Procesamiento de Imágenes

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***Abstract* — An image is much more than just a real-life background, it has pixels and a whole complex process in order to get what we now call an image or photograph. Due to its complexity we are able to interact with the pixels in order to change every photo characteristics through the image pixels.**
***Keywords*—image, pixels, interact, process, matrix, rgb, size.**

I. Introduction

An image is a two dimensional object which includes *x* and *y* coordinates. When x and y coordinates in an f function have a finite quantity we call it a digital image, thus the field of digital image processing where through a digital computer we may modify the image elements in location or value. [1]

Image elements are called pixels whereby these are arranged in the x and y axis. We may modify pixels through linear algebra. We may understand matrices as *m* real numbers arranged in rows times *n* real numbers arranged in columns. [2]

Digital Image processing is divided into three areas, low, middle and high level. The low level refers to noise, color and sharpness. Middle level consists in object recognition and segmentation. Finally the high level is Scene knowledge and autonomous navigation.

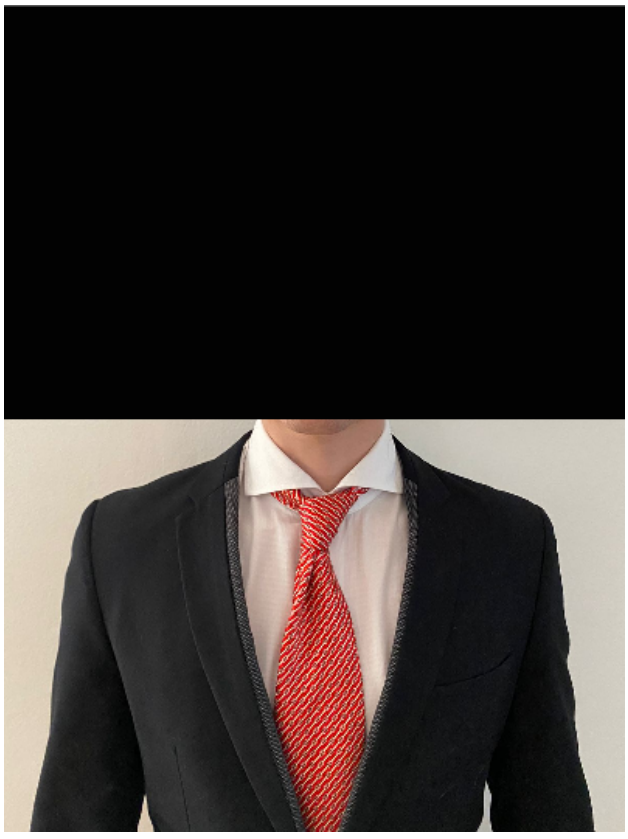
So far in this course we have learned the basics which includes RGB colors and how it interacts with an image, how pixels are arranged in matrices and basic transformations.

