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Hiding Data in Halftone Image Using Modified Data Hiding Error Diffusion

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Abstract: Halftoning is found to be one crucial process for converting gray scale figure into binary figure having white and black pixels. Clipping-free DBS (Direct Binary Search)-oriented halftoning happens to be one among the halftoning techniques which is capable of generating binary images of high quality. Different methods have already been developed in the past by making use of Halftoning strategies for attaining watermarked figures from printing paper and for achieving data security. Yet, there are only a few properties of time-maintenance in the existing approaches. In this study, we propose one halftoning-oriented multilayer watermarking with low computational complications. One additional technique for data hiding has also been used for embedding multiple watermarks in the watermark that needs to be implanted for improving security and the embedding ability. There have been different halftoning strategies that have been developed, Ordered Dithering (OD), Direct Binary Search (DBS), Dot Diffusion (DD) and Error Diffusion (ED), to name a few. Such methods help converting a continuous stone figure into a two-tone figure founded on the particular fact that halftone figure is recognized as a continuous tone figure when being viewed from a distance because of low-penetration filtering impact of Human Visual System, (HVS). Among the said techniques, DBS provides the best quality of image having high computational intricacy. This research suggests one highly efficient multi-layer halftoning-oriented watermarking that engages noise-balanced fault diffusion for achieving high embedding ability and enhancing the security aspects. The encoder uses Effective Direct Binary Seeking (EDBS) and Look-up-table (LUT) approach for embedding multitudinous watermarks. A decoder just uses Least Average Square (LMS) and the simple Bayes classifier for extracting implanted watermarks in the multi-layered framework with the capability of self-decoding. All things considered, the suggested method satisfies the needs of printing industry with regard to apparent supremacy in connection with processing time. Specifically, since the size of the image keeps increasing with advancement in consumer electronics, processing efficiency happens to be a vital issue in the practical applications.

Key words: Look-Up-Table (LUT) · Least-Mean-Square (LMS) · Efficient Direct Binary Search (EDBS) · Grey Scale · Pseudo Key

INTRODUCTION

Rendition of the continuous tone images on displays which are able to produce two levels only is called Digital Half toning. There are a few good techniques of half toning: error diffusion, ordered dither, neural-net oriented techniques and, further lately, direct binary search (DBS). Ordered dithering happens to be the thresholding of continuous-tone picture with spatially recurrent screen. Error gets diffused in Error Diffusion to neighboring pixels that are not processed. In the concerned study, we have suggested progressive halftone watermarking by employing multitudinous table monitoring method with gray scale picture. With earlier systems, in several cases, DBS produces images of better quality. The main idea behind DBS is finding the binary picture whose propelled picture onto the human eyes happens to be very close with the authentic image. The picture that is projected can be calculated by making use of Gaussian filter that resembles characteristic of human visual system. Consider the sum total of all errors of binary picture is sum of differences of levels of intensity across all the pixels between projected picture and the authentic image. Pixel value is considered toggled in DBS if resulting picture has a smaller complete error. Moreover, adjoining pixel values get swapped in case the resulting images total

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error decreases. We have introduced watermarking picture for solving this issue and partitioned table form 62 as well as 32 picture with progressive halftone picture for adding information to watermarking picture. Predominant applications consist of tampering diagnosis of pictures located on World Wide Web in addition to authorization of pictures that are acquired from the questionable sources. Powerful watermarks are needed so that they can remain in watermarked picture even after being attacked by hackers or handled through common picture processing functions like scaling, cropping, filtering, requantization and so on. Major applications consist of distribution, copy control and copyright protection and so on. Image data concealing can be defined as embedding or hiding a picture without impacting its tangible characteristic in such a way that it would be possible to extract the concealed data using some process. The particular study concerning the data hiding methods is generally known as steganography. The result from this happens to be not efficient and secured with halftone picture and its computational time intricacy happens to be high in the present system. We have put forward a Pseudo key with regard to printed picture to be extracted along with accuracy and for getting results with efficacy. In this study, we have proposed one halftoning-oriented multilayer watermarking with low computational intricacy. One additional method of data-hiding has also been used for embedding multitudinous watermarks inside the particular watermark that has needs embedded for improving the embedding ability and security. The effective direct binary search technique is used at encoder for ensuring that the output happens to be in a halftone format. Consequently, watermarks get embedded through a group of improved compressed tables having different textural angles related to table look up. In the decoder, least average square metric has been meant to increase differences between such produced phenotypes of implanting angles and bring down the necessary number of magnitudes for each of the angle. At the end, the simple Bayes categorizer is used for collecting possibilities of multiple layer data for grading the related angles for extracting implanted watermarks. These watermarks that have been decoded can further be overlapped to retrieve further hidden-layer watermarks.

