[3] Гутер Р.С., Овчинский Б.В. Основы теории вероятностей, 1967. М.: Просвещение, 159 с.
[4] Колмогоров А.Н. Основные понятия теории вероятностей, 1974. М.: Наука, 119 с.
[5] Феллер В. Введение в теорию вероятностей и ее приложения, 1984. М.: Мир, Т.1. 527 с.
[6] *Вентцель А. Д.*, Курс теории случайных процессов. — М.: Наука, 1996. — 400 с.
[7] Купчишин А.И. Взаимодействие излучений с веществом. Каскадно-вероятностный метод (методическая разработка для студентов физико-математического факультета).- Алма-Ата, 1986.- 68 с.

REFERENCES

[1] Boss Э.G., Kupchyshyn A.I. Reshenye fyzycheskyh zadach kaskadno-veroyatnym metodom. - Alma-Ata: Nauka, 1988, t.1. - 112 s.
[2] Boss Э.G., Kupchyshyn A.I. Reshenye fyzycheskyh zadach kaskadno-veroyatnym metodom. - Alma-Ata: Nauka, 1988, t.2. - 144 s.
[3] Guter R.S., Obchynsky B.V., Osnovy teory veroyatnosty, 1967. M.: Prosvechenye, 159 s.
[4] Kolmogorov A.N. Osnovnye ponyatye teoryy veroyatnostey, 1974. M.: Nauka, 119 s.
[5] 5.Feller V. Vedenie v neoryu veroyatnostey i ee prylojenya, 1984. M.: Myr, T.1. 527 s.
[6] Ventsel *A. D.*, Kurs teoryi sluchaynyh prosessov. — M.: Nauka, 1996. — 400 s.
[7] Kupchyshyn A.I. Vzaymodeystvie izluchenyi s veshestvom. Kaskadno--veroyatnym metod (metodycheskaya razrabotka dlya studentov fyzyko-matematysheskogo fakulteta). –Alma-Ata, 1986.- 68 s.

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Ақау түзуші радиациялық процестерінің Марков тізбегімен ионды сәулелендіру кезінде байланысы

Түйіндеме. Жұмыста Марков тізбектерімен және ионды сәулелендіру кезіндегі радиациялық ақаулар түзу және заттармен бөлшектердің өзара әрекеттесу процесін сипаттаушы моделдерін алуға арналған Марков процестерімен байланыс қарастырылған. Ары қарай Марков тізбектерін тұрақсыз бөлшектер, мю-мезон, пи-мезон, нейтрон, позитрондар үшін арналған каскадты-ықтимал функцияларды алу үшін қолдану жоспарлануда.

Кілттік сөздер: Каскадты-ықтимал, ион, ақау түзуші, Марков тізбегі, Марков процестері.

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Communication processes of radiation defect formation by ion irradiation with Markov chains

Summary. The paper considers the communication with Markov chains and Markov processes to produce models describing the process of interaction particles with matter and Education radiation defects in the ion bombardment. In the future we plan to use a Markov chain for the cascade-probability functions for unstable particles, muons, pions, neutrons, positrons.

UDC 004

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COLOR MANIPULATION OF IMAGES OPENCV IN PYTHON

Abstract. This paper investigates, demonstrate in use and evaluate the need for image processing and manipulation. This work presents a technique of the gray image coloring, negative image and sepia image. Here is introduced a general technique for “colorizing” grayscale images by transferring color between a source, color image and a destination or target, grayscale image. The approach presented here attempts to provide a method to help minimize the amount of human labor required for this task. Here we transfer the entire color “mood” of the source to the target image by matching luminance and texture information between the images. This work presents a technique of the gray image coloring, achieved using a very simple algorithm, and its core strategy is to choose a suitable color space and then to apply simple operations there. Color manipulation of images did in program language python using library opencv.

Keywords: Image manipulation, grayscale, sepia, negative, RGB color.

Digital image processing is the use of computer algorithms to perform image processing on digital images. Digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build- up of noise and signal distortion during processing. Since images are defined over 2D(two dimensions) digital image processing may be modeled in the form of multidimensional systems. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. Image processing are computer graphic and computer version. In computer graphics, images are manually made from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high-level image processing out of which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans) [1].

Digital image processing refers to the process of using algorithms to edit and manipulate digital images. A digital image is a finite collection of small, discrete picture elements called pixels. These pixels are organized in a two-dimensional grid and represent the smallest amount of picture information that is available. If you look closely at an image, pixels can sometimes appear as small "dots". More pixels in your image mean more detail or resolution [2].