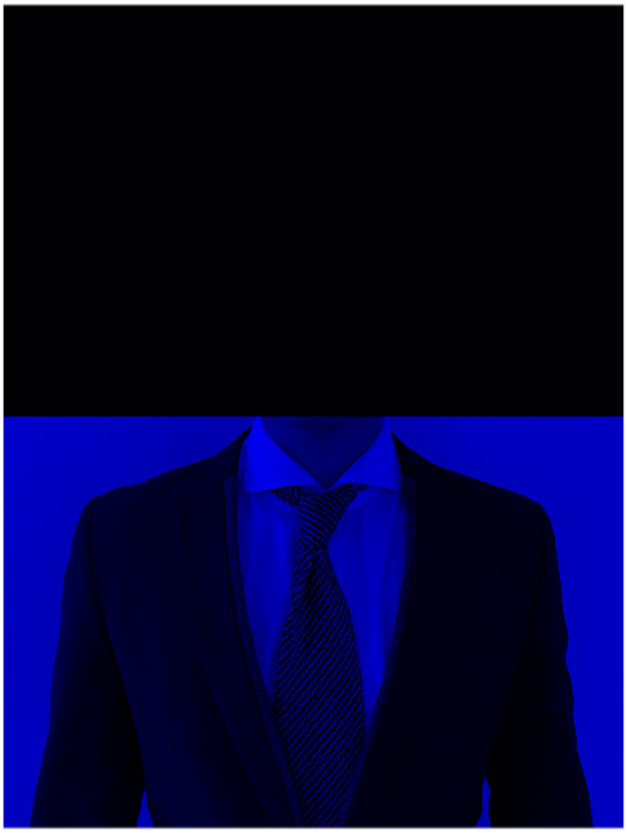
II. Original image

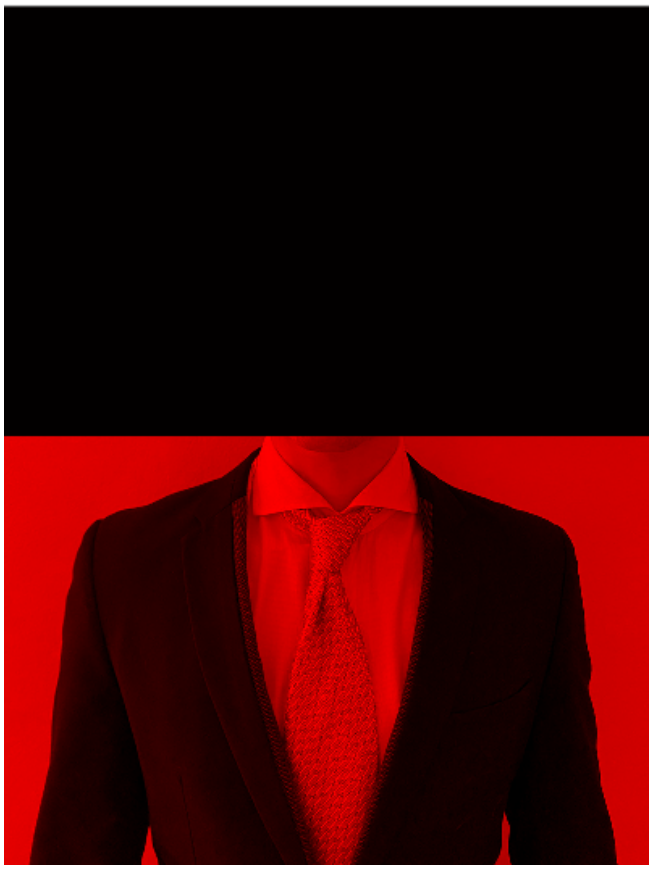
original size: 1200 x 1600

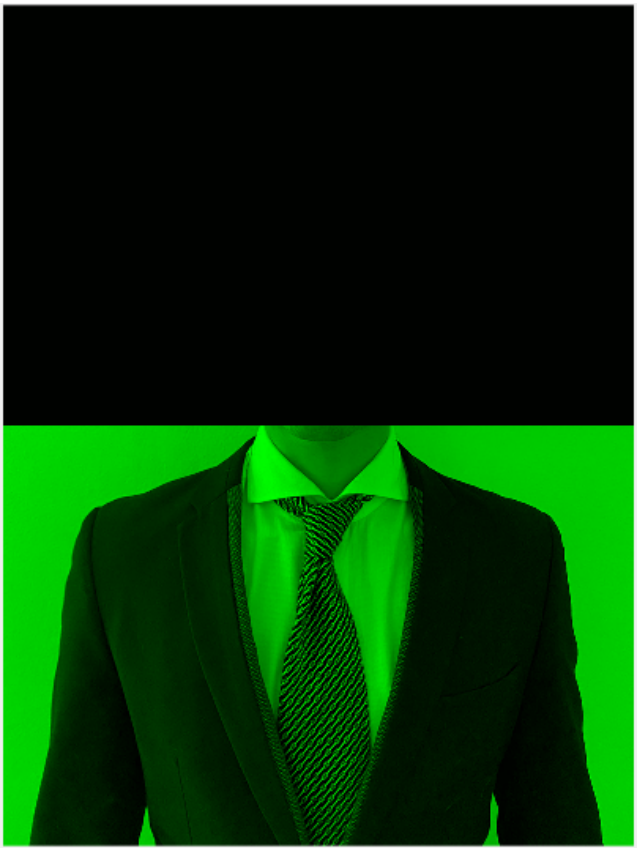
1) *Task 1*

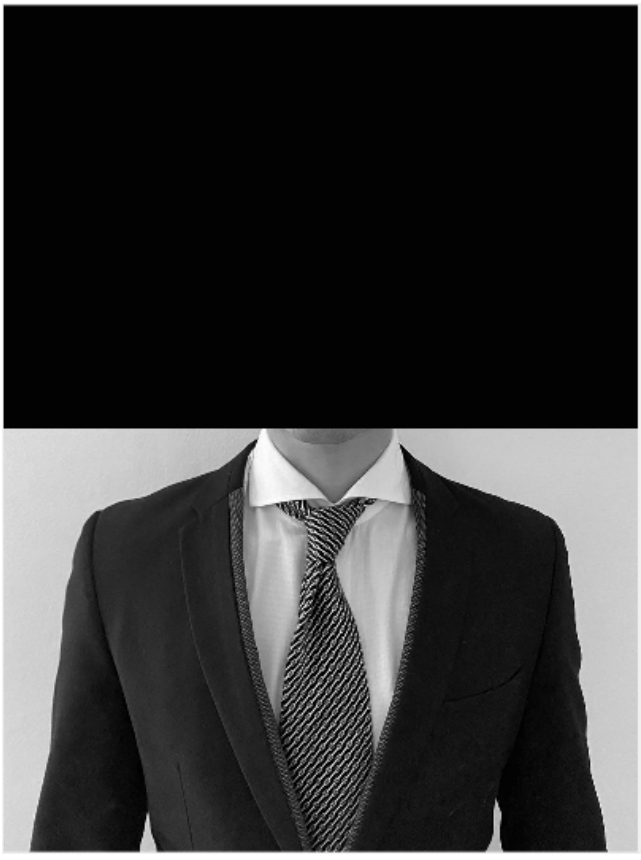
El primer task que constaba de 6 puntos; El primer punto nos pedía hacer una matriz de número aleatorios de 5x3, utilizando la función random (rand). El segundo punto nos pedía cambiar a 1, todos los valores mayores a 0.52 encontrados en la matriz anterior, en donde por medio de rangos pudimos cambiar todos estos valores. El tercer punto, crear una matriz de identidad de 3x3 en donde utilizamos los algoritmos aprendidos en clase. El cuarto, mostrar únicamente la mitad de la imagen en RGB, en donde al igual que el punto 3, descartamos la mitad no deseada y solo mostramos la que queríamos. El quinto, generar las figuras RGB que se muestran en la Figura 3. El último, generar una imagen que se perciba en escala de grises pero que en realidad tenga los 3 canales.