Related Work: P.P.Vaidyanathan [1] and Murat Mes put forward that different from error diffusion approach, the dot diffusion technique related to halftoning has got the benefit of parallelism at pixel-level. Anyhow, error diffusion offers superior image quality than most known methods in existence. In this analysis, we prove how to enhance the dot diffusion technique through optimization of class matrix. Considering human visual qualities, we prove that such an optimization regularly ends in pictures comparable to fault diffusion, even not having to sacrifice parallelism of pixel-level. Flexible dot diffusion gets introduced also and thereafter, one mathematical narration of dot diffusion may be extracted. Moreover, converse halftoning of the dot diffused pictures is reviewed and two techniques have been suggested. The first method employs projecting onto convex groups (POCS) and the second one uses wavelets. Between the two, wavelet technique does not involve using knowledge about class matrix. We have discussed also about Embedded multiple resolution dot diffusion that helps in rendering at various resolutions and in transferring pictures progressively. Yasuaki Ito, Koji Nakano [2] and Hiroaki Koge put forward that halftoning is supposedly the crucial process for converting gray scale picture into binary picture with white and black pixels. Clipping-free DBS (Direct Binary Search)-oriented halftoning happens to be one among the halftoning techniques which produce binary images of high quality. Anyhow, taking computing time into account, this will not be practical for most of the applications like printing purpose. This studys primary contribution is to prove a new execution for clipping-free DBS-oriented halftoning. Programming issues relating to CPU architecture has been considered for implementing this technique on CPU. Results from experiments prove that CPU execution on NVIDIA GeForce GTX 780 Ti for 40963072 gray scale picture takes 7.240 second to run, whereas the CPU execution takes 346.6 second to run. Hence, our CPU execution reaches speed-up element of 47.82. Christopher C. Taylor, Jan P. Allebach and Farhan A. Baqai [3] suggest that direct binary search scheme happens to be one robust heuristic for producing halftone images of high quality that justify the qualities of both viewer and output device. With one hard circular model of dot overlap, it reaps improved detail presentation, elimination of aliasing observation n errors and enhanced tonal classification on shadow zones. We have proved that DBS combined with hard circular model of dot-overlap returns images with good spatial resolution, precise tone rendition and visually satisfying textures. It also has got the capability of exploiting intermediate levels of gray that are caused by the dot overlap. In contrast with conventional DBS algorithm, this does not require tone correction prior to the halftoning apart from eliminating the clipping at extremes of given gray scale distribution. We have shown also that this algorithm can efficiently be executed through pre-calculating and then

by storing the most number of terms possible. Joseph Pasquale, Jonathan Kay and Tuong Q. Nguyen [4] put forward source-oriented dithering as a group of methods fabricated for maximizing the operation of the real-time gridded electronic video schemes which can decode and encode video completely in software. Normally, the hardware of frame grabber furnishes frames in the format of 24 bits in a pixel 9bpp). Nevertheless, as many out of the hosts usually are equipped either with eight bit sized or single displays, the videos color depth needs to get reduced at certain point. In case of the encoder reducing color depth, then bandwidth needed for performing the given video in the grid gets lowered respectively through an aspect of 24 or 3 and computational load gets lightened with regard to receiving hosts. An algorithm of color size reduction needs to be efficient as resulting rate of frame and consequently the level to which given motion's illusion can be secured, relies on how fast it is possible to process a pixel. We make us of dithering algorithms selected for efficiency while employing a contrast improvement algorithm for enhancing quality of image [5-10].

