

# 3D Generation and Watermarking From 2D Images and Videos

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## Abstract

*In this paper we develop a program for the generation of images and / or out from a three-dimensional video image and / or video bidimensional, using the technique of anaglyph (red and cyan). Taking advantage of the Technical Characteristics of Matlab, the images are modified so that the viewer gets an in depth perspective bidimensional images, using anaglyph glasses with the same colors that were modified. Later for Customization and reservation of rights is placed a watermark to each image feature and / or video developed*

## 1. Introduction

### a. 3D Generation

Eyes to be placed in different positions, taking each in their retinas a slightly different image of reality before them. These small differences are processed in the brain to calculate the distance to the objects found by the technique of parallax. The calculation of distances, place the items we are seeing in three dimensions, giving a sense of depth or volume. Thus, if we modify or create two images with a slightly different angle and are shown to each eye separately, the brain can reconstruct a distance and therefore the three-dimensional impression.

To enable the brain to interpret an image in three dimensions, requires data about the distance of objects. This information is obtained because we have two eyes, and each perceives the elements of the scene from a different angle, resulting in a triangulation in which the brain gets the distance to the object. This fact is called physiological diplopia

### b. Anaglyph

Anaglyph images or anaglyphs are two-dimensional images that can cause a three dimensional effect. Anaglyph images are composed of two color layers,

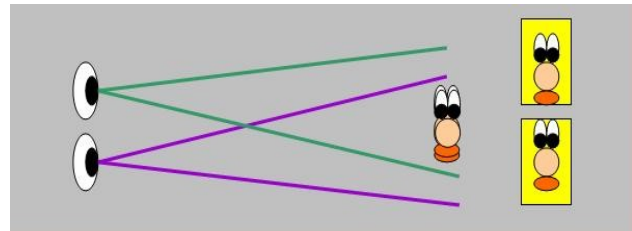


Figure 1. Perception of the eyes to create the sensation of depth of objects

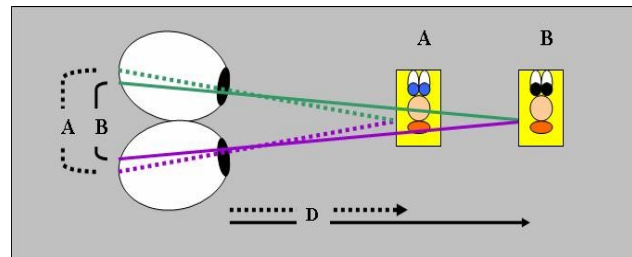


Figure 2. Physiological diplopia

superimposed but slightly moved relative to each other to produce the depth effect.

Usually, the main object in the center, while the surrounding environment and background are moved laterally in opposite directions.

To create an anaglyph is essential to have two photos taken at the same time (to keep the same lighting conditions and scenery), the photos should focus the same object, moving the camera laterally between 3 and 5 cm for the second picture.

These photos must be taken with filters so that only capture a portion of the light received on the basis that light is emitted in three colors, red, green and blue, if you do not have these filters, you can use photo editor



Figure 3. Anaglyph made with the technique of double exposure



Figure 4. Anaglyph glasses (color blue & red)

Anaglyph glasses are formed by two lenses, each with one of the two colors in the image. In this way are used as filters and let each eye see only the stereo pair it deserves. So, for example, if we had an image created from the displacement of a blue image (focused for the left eye) and red (focused for the right eye), we would need anaglyph glasses with the same color filters: the eye would have the right lens blue and red left lens, since the filter only lets you see the image that is not the same color.

### c. Watermarking

The watermarking or digital watermark is a technique of hiding information that is part of what are known as steganographic. Its main objective is to highlight the illegal use of a digital service by an unauthorized user.



Figure 5. Example of an image with a visible watermark

Specifically, this technique involves inserting a message (hidden or not) within a digital object, as could be images, audio, video, text, software, etc. This message is a bit group containing information about the author or copyright owner treated the digital object (copyright).

