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Increase the brightness of the image using Cyclic Group C_n

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Abstract

In this paper, circular group and its effect on the color of gray images is represented.

Aim of this research is to improve the contrast of images that have a bad contrast. Make it look bright Circular group is changes the gray levels of the colors, which makes the gray.

image more light as the rotation of the elements of the group when number of size matrix Increasing.

The proposed method gave effective results and was applied to gray-type images format (.png,.tif).

Increasing . ***Key ward***

White Images , more light image , cyclic group C_n.

1. Introduction

The properties of the theory of representation for a limited group G were discovered on the complex numbers of ferdinand Geory Frobenius in the years before 1900 Then the theory of representation was developed by Richard Brauer

The term group representation is also used in a more general and comprehensive sense and means any "description" of any group such as the crossover of some mathematical objects. In addition, the word "representation" means a form of grouping, the automatic group of an object. If this object is a directional space, then it is a linear representation. Some people use the term realization to refer to the general concept, while the term representation is used in special cases of linear representation. [2]

A paper structure consists from a paragraph 2 Theorems and Definitions of Cyclic group , paragraph 3 The proposed method , paragraph 4 Experimental Results and paragraph 5 Conclusion

2 . The Basic concepts of Cyclic group

In this part, we present some important definitions of representation theory.

Definition *[5] .A group is said to be cyclic if it is generated by r a single element, i.e., if G = ⟨r⟩ for some* $r \in G$ *.,* $\Rightarrow G = \{ 1 , r. , r^2 , …….. , r^{n-1}. \} \approx C_n$ *,* $r^l \leftrightarrow i$ *mode n.*

G can be thought of as the group of rotational symmetries about the center of a regular polygon with n –sides, the rotations (about the origin) with the angle $2l\pi/n$ *, l=0,1,2,…,n-1.* ***[3]***

Definition ***[1]*** *A set of* $n \times n$ *non-singular matrices on a field F forms a group under the operation of the matrix multiplication is called* ***the general linear group*** *of the dimension* n *over the field F, denoted by GL (n ,F).*

Definition ***[1] A matrix representation*** *of a group G is a group homomorphism T of G into GL (n ,F) , l is called* ***the degree of matrix representation T*** *.*

T is called a ***unit representation (principal)*** *if T(g)=1, for all* $g \in G$*.*

Example: *The group* C_7 *=< r > consists of the elements 1, r. ,* r^2 *,* r^3 *,*r^4 *,* r^5*,* r^6 *,(*r^7*=1.) . of order 7 ,define* $T: C_7 \rightarrow GL(7,C)$ *as follows :*

$$1 = (1) \Rightarrow T((1)) = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix},$$

r = (1234567) $\Rightarrow$ *is a clockwise rotation about the center with angle* $^{2\pi}/_{7}$ *.*

$$T(r) = T((1234567)) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix}.$$

r^2 *= (1357246)* $\Rightarrow$ *is a clockwise rotation about the center with angle* $^{4\pi}/_{7}$ *.*

$$T(r^2) = T((1357246)) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}.$$

$r^3 = (1473625) \Rightarrow$ is a clockwise rotation about the center with angle $6\pi/7$.

$$T(r^3) = T((1473625)) = \begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix}.$$

$r^4 = (1526374) \Rightarrow$ is a clockwise rotation about the center with angle $8\pi/7$.

$$T(r^4) = T((1526374)) = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{bmatrix}.$$

$r^5 = (1642753) \Rightarrow$ is a clockwise rotation about the center with angle $10\pi/7$.

$$T(r^5) = T((1642753)) = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}.$$

$r^6 = (1765432) \Rightarrow$ is a clockwise rotation about the center with angle $12\pi/7$.

$$T(r^6) = T((1765432)) = \begin{bmatrix} 0&1&0&0&0&0&0\\ 0&0&1&0&0&0&0\\ 0&0&0&1&0&0&0\\ 0&0&0&0&1&0&0\\ 0&0&0&0&0&1&0\\ 0&0&0&0&0&0&1\\ 1&0&0&0&0&0&0 \end{bmatrix}.$$

3.The proposed method

In this part, we explained the sequence of steps of the proposed body of the implementing system .

1-This a group of C_7 is order = 7 , $C_7 = \{1, r, r^2, r^3, r^4, r^5, r^6\}$.