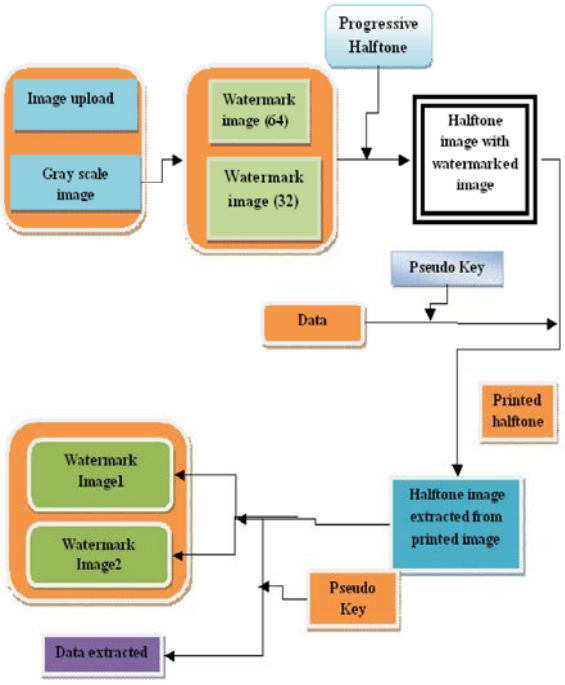
Proposed Work

Overview: In this analysis, we have suggested halftone watermark picture employing multi-layer table monitor method involving low time computational complexity and summed up the data to the printed image securely. In the said process, the input image that is converted as gray scale picture related to a concerning image process results in high quality. Gray scale picture output is classified into two, namely, watermark 32 and watermark 62. By using progressive halftone method, image gets compressed as halftone watermark picture. After that, data is added to the halftone watermark picture; it happens to be a printed picture. Data addition in halftone picture makes use of Pseudo key which is used for decoding and encoding data in the printed picture. We have suggested extraction method, printed picture in the hidden data next to processing using this method; extract given output is in three kinds, namely, extracted data, watermark 2 and watermark 1. Finally, the Pseudo key is used for extracting the data and original result is collected. The results of the experiment have been accurate and efficient. The introduced work describes four elements and illustrates about the processes such as compressing images and image concatenation, Halftoning and hiding watermark pictures, Data printing and hiding and Restoring watermark pictures and data.

Image Concatenation and Compressing Images: This study proposes converting original picture as gray scale picture by dividing it into specific pixel size picture. The watermark image can be defined with respect to the pixel value. We have finally considered combining the pixel value along with generating watermark pictures. This section emphasizes about how the host picture that we have uploaded gets concatenated meaning getting interconnected with every pixel together in connection with further process while also compressing the watermark pictures that we have earlier uploaded [11,12].

Hiding Watermark Images and Halftoning: In this part, the uploaded watermark pictures get hidden in host picture and we have got to perform halftoning on the host picture.

Overall Architecture:



Data Hiding and Printing: This section permits us to conceal the external data within the halftone watermarked original picture. Consider an example, choose all other blocks as contenders for the data concealing, which, say, satisfy the condition of (I + j) staying an even numeral d"id"M/8, 1d"jd"N/8) for giving some security to the data or instruction and then print the picture. In this study, we have proposed a pseudo key regarding hiding data in the printed picture and the pseudo key is used for decoding and encoding data in the printed image [13].

Recovering Watermark Images and Data: After having completed all the processes mentioned above, user need to restore watermark pictures from the host picture and also message or data. Secret bits are derived and decoded as simple bits, thus the authentic bits get recovered perfectly. The experiment has proven to be accurate and offers high standard with low complexity of time.