Image manipulation

One of the great of digital images is that they can be manipulated just like any other kind of data. Although methods for processing images have been developed almost since the beginning of the computer, these methods where available only for large computers and were not relevant to clinical medicine. This situation is changing rapidly, however, as digital images become widely available through the image modalities themselves, Picture Archiving and Communication System and powerful desktop workstations. Even though there has been relatively little progress in the area of computer image understanding, these has been much progress in applying existing methods to aid the human as he or she analyzes the images [3].

The RGB color model

The RGB color model is used for specifying colors. This model specifies the intensity of red, green, and blue on a scale of 0 to 255, with 0 (zero) indicating the minimum intensity. The settings of the three colors are converted to a single integer value by using this formula:

$$RGB = \mathrm{Re}\,d + (Green * 256) + (Blue * 256 * 256) \quad (1)$$

The Image Module

The Image module provides a class with the same name which is used to represent a PIL image. The module also provides a number of factory functions, including functions to load images from files, and to create new images.

The pixel Object

Images are collections of pixels. In order to represent a pixel, we need a way to collect together the red, green and blue components. The Pixel object provides a constructor and methods that allow us to create and manipulate the color components of pixels. The constructor will require the three color components. It will return a reference to Pixel object that can be accessed or modified. We can extract the color intensities using the getRed, getGreen, and getBlue methods [4].

Basic image processing

We now have all of the tools necessary to do image processing. We will perform color manipulations on an image. The basic idea will be to systematically process each pixel one at a time and perform the following operations:

1. Extract the color components.
2. Build a new pixel.
3. Place that pixel in a new image at the same locations as the original.

Grayscale image

Despite the eventual introduction of color photography, monochromatic photography remains popular. If anything, the digital revolution has actually increased the popularity of monochromatic photography because any digital camera is capable of taking black-and-white photographs (whereas analog cameras required the use of special monochromatic film). Monochromatic photography is sometimes considered the “sculpture” variety of photographic art. It tends to abstract the subject, allowing the photographer to focus on form and interpretation instead of simply reproducing reality.

Because the terminology black-and-white is imprecise – black-and-white photography actually consists of many shades of gray – this article will refer to such images as grayscale.

Several other technical terms will be used throughout my explanations. The first is color space. A color space is a way to visualize a shape or object that represents all available colors. Different ways of representing color lead to different color spaces.

How all grayscale algorithms fundamentally work?

All grayscale algorithms utilize the same basic three-step process:

1. Get the red, green, and blue values of a pixel
2. Use fancy math to turn those numbers into a single gray value
3. Replace the original red, green, and blue values with the new gray value [5].

When describing grayscale algorithms, I'm going to focus on step 2 – using math to turn color values into a grayscale value. So, when you see a formula like this:

$$Gray = (Red + Green + Blue)/3 \tag{2}$$

Recognize that the actual code to implement such an algorithm looks like:

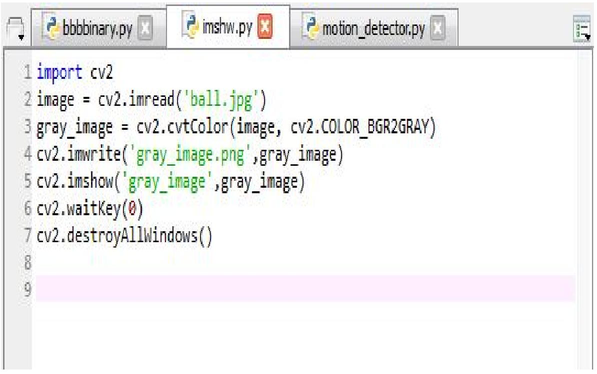


Figure 1. The pseudo-code in python

Figure 2. The grayscale image

To get sepia, you need to calculate the average value and take a coefficient.

$$middle = (R + G + B)/3 \tag{3}$$

$$R = middle + 2 * k \tag{4}$$

$$G = middle + k \tag{5}$$

$$B = middle \tag{6}$$

Recognize that the actual code to implement such an algorithm looks like:

