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# A Review on Histogram Shifting for Reversible Watermarking Technique

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**Abstract:** ***As there is rapid growth in Internet technology, Information can be exchange rapidly and easily over web. This include images, videos, documents etc. This information needs to be protectedo protect this various techniques were developed. Reversible Watermarking is one of the techniques to protect images of sensitive contents. In the field of watermarking lot of researches is taking place to establish more efficient reversible techniques. The existing system suffers from undesirable distortion which is unsuitable or less reliable. To improve the quality of the watermarked image a combination of two techniques pixel histogram shifting (PHS) and dynamic predictive error histogram shifting (DPEHS) are introduced. In this method the image is classified for finding watermark region and then watermark bits are applied by direct histogram shifting or by shifting it dynamically.***

**Keywords:** Histograms, Applications of histograms, *Sliding histograms*, Histogram shifting

## 1. Introduction

Information was exchanged in text messages during older days. Now-a-days Information is being transferred as digital images or videos etc. This gave a boost to the technology but at the same time multimedia transmission is insecure as lot of hackers and attackers are there who can modify or duplicate the data. Thus there should be a technique to protect this data that are being transmitted. Most of the military and medicals records need a high security. These documents contains lot of confidential information which should not be exposed without the concerned person's permission. So Reversible watermarking method is developed to maintain integrity of data. Watermarking means hiding secret data with cover image, so that the image is protected from external access. So for reversible Watermarking Histogram shifting is developed which shifts histogram bins to create gap and embed secret data in that gap which reduced distortion and gives high embedding capacity.

## 2. Histograms

A histogram is simply a graph like structure. Showing frequency of anything. Histograms have bars that represent frequency of occurring of data. A Histogram has two axis one the x axis and the another is y axis. The x axis contains event whose frequency you have to count. The y axis contains frequency. The different heights of bar shows different frequency of occurrence of data.

## 3. Histogram of an Image

An image histogram is a graphical representation of the number of pixels in an image as a function of their intensity. For inspecting images image histograms are an important tool. It plots the number of pixels for each tonal value. A viewer will be able to judge the entire tonal distribution at a glance by looking at the histogram. modern digital cameras has Image histograms. Photographers can use them as an aid to show the distribution of tones captured. Tonal variations are represented by horizontal axis while the vertical axis represents the number of pixels in that particular tone. The black and dark areas is represented by the left side of horizontal axis, middle represents medium grey and the right hand side represents light and pure white areas. The vertical axis represents the size of the area that is captured in each one of these zones. The darker image has majority of data points on left side and in center of histogram. The lighter image has majority of data points in right side and center.

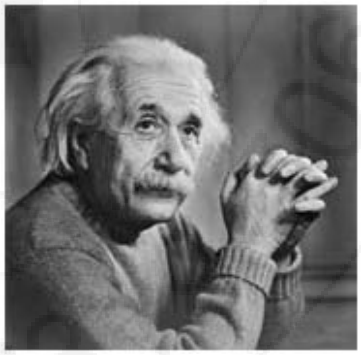

**Figure 1:** Einstein image

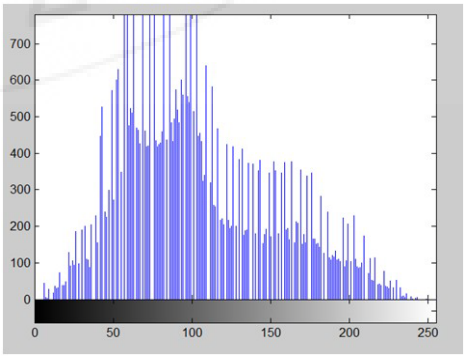


**Figure 2:** Histogram of the Einstein image

The histogram of the picture of the Einstein shown in Figure 1 would be something like shown in Figure 2 the range of pixel values is represented by x axis of the histogram. Since its an 8 bpp image, that means it has 256 levels of gray or shades of gray in it. so the range of x axis starts from 0 and end at 255 with a gap of 50. The count of these intensities is represented on the y axis As we can see from the graph, that most of the high frequency bars lies in the first half portion which is the darker portion. That means that the image is darker. And this can be seen from the image.

## 4. Applications of Histograms

Histograms have many uses in image processing.

- **Analyzing the image**: By just looking at the histogram we can predict about an image. It's like looking an x ray of a bone of a body.
- **Brightness**: The histograms have wide application in image brightness and in adjusting contrast of an image.
- **Equalizing an image:** Histogram equalization is used to enhance contrast. It is not necessary that contrast will always be increase in this. There may be some cases were histogram equalization can be worse. In that cases the contrast is decreased.
- **Thresholding:** This is mostly used in computer vision.

## 5. Sliding Histograms

As we can see from the 1st histogram on the y axis of this histogram are the frequencies or count. And on the x axis, we have gray level values. As we can see that those gray level intensities whose count is more then 700, lies in the first half portion, means towards blacker portion. Hence we got an image that is a bit darker. In order to bright it, we will slide its histogram towards right, or towards whiter portion. In order to do we need to add at least a value of 50 to this image. Because we can see from the histogram above, that this image also has 0 pixel intensities, that are pure black. So if we add 0 to 50, we will shift all the values lies at 0 intensity to 50 intensity and all the rest of the values will be shifted accordingly. After comparing these two images and their histograms we get brighter image.