2. *I represent each element with its corresponding spindle elements such that :*
   $1 = (1)$, $r = (1234567)$, $r^2 = (1357246)$, $r^3 = (1473625)$, $r^4 = (1526374)$,
   $r^5 = (1642753)$, $r^6 = (1765432)$.
3. *I represent each element with an a matrix .*
4. *Start by representing the identity element with an identity matrix such that :*

$$1 = (1) \Rightarrow T((1)) = \begin{bmatrix} 1&0&0&0&0&0&0\\ 0&1&0&0&0&0&0\\ 0&0&1&0&0&0&0\\ 0&0&0&1&0&0&0\\ 0&0&0&0&1&0&0\\ 0&0&0&0&0&1&0\\ 0&0&0&0&0&0&1 \end{bmatrix}$$

5. *All other elements are represented by a matrix so that the rows of the matrix change according to the substitution of the elements of the group*
6. *r is a clockwise rotation about the center with angle $2\pi/7$.*

r^2 is a clockwise rotation about the center with angle $4\pi/7$.

r^3 is a clockwise rotation about the center with angle $6\pi/7$.

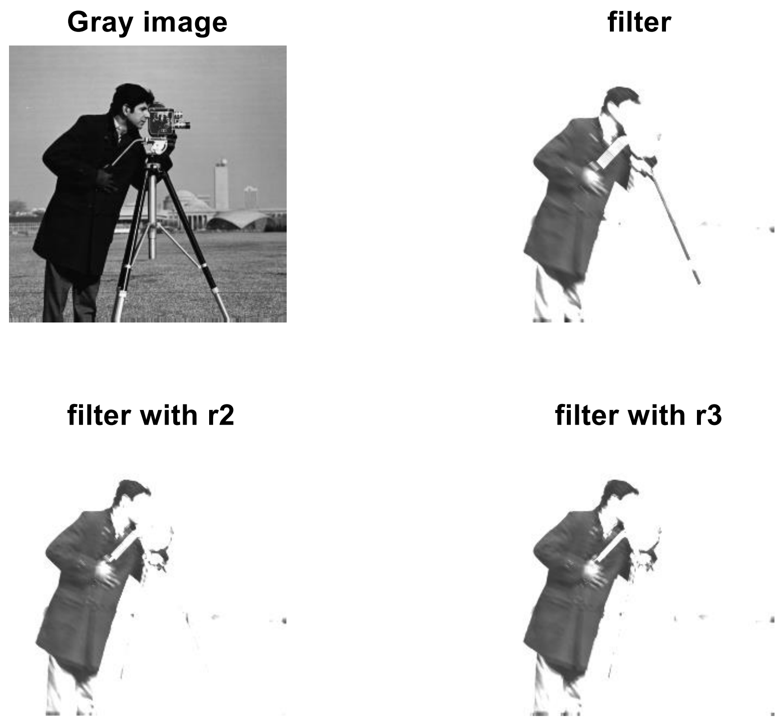
r^4 is a clockwise rotation about the center with angle $8\pi/7$.

r^5 is a clockwise rotation about the center with angle $10\pi/7$.

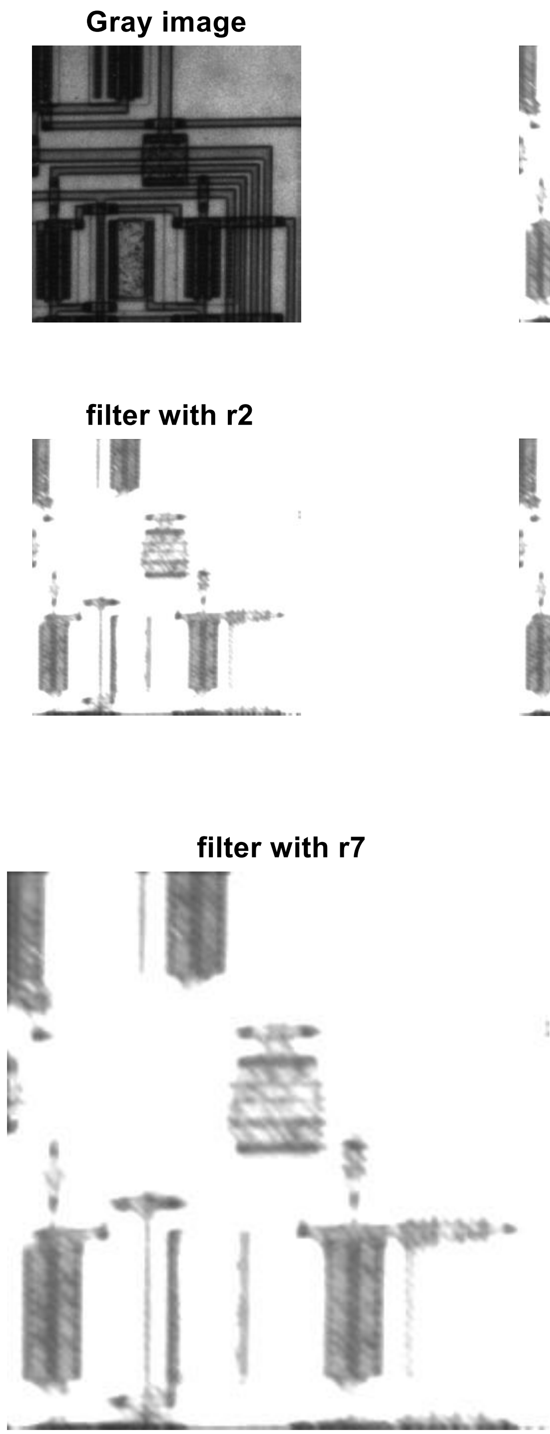
r^6 is a clockwise rotation about the center with angle $12\pi/7$.