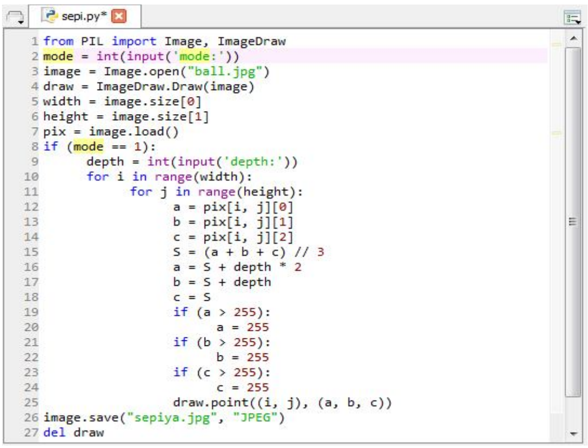


Figure 3. The pseudo-code in python

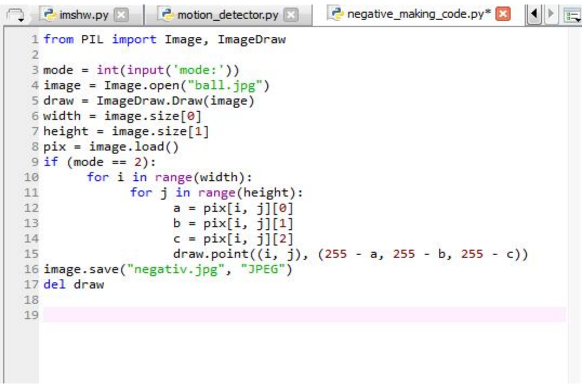
Figure 4. The sepia image

Negative image

In photography, a negative is an image, usually on a strip or sheet of transparent plastic film, in which the lightest areas of the photographed subject appear darkest and the darkest areas appear lightest. This reversed order occurs because of the extremely light-sensitive chemicals a camera film must use to capture an image quickly enough for ordinary picture-taking, which are darkened, rather than bleached, by exposure to light and subsequent photographic processing [6].

In order to obtain a sufficiently negative each pixel value subtracted from 255.

Recognize that the actual code to implement such an algorithm looks like:




```
from PIL import Image, ImageDraw

mode = int(input('mode:'))
image = Image.open("ball.jpg")
draw = ImageDraw.Draw(image)
width = image.size[0]
height = image.size[1]
pix = image.load()
if (mode == 2):
        for i in range(width):
                for j in range(height):
                        a = pix[i, j][0]
                        b = pix[i, j][1]
                        c = pix[i, j][2]
                        draw.point((i, j), (255 - a, 255 - b, 255 - c))
image.save("negativ.jpg", "JPEG")
del draw
```

Figure 5. The pseudo-code in python

Figure 6. The negative image

CONCLUSION

In this paper, we have explained about Image processing and then about the Image Manipulation. Image manipulation algorithms either transform pixels at given positions or create a new image using the pixel information of a source image. Examples of the former type of operation are conversion to grayscale, sepia and negative.

REFERENCES

[1] Shikha Kothiyal, Shivani Sanini. Image processing and manipulation. // Internatonal journal of innovative research in technology. – 2014. – Vol. 1, No 6. – P. 962–966.

[2] Bradley N. Miller, David L. Ranum. Python Programming in Context. – 2nd Edition –Paperback, 2014. – 185 p.

[3] Edward H. Shortliffe, Leslie E. Medical Informatics. – 2nd Edition – SpringerScience+Business Media, 2001. – 515 p.

[4] Bradley N. Miller, David L. Ranum. Python Programming in Context. – 1st Edition –Jones and Bartlett publisher, 2009. – 187 p.

[5] http://www.tannerhelland.com/3643/grayscale-image-algorithm-vb6/

[6] https://en.wikipedia.org/wiki/Negative

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Манипуляции с цветом изображений OpenCV В Python

Резюме. Статья посвящена обработке цифровых изображений, в частности задаче повышения разрешающей способности изображений. Рассматриваются методы оттенки серого, негатива, сепии изображения, а также реализация изображений в реальном времени на основе технологии Python используя библиотеку OpenCV.

Ключевые слова: Манипуляции изображения, градациях серого, сепия, негатив изображения, цвет RGB.

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OpenCV Python-да бейнелердің түсіне әр-түрлі өзгерістер енгізу

Түйіндеме. Бұл мақалада бенелік ақпараттарды өңдеу үшін әр түрлі кеңістікте түс түзетуі қарастырылған. Сұр түс, негатив, сепия әдістері қарастырылған, сонымен қатар бейнені нақты уақытта өңдеу үшін Python технологиясының негізінде OpenCV кітапханасын қолдану арқылы жасалынған.

Кілттік сөздер: бейнеге өзгерістер енгізу, сұр түс, сепия, негатив бейнесі, RGB түсі.