A watermarking technique is often required to be:

- \*Undetectable: that is invisible to the observer
- \* Do not degrade the object
- \* Robust: the elimination or reduction of the mark should ideally be difficult or impossible without degrading the quality of the digital object.
- \*Must support common processes of transformation (compression, filtering, format conversion, geometric distortion, ...)
- \* Must not be ambiguous: the mark must clearly identify the copyright owner so you can claim ownership.

Even with these assumptions there are watermarks that are visible and which degrade the object, such as water marks indicating superimposed images of the same property.

## 2. Generation of a 3D image out from a 2D image

When an image is "read" in the MATLAB workspace, the program immediately recognized as a three-dimensional array, where the first two dimensions correspond to the length and width of the image divided by pixels, and the third dimension of the array is assigned to values of the primary colors of the image (red, green and blue, in that order) is here where the proposed method works

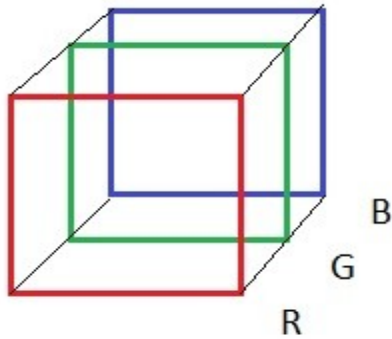


Figure 6. Schematic of representation of an image in Matlab (the third dimension represents the layers, red, green and blue)

In an analogy with other methods designed for the generation of 3D, it is necessary to use two images of the same scene, but in the method of the present work, the second image is taken from the decomposition of the original image.

This way we can change the image and transform it into three dimensions, amplifying the opacity of the layer to highlight the details and shifting the layer with respect to the other two a distance of approximately 4% of the red layer (distance proposal was obtained by trial and error) [Sanchez et al., 2010].

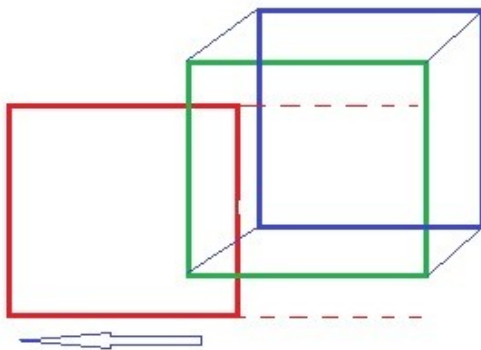


Figure 7. Schematic of the displacement of one of the layers in the image displayed in Matlab

### 3. Generation of a 3D video from a 2D video

When MATLAB reads a video file types, transforms it for use in a structure with different arrangements, each structure contains an array of frames that make the video, each frame is in some ways, a static image with the same

properties the previous images, so, you can apply the method of displacement of layers to achieve a three-dimensional perspective of the image.

After frame by frame to transform the original video, build a new modified video frames, resulting in a new video, but now with three-dimensional perspective.

ir	<Too many ...	<Too many...	<480x640x3 uint8>
ir_t	<Too many ...	<Too many...	<480x659x3 uint8>
irf	<Too many ...	<Too many...	<480x640x3 uint8>
k	240	240	240
mov			<1x240 struct>
numFrames	240	240	240
readerobj			<1x1 mmreader>
s	240	240	240
tform_traslate			<1x1 struct>

Figure 8. Structures created by Matlab to read videos (created by the frames)

### 4. Placement of a custom pattern in images and videos (watermarking)

Depending on the type of images that wish to convert, the program can "read" the images formed by 8 bits being the least significant bit first, and the eighth bit the most significant.

The method for modifying the image is called "Least Significant Bit (LSB) where the modified bit is the least significant bit to change this there is no visible change in the original image. Lsb level is a bit binary image consists of all the image lsb

The pattern you want used for the watermark must be a binary pattern to replace the bits in the desired position, if what you want is a visible mark can be achieved by changing from the fourth through eighth bit, remembering that the amendment of eighth bit is the most visible.