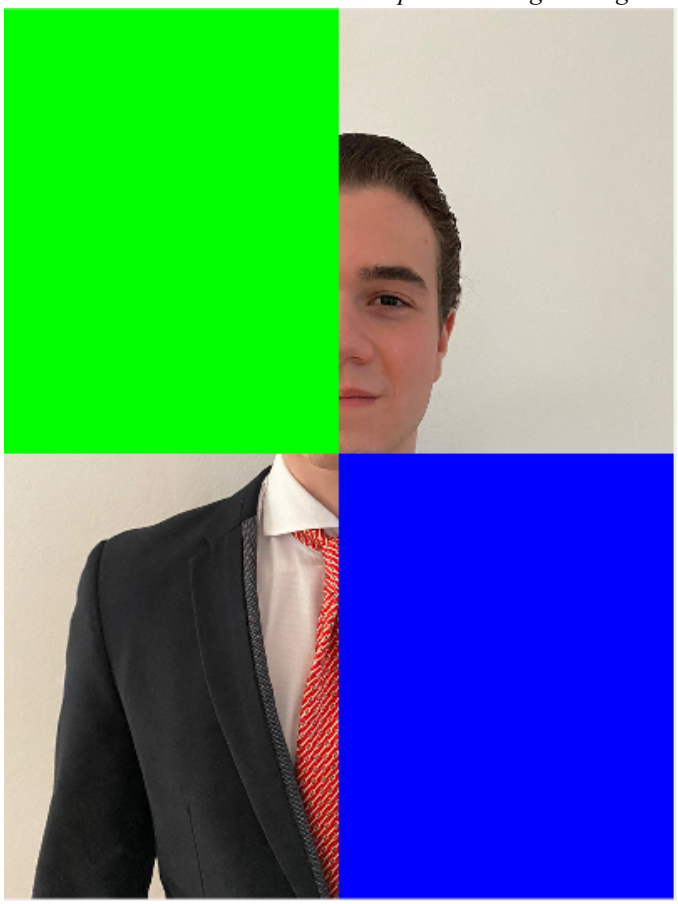






2) Task 2

El segundo task consistía en realizar el código necesario en Matlab, tal que se a partir de una imagen generamos otras dos imágenes; En una de ellas la esquina superior izquierda debe tener el color verde sólido y tambien la esquina inferior derecha de color azul sólido, esto se consegue poniendo los valores de RGB de los colores que no queremos en cero y del color que queremos en 255. La otra imagen consistía en que la esquina superior derecha ponerla como un verde "transparente" y la esquina inferior izquierda en un rojo "transparente", esto se consigue solo quitando los valores de RGB de los colores no deseados y dejando los valores RGB del color deseados como venían por la imagen original



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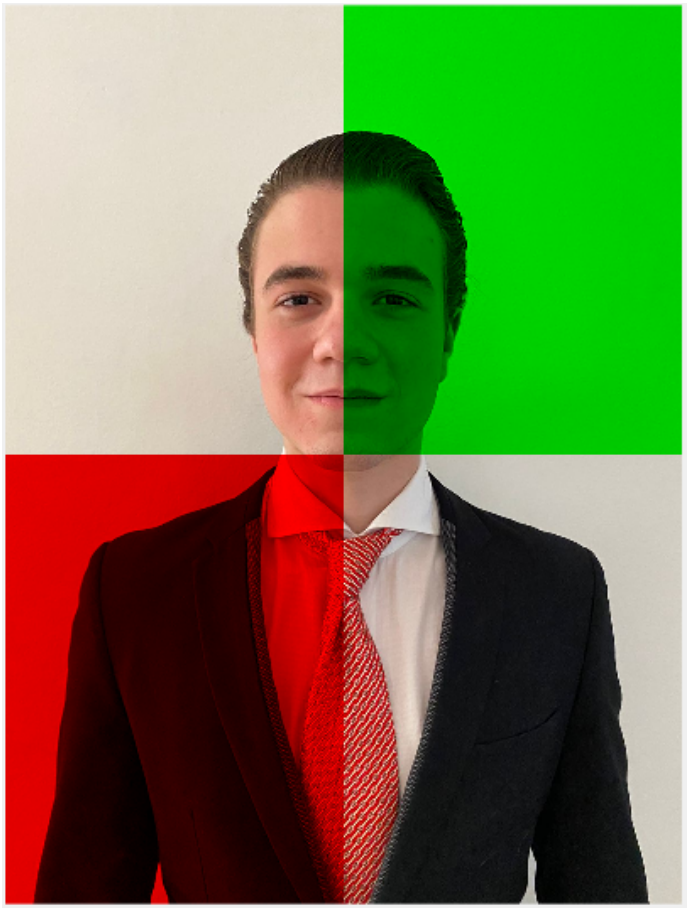
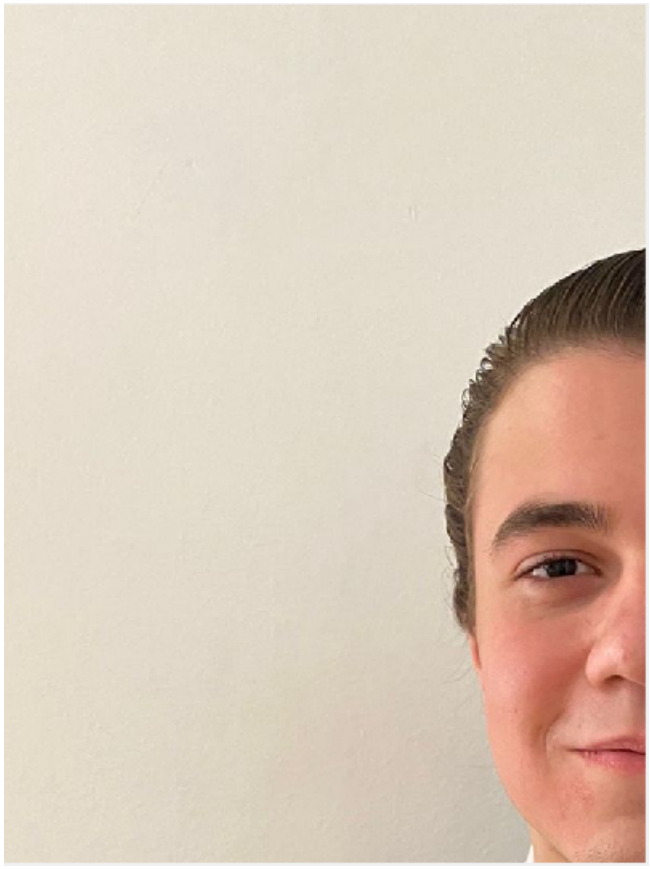