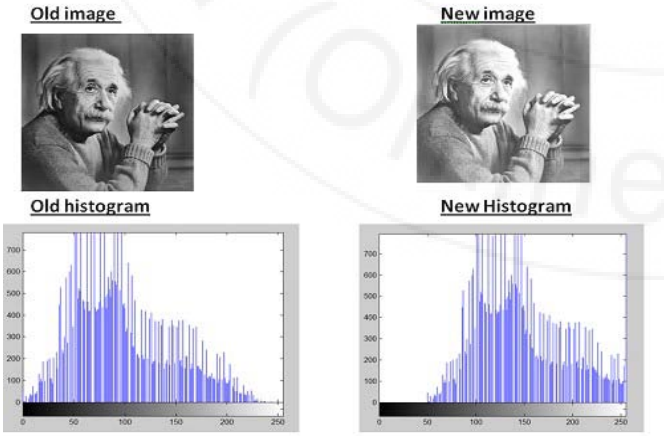


**Figure 3:** Comparison of older and new image and histogram

As we can clearly see from the new histogram that all the pixels values has been shifted towards right and its effect can be seen in the new image. Now if we were to decrease brightness of this new image to such an extent that the old images look brighter, we need to subtract some value from all the matrix of the new image.

## 6. Two Kind of Histograms

### 6.1 Intensity Histogram

The histogram of an image normally refers to a histogram of the pixel intensity values. This histogram is a graph showing the number of pixels in an image at each different intensity value found in that image. For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels amongst those grayscale values. Histograms can also be taken of color images either individual histogram of red, green and blue channels can be taken, or a 3-D histogram can be produced, with the three axes representing the red, blue and green channels, and brightness at each point representing the pixel count. The exact output from the operation depends upon the implementation it may simply be a picture of the required histogram in a suitable image format, or it may be a data file of some sort representing the histogram statistics.

### 6.2 Individual Color Channel Histograms

Even though the luminance histogram takes into account all color channels, image errors appearing in single channel can remain undiscovered. Component histogram provides a breakdown of the intensity distribution within the individual color channels. When computing component histogram, each color channel is considered as a separate intensity image and its histogram is computed and displayed independently of other channels. Both type provides useful information about lighting, contrast, dynamic range and saturation effects for individual color components They provide no information about the actual color distribution.

## 7. Histogram Shifting

Histogram shifting is a method in which first the Histogram of the image is created. Then Zero point and the peak point is found. A zero point corresponds to the grayscale value which no pixel in the given image assumes; A peak point corresponds to the grayscale value which the maximum number of pixels in the given image assumes. The objective of finding the peak point is to increase the embedding capacity as large as possible. Then by considering a fixed magnitude the histogram is shifted so that a gap is created near the histogram maxima and data bits are embedded into that gap as shown in figure 4.

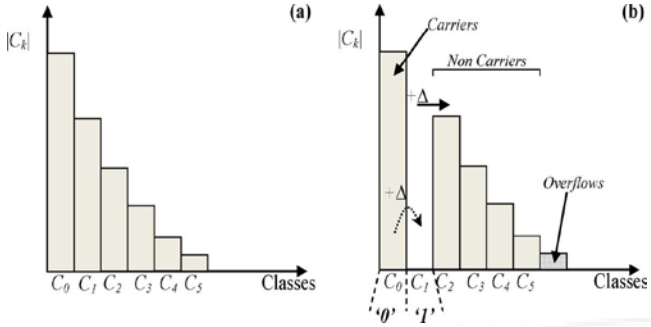


**Figure 4:** Histogram shifting modulation. (a) Original histogram. (b) Histogram of the watermarked data.

## 8. Benefits of Histogram Shifting

- Directly trying (HS) Histogram Shifting on pixels may be more powerful and of smaller difficulty than trying it on prediction-errors.
- The extractor will restore the same source image so that the watermark embedder and extractor remain synchronized. This process used to select the most locally proper watermarking modulation provides robustness
- The image is well protected.
- Better pixel prediction.

## 9. Conclusion

The proposed reversible watermarking scheme combines two distinct modulations pixel histogram shifting and dynamic prediction error histogram shifting. Using Histogram shifting for embedditing secret data provides security and authentication also more data can be embedded with less distortion.

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## References

[1] G. Coatrieux, C. Le Guillou, J.-M. Cauvin, and C. Roux, "Reversible watermarking for knowledge digest embedding and reliability control in medical images," IEEE Trans. Inf. Technol. Biomed., vol. 13, no. 2, pp. 158–165, Mar. 2009.

[2] G. Coatrieux, L. Lecornu, B. Sankur, and C. Roux, "A review of image watermarking applications in healthcare," in Proc. IEEE EMBC Conf., New York, 2006, pp. 4691–4694.

[3] J. Tian, "Reversible data embedding using a difference expansion," IEEE Trans. Circuits Syst. Video Technol., vol. 13, no. 8, pp. 890–896, Aug. 2003.

[4] Z. Ni, Y. Q. Shi, N. Ansari, and S.Wei, "Reversible data hiding," IEEE Trans. Circuits Syst. Video Technol., vol. 16, no. 3, pp. 354–362, Mar. 2006.

[5] [5]D.M. Thodi and J. J. Rodriquez, "Expansion embedding techniques for reversible watermarking," IEEE Trans. Image Process., vol. 16, no. 3, pp. 721–730, Mar. 2007.

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