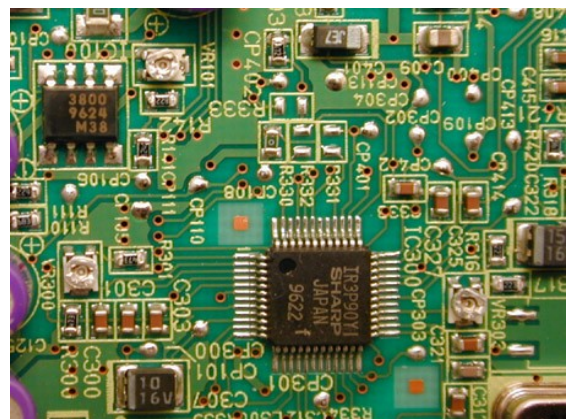


Figure 8. Original image of a PCB circuit

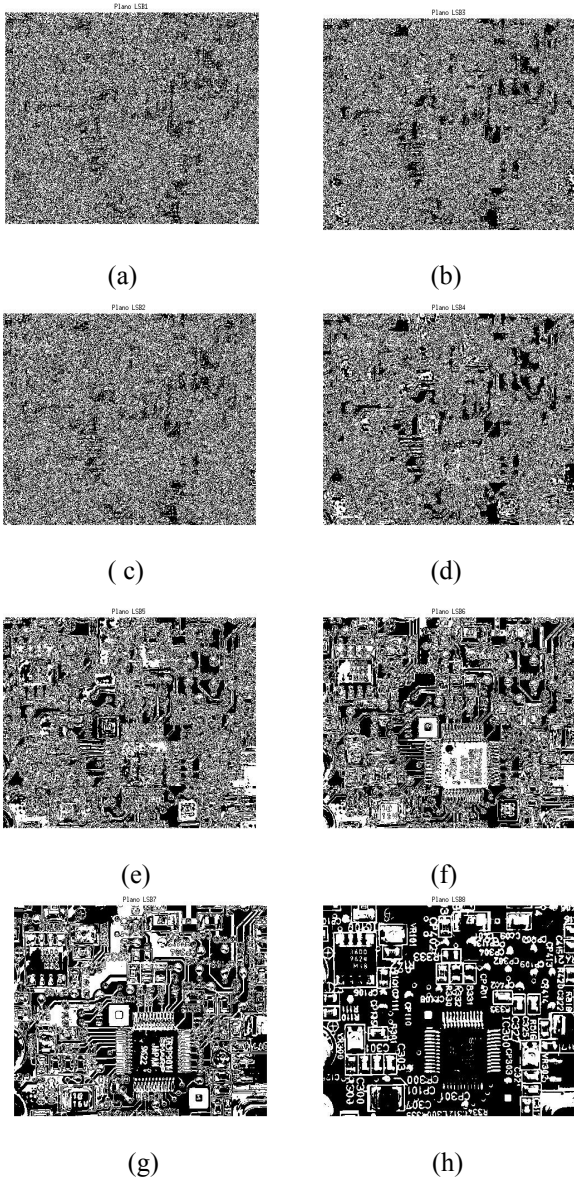


Figure 9. An 8 bit gray-scale from the figure 8. (a) through (h) Bit planes 1 through 8, with bit plane 1 corresponding to the least significant bit

## 5. Results

Using the proposed techniques, we first placed a watermark to each image in the least significant bit, the pattern of the mark was another image of smaller size, which previously was transformed to a binary image, ie the image is immediately converted to a pattern of 0's and 1's

As previously mentioned, the pattern was placed in the least significant bit, because of that, the image was not

visible in the final image, but change is evident when observing the layers for each bit.

To implement the watermark in a video, (as previously mentioned), the technique is done frame by frame, obviously if the watermark is not visible to the naked eye in an image, nor will be for a video, but in reviewing some of frames, the pattern will be present.

