message. After some decades peoples are using birds to send the messages by tying message slip on its leg. In this case, if anyone captures the bird then messages are getting exposed to other peoples. Like this, there are so many evolutionary developments are done. But now we are in a revolutionary development where most of the people using the Internet to send and receive the message. Here also messages are not safe, if someone intercepts the message then the problem arises. So, in this situation, we don't have 100% assurance of security to our confidential messages or information. When the internet is not safe for traveling the messages then what about our messages? There is a chance of accessing and use of our messages is more. Hence, we need one method to change the appearance of the sent message. By

using the internet one may need to send confidential information over the internet, then there may be a chance of intercept the message and misuse the message. Here, one needs to change the appearance of the message so, no one can read the message. For this purpose, there is a need to give the security to that message by changing its form. In this regard, we are motivated to the experiment on the image to change its appearance. To change the form of the image, we are scrambling the image. For scrambling, we considered the camera captured document images, due to more usefulness of the smartphone cameras. Nowadays, most of the peoples are using smartphones to capture the different kinds of images. In those images documents are also captured, those document may be important like property documents, old fragile pages, conversion of the physical document into the digitized document. The digitized documents may be used to process for further use. Here, our proposed method gives the security to the digitized document in the form of scrambling the image to give the safety to the document image. In the current trend, the buzzword is very popular, that is cloud computing. In the cloud computing, one can use that to store the information to access for the later use. There many organizations who gave the services of the cloud computing on the paid services. There is no guarantee of security of the information in cloud computing. To have the safety of the document, our proposed method can give assurance of safety of the stored documents in the cloud computing environment.

The paper has the flow as follows, in the section 2 we have given brief details of earlier works in image scrambling, the proposed method has been introduced in section 3, section 4 shows the experimental result and discussion, finally the conclusion on the proposed work this section 5 concludes the paper.

II. LITERATURE REVIEW

Now a day's many peoples are using images for many purposes. The generation of image document image is increased tremendously, due to easily availability of digital camera in low-cost and embedded in smart phones. In current generation many peoples are keeping the smart phones. We can't expect only calling feature by using the smart phone, beside this smart phone providing other features with it like digital camera for example. By using the phone camera we can capture any scene images, natural

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images, and document images. This paper considering the document images which are captured by the digital camera. Hence, for camera-based document images, we do scrambling to change its appearance to others. The scrambled images are stored in phone memory, pen drives, hard disks or the latest technology; cloud computing environment. From using cloud computing, one can store and access the information from anywhere in the globe.

In this regard, from the view of the scrambling techniques, we gone through the literature where many researchers have worked in the scrambling research area.

Rupali Nayyar et.al.[1] has presented a work on audio watermarking by using the Arnold Transform (AT), modified SVD and DWT.

Min Li et.al.[2], proposed the removed the limitation of AT scrambling of random sized image scrambling, by using multi-region algorithm they have successfully obtained the good results.

MosayebNasin et.al.[3],has introduced the new quantum images encoding scheme. Their scheme has four different encoding algorithms. The four algorithms used to swap the qubits of gray-scale values for input pixel with its qubits grayscale values respectively. In their experiment they have generated a binary key randomly for the individual pixel. After generating key, they employ encoding algorithm selection procedure for selecting the qubit pair of the generated random binary key. They represented the resulting images in histogram diagram, for encoded image is given the flatter as compare to the original image.

Tie-jun ZHANG et.al.[4], have developed the new scheme for quantum image stegnography. The inserting the quantum secrete gray image in the quantum cover image. This method scrambles the secrete image by using Arnold cat map method. The scrambled image inserted into quantum cover image by using least significant qubit (LSQb). In the extraction phase it needs the stego image for extraction of embedded secrete image. They have obtained good hidden invisibility.

Lingling Wu et.al.[5], have introduced the new algorithm for Arnold algorithm called anti-arnold transformation algorithm it is got solution by solving some equation groups. The have got good results for the images which are in big image.

Nan Jiang et.al.[6], have promoted the quantum image processing (QIP). For this proposed work they used the Hilbert image scrambling method. This method carried out to give the scrambling quantum circuits by using quantum computer. In this method the Hilbert scanning matrix is given, next the matrix is based on the flexible representation of the quantum images the Hilbert scrambling quantum circuits are then proposing the recursive of progressively layered.

Gyan vardhan Artist et.al.[4], they discussed an different Arnold Transform based image scrambling along with this they also reported an extension work to improve the method and then compared with the other methods like by figures, statistically and experimental result. Finally they have obtained the good results.

Kamalpreet Kaur.[4], has provided the modification in the Single Value Decomposition (SVD) for robustness improvement they have proposed and integrated

watermarking which integrate the DCT,DWT and modified SVD.

Hui Liu et.al.[5], has proposed an algorithm for encryption of image based on the two-dimensional Arnold Transform along with the key of quantum chaotic map. They have analyzed the security level in the form of theoretical analysis and simulations using computers. The level of security has given the confirmation of the proposed algorithm is good at high level security.

Li Bing.[6], has presented an work of period in image scrambling applications using the popular Arnold transform method they have studied the new integer sequence is Arnold Transforms, they have provided the periods for new computations method. They have explained this new method with help of various examples.

Liang Zhao et.al[7], they have reported an work on analysis of security for image scrambling encryption, this method is based on pixel bit and the improved scheme on self –correlation encryption.