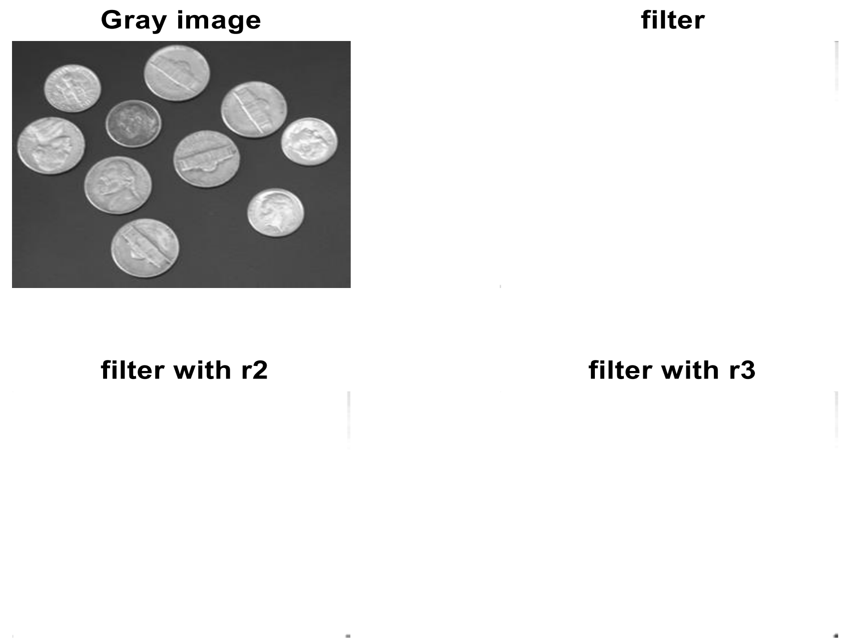
4.Experimental Results

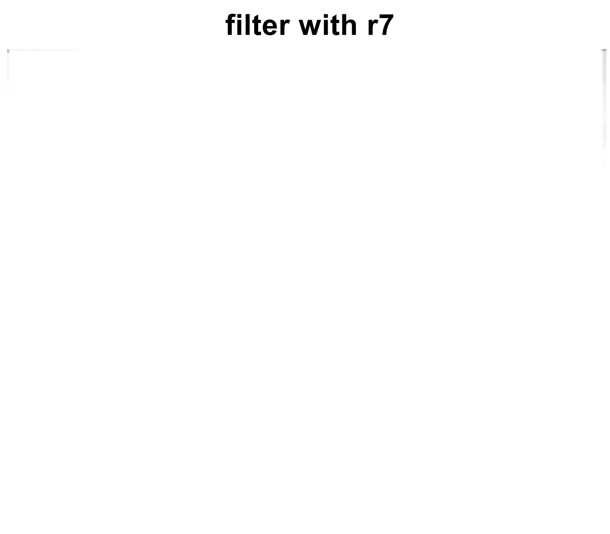
The higher the , the rotations (about the origin) with the angle $2l\pi/n$, the more white it becomes


Gray image
filter
filter with r2
filter with r3


filter with r7


Gray image
filter
filter with r2
filter with r3
filter with r7


Gray image
filter
filter with r2
filter with r3


filter with r7

5. Conclusion

In this work we used a periodic set and represented the group values we used as the sample matrix as a mask to increase the lighting of the images in this study. Note a periodic group using the values representing the group and its efficiency in deleting and hiding the components and regions in the gray images is very high.high.

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