3) Task 3

El task 3 nos pedía rotar, trasladar y escalar una imagen. También generamos un espejo horizontal y vertical. Luego nos pedía recortar la parte superior izquierda de la imagen y la parte inferior derecha.

Dos aplicaciones prácticas que se le podría dar a este tipo de aplicaciones son: El poder revertir el efecto espejo que algunos celulares hacen automáticamente al tomar fotos. Rotar nos sirve para enderezar unas imágenes que estén algo chuecas.



2) *Conclusiones*

A. Diego Arenas

It is interesting to know how RGB can produce many of the images that we see, creating arrays with each value and thus being able to play with the colors of each image. Also cropping, moving and mirroring an image is something useful for the day to day.

B. Mauricio Ascencio

For the sake of simplicity, I'll conclude this work by stating a few learned-points. First of all, we learned how human vision works and how with only three colors (red, green, blue) we can create any other by combining them. Right after, we learned how cameras work in order to understand the process that makes possible the digitalization of a picture. Once we had such knowledge, we started learning and applying the manipulation of images using the MathWorks software, MatLab. After understanding how each pixel represents an RGB combination, and that each picture is a matrix of pixels, we got to work on Task1, Task2, and Task3. In each of these tasks we were able to demonstrate how images can be manipulated by changing the orientation, changing the values of just a set of pixels in the image and resizing it.

C. *Daniel Leal*

Within the first period, we have learned how to digitize an image with 8-bit values. After understanding it we learned to use functions within MatLab for the manipulation of these. The use of matrices for images is something very impressive, being able to manipulate matrices of more than 1000x1000, being able to see them in 3 RGB dimensions is something that becomes very useful. I think this is just the beginning of more ways to interact with images.

D. *Kenji Minemura*

In conclusion images are really easy to modify through pixels which are arranged in matrices. Likewise I believe there are other applications of linear algebra in this course which will allow us to learn harder stuff. Needless to say, there are various ways to manipulate images, with these three tasks the main things we learned were adjusting and resizing images, manipulating colors, changing some pixels 8 bit values, and arranging them as we want to.

E. *Sara Miranda*

To sum up, Digital Image processing is more complex than I expected. It has a lot of things involved and it requires a high mathematical thinking which I have found a little difficult. So far I have learned a lot of things, such as the Bayer filter and how a camera works. However through Matlab (a software we have been using as a tool) I have learned how are the pixels arranged in an image and how to interact within these matrices in order to modify different aspects of the image such as color in which we use the RGB color composition, and basic transformations such as size, rotation, translation, cropping and flipping. I think we can use this knowledge as tools for image editing and in order to learn more advanced techniques of Image Processing.

References

[1] Gonzales, R., Woods, R.. (2008). Digital Image Processing. New Jersey: Prentice Hall.

[2] Bapat, R. B. (2012). *Linear algebra and linear models*. Springer Science & Business Media.