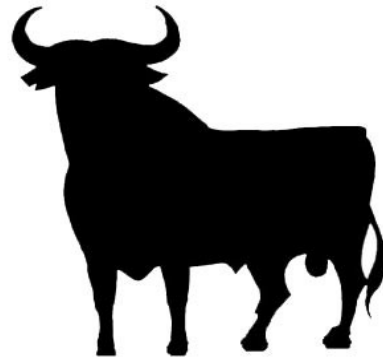


Figure 10. Chosen image as a pattern for watermark

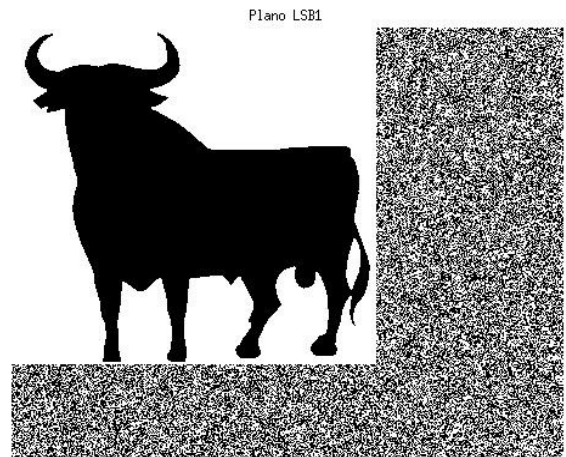
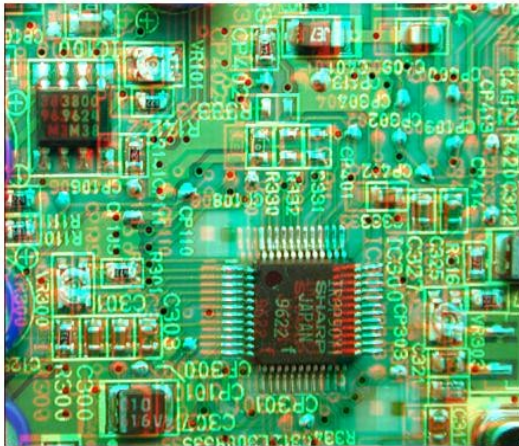


Figure 11. Pattern image inserted in the bit plane number 1

After you have marked the images, you can proceed with the generation of 3D images from the image and modified

The proposed opacity factor for "real" images (commonly photographs), was 1.4 [Sanchez et al., 2010], however, the factor may be variable in images that are not "real", ie images where are two-dimensional scenes, such as drawings or cartoons without background perspective.





**Figure 12. Final image after watermark and 3D generation**



**Figure 13. Example of a 2D image “not real” ie drawn image without light effect**



**Figure 14. Conversion from an 2D image with watermark and a bigger opacity factor**



**Figure 15. Original image of a scene without light and without depth perspective,**



**Figure 16. As in the figure 13, a change in the opacity must be necessary if we want to see a better image.**

Finally, the videos are built the same way that images and assuming the same parameters of opacity for the types of images.

## 6. Conclusions

This work reached the goal of developing some applications of the 3D generation out from a 2D image, the extension of the technique to videos is an issue that had not been exploited using this technique, a great advantage of the application of this proposal videos, is the low cost, because while normally the third dimension is generated using two cameras, this proposed technique does not need them, also only needed one shot of the camera for editing.

Unfortunately there are some problems with the anaglyph technique because the resulting color of the images is modified to the user when the notes so that the color is

poor and in some cases, homogeneous. Moreover, the use of anaglyph glasses is restricted for some people with some sort of medical condition, because prolonged use can lead to headaches and even nausea, vomiting and dizziness in the most serious cases.

Naturally after a presumed novel process, we need a digital signature to ensure the contents of the original image and the results of the application of a watermark on images and videos is a good choice for the work done, so and also avoid plagiarism of images by the proposed program.

The use of a tool as powerful as MATLAB for this work is very important for the characteristics at the time of "reading" the images, however, even using MATLAB, there are processes such as image binarization pattern, which in a computer desktop "normal" takes too long, but even if we assume that the image has dimensions of 1000 pixels over and especially in videos with more than 1000 frames, therefore use of a device such as a GPU may accelerate the process transformation to a binary image. The case in this work.

For demonstration purposes in this program, the image pattern does not function broke down and placed in the least significant bit retains its form, but in a job where you need some company, you must create an algorithm that decomposes the image and hide within the same bit plane, plus an algorithm that can extract the image from the same level, because ultimately the goal of watermarking is to hide a digital signature.

## 7. References

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