RESULT AND DISCUSSION

In this paper we proposed to halftone watermark image using multilayer look up table strategy for printed image is quality and accuracy with low time process.

The above figure shows upload input image and convert into gray scale image, this image used to hiding the data and watermarked images. The above screen shows the three different stages First one is upload image, in this process input is uploaded, then Second process is convert original image into gray image and finally concatenate image because watermark image.

The Figure 3 explains the selection process of two types of images like 64 and 32 bit images. These above images are already converted into gray scale image.

The above figure explains the process of hiding the watermark imges into the host images. In that two watermark images are added with selected host imge.

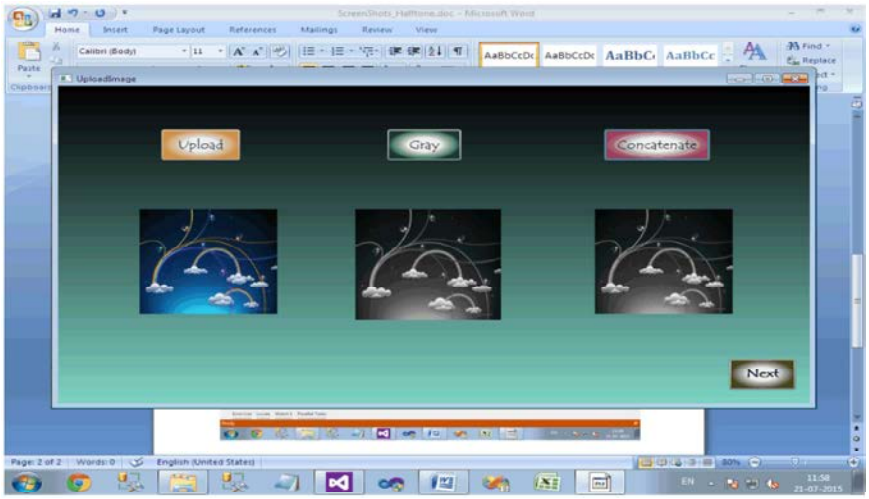


Fig. 2: Shows upload input image & convert into gray scale image

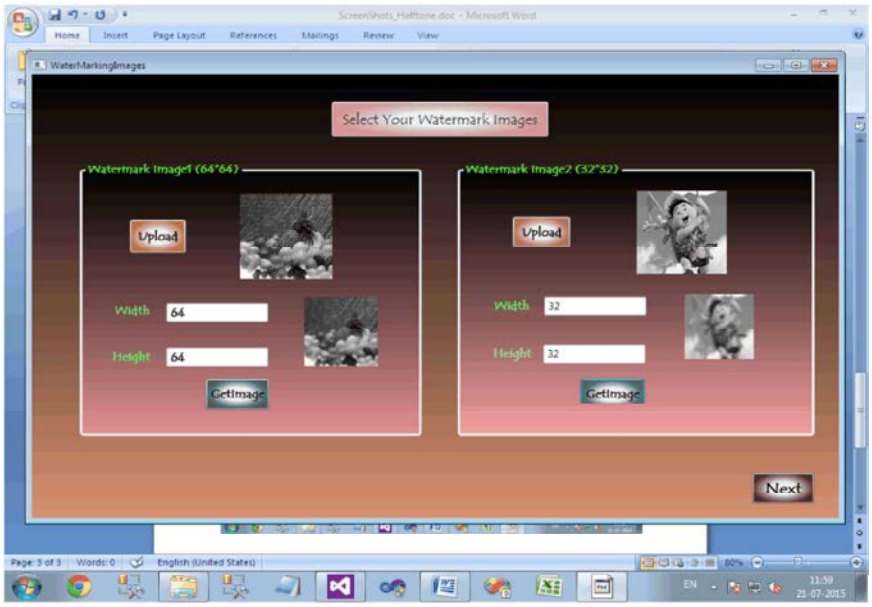


Fig. 3: Watermark Images Selection

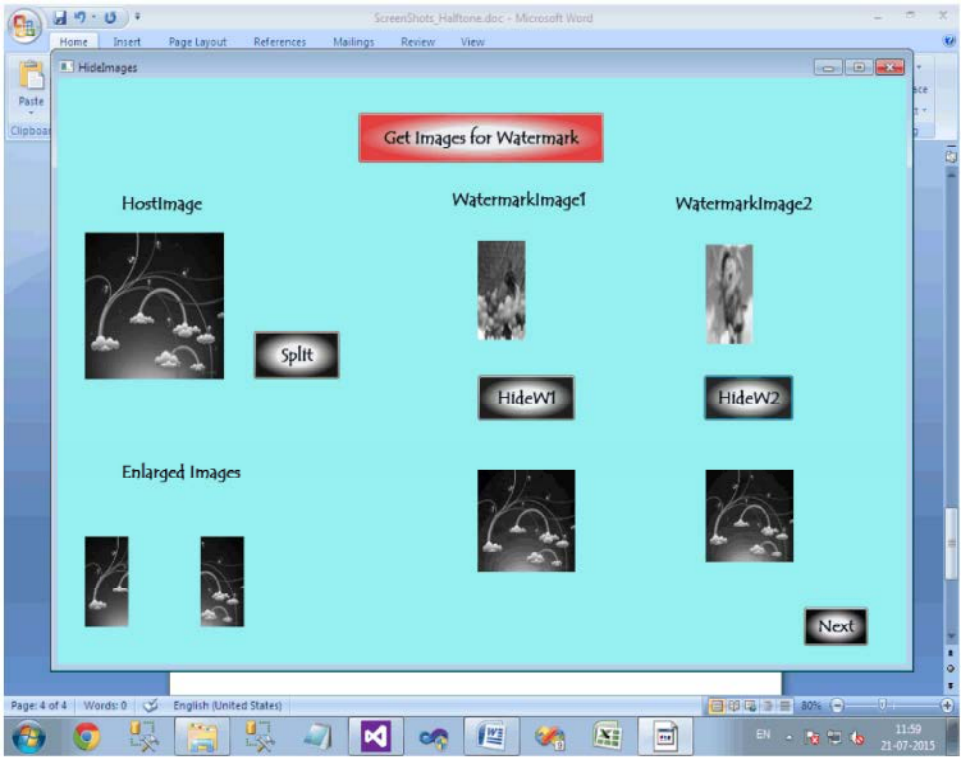


Fig. 4: Hide the watermark images with host image

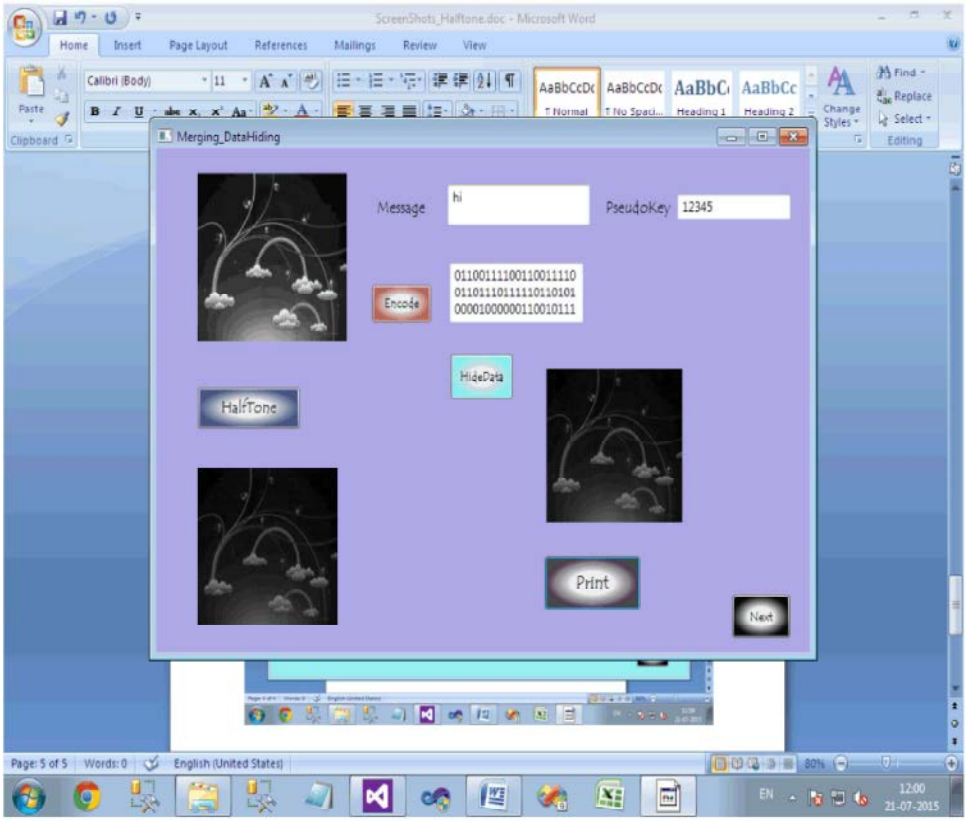


Fig. 5: Hide the data by halftone technique

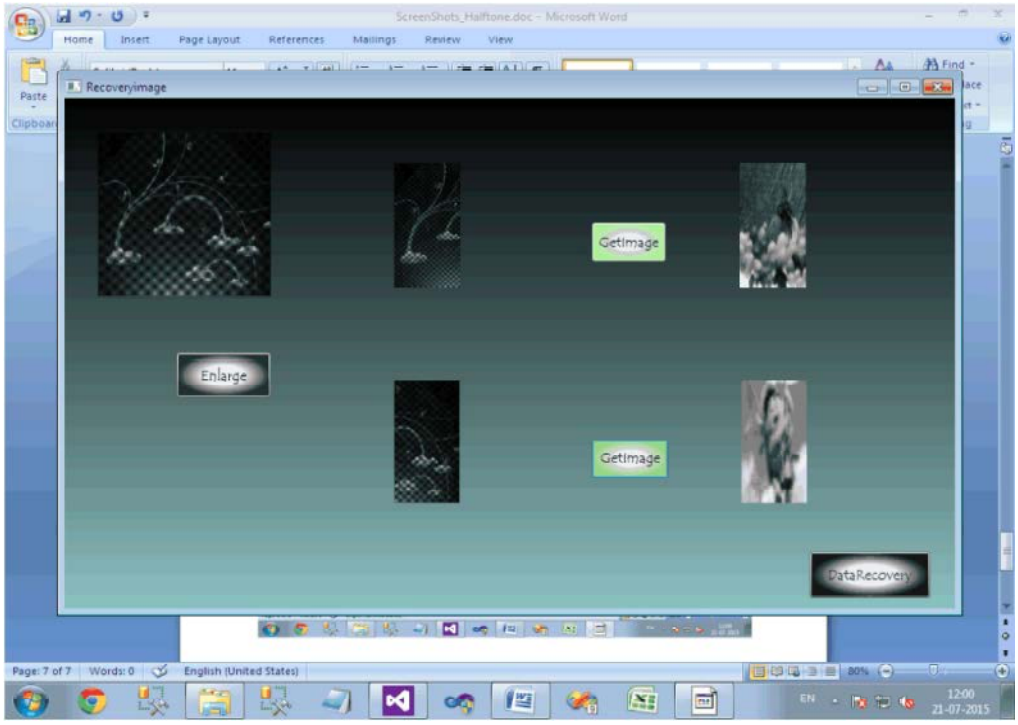


Fig. 6: Exract watermark images from Host images

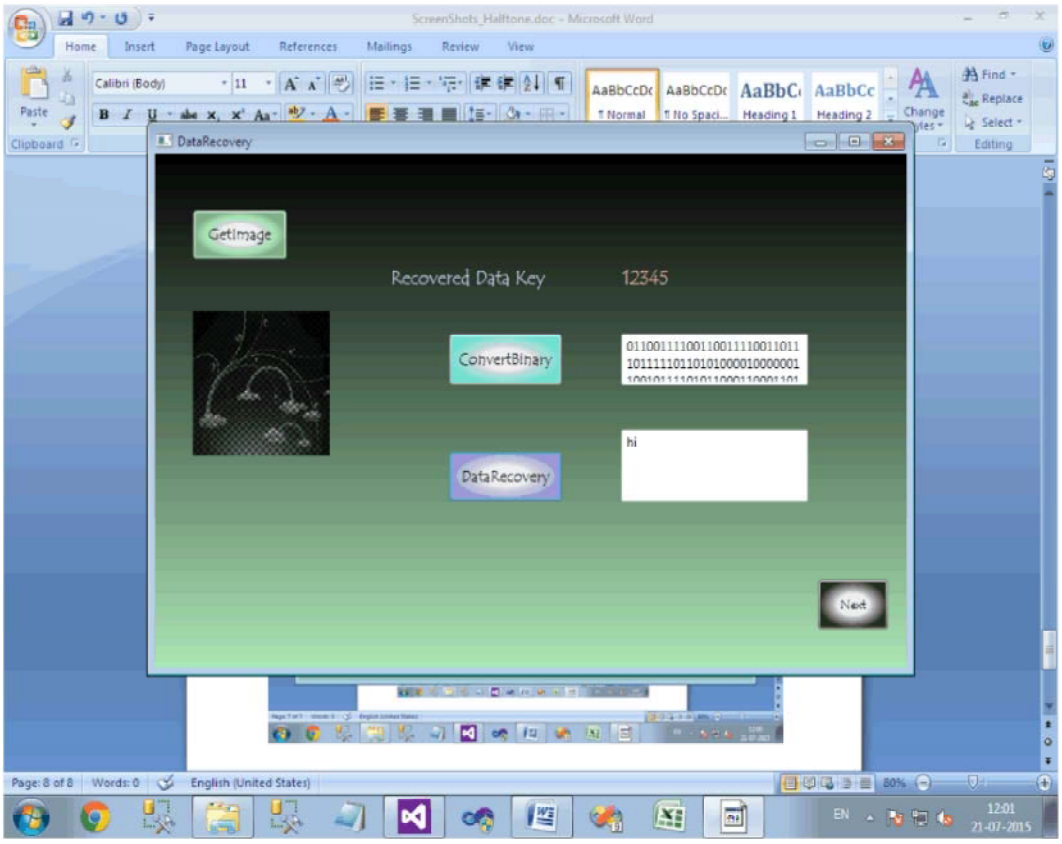


Fig. 7: Extract data from host image

The above figure explains data hiding process with the watermarked images. When hiding the data with image we use halftone technique. Using this pseudokey we encode the given message and hide the data to watermark image.

The above figure explains extracting process of watermark images from printed host images. Once the data hiding process is done the image will be sent to user with printed format.

Above screen shows the extracting process of data from images. If we need to get data from host images first we have to extract the watermarked images then we can get the hiding data from host image.

CONCLUSION

In this study, we have proposed halftone watermark picture by making use of multi-layered monitor table method for hiding watermark picture and adding data to the hidden image securely. We have suggested a method for converting a normal picture as a gray scale picture in order to process grade increment and the result of the approach is of high quality. The problem with the hc CJ aJ h-g methods is the long time consumption because of the complexity in computational time being high and that they do not give accurate results. This issue has been subjugated and we suggested halftone progressive strategy for fast processing and saving time consumption while getting results efficiently. The results of the experiment have been proven to be accurate and of high quality. Future improvement is suggested for enhancing halftone method and the process of hiding to get secure and reliable results.

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