From the Above literature the works on scrambling methods has given. It is evident that the scrambling techniques have been successfully applied on various application areas. The scrambling, has given the robust security to the images, which are contained the confidential information embedded.

III. PROPOSED METHOD

The input image is partitioned in many sub-parts and scrambling method is applied. In the sub-parts of the images, the positions of the pixels are swapped with other pixel positions. This swapping mechanism is done in two fashion; one even pair cells swap and two odd pair cell swap. In reverse scrambling means obtaining original image in this process the iterative method is used to find a new inverse position. Thereafter, odd pair cells are selected on the base of threshold value and even pair cell also considered.

The working of this Hilbert method as implemented in[6], the original image has been treaed as $2^n \times 2^n$ matrix. This matrix called start matrix s_n and use to 1 to 2^n for all pixels.

$$S_n = \begin{pmatrix} 1 & 2 & 3 & \dots & 2^n \\ 2^n + 1 & 2^n + 2 & 2^n + 3 & \dots & 2^{n+1} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 2^{2n-1} + 1 & 2^{2n-1} + 2 & 2^{2n-1} + 3 & \dots & 2^{2n} \end{pmatrix}$$

For example $S_0 = (1)$, $S_1 = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $S_2 =$

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{pmatrix}$$

The permutation of Hilbert scanning matrix is obtained on these examples



$$H_0 = (1), H_1 = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}, H_2 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & \end{pmatrix}, \text{ and so on.}$$

The pixel position(i,j) from the Hilbert scanning matrix H_n is going to take the place of the pixel $H_n(i, j)$ by the start matrix S_n .

Next it will generates and Hilbert Scanning Matrix, this is generated by recursive generation algorithm. This algorithm considers many matrix operations. By these method the images get scrambled and descrambled.

3.1 Result and Discussion

Following figure shows the functional diagram of proposed method

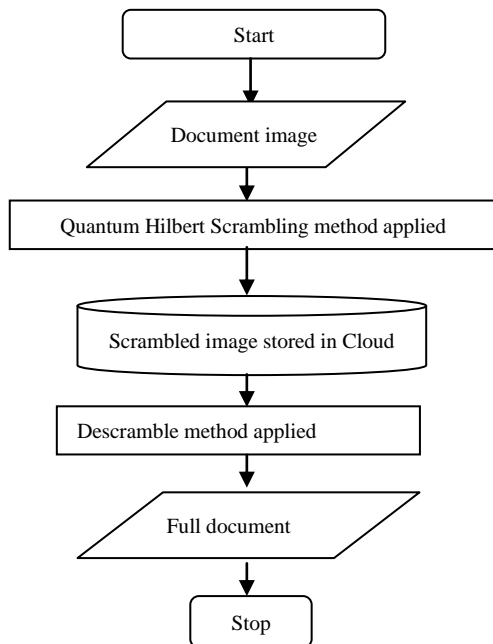


Fig 1: Functional diagram of proposed method.

Following figure shows the Malayalam document image used for scrambling and the descrambling.

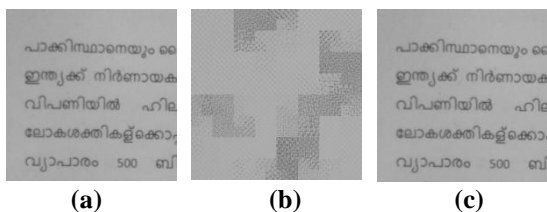


Fig 2. (a) Input Image (b) Scrambled image (c) Descrambled Image

Following figure shows the IUPR dataset document image used for scrambling and the descrambling.

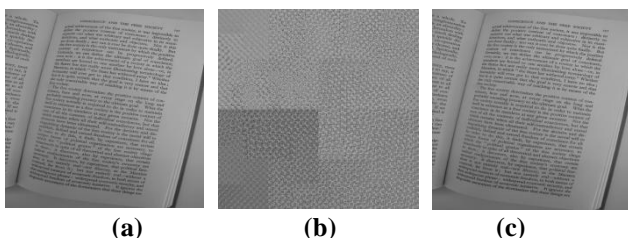


Fig 3. IUPR dataset image (a) Input Image (b) Scrambled (c) Descrambled

3.2 Data Collection

For this experiment we have taken the IUPR dataset of camera captured documents standard dataset prepared by Syed Saqib Bukhari^[15] and some images we have created our own dataset by using mobile cameras.

3.3 Future Scope

From this proposed method we have tried to provide the security to camera captured document images. In the present scenario, there is a much demand for the security for the document images due to its secret contents in it. Hence, this method given optimal solution for the security for the camera captured document which can be stored in cloud to access from anywhere in the world. In the next future work we are planning to extend this work embed other techniques which can take less time for scrambling. Plan to implement the robust method for scrambling and descrambling the camera captured document image.

IV. CONCLUSION

In the present scenario many peoples have using the digital cameras which are embedded in mobile phones. Peoples can capture any kinds of images in general and in particular document images which are have secret information in it. Some Government and Non-Government organizations are in need of many documents which are disclose the identity of any individuals. In this case many peoples are simply capturing those documents by using mobile cameras and upload in websites. Now the matter of security is arises. There is no 100% assurance of the security for the document confidentiality. In this scenario our proposed method is suitable, which disturbs the image in such way that no one can understand that document. The other side of this proposed method. This proposed method is suffers from large scale images in term of time complexity for execution and it strictly needs a square images only. In the upcoming we work to attempt these challenges.

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