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REVIEW PAPER ON TWO DIMENSIONAL GRAPHIC TRANSFORMATIONS FOR TECHNICAL DRAWING, ADVERTISING, TYPOGRAPHY, CARTOGRAPHY APPLICATIONS

[1]Tripta, Research Scholar, Dept. of CSA, CDLU Sirsa
[2]Mrs.Shailja kumari, Assistant professor CSA Deptt. ,CDLU, Sirsa

Abstract: Two Dimensional computer graphics is computer-based generation of digital image/graphics—mostly from two-dimensional models such as two Dimensional geometric models, text, & digital image/graphics & by techniques specific to them. Two Dimensional computer graphics are mainly required in applications that were originally developed upon traditional printing & drawing technologies, such as technical drawing, advertising, typography, cartography, etc. In those applications, two-dimensional image/graphic is not just a representation of a real-world object, but an independent artefact with added semantic value, 2D models are therefore considered, because they give more direct control of image/graphic than three Dimensional computer graphics whose approach is considered more akin as compare to photography than to typography. During this research we will use existing Matlab Function as well as user defined functions. Moreover we will make the comparative analysis of quality of image and simulate the noise ratio.

[I] INTRODUCTION

In many domains, like engineering, business, desktop publishing, a description of a document based on two Dimension computer graphics techniques can be much smaller than corresponding digital image/graphic—often by a factor of 1/1000 or more. This representation is also more flexible since it may be rendered at various resolutions to suit different output devices. For these reasons, documents & illustrations are often stored or transmitted as two Dimensional graphic files.

Two Dimensional computer graphics started in 1950s that is based on vector graphics devices. These were largely supplanted by raster-based devices in following decades. PostScript language & X Window System protocol were landmark developments in field.

Two Dimensional graphics models may combine geometric models also known vector graphics, digital image/graphics also called raster graphics, text to be typeset is defined by content, font style & colour, position, size & orientation, mathematical functions & equation. Components can be modified & manipulated by two-dimensional geometric transformations such as rotation, translation, scaling. In object-oriented graphics, image/graphic is described indirectly by an object endowed with a self-rendering method a procedure which assigns colors to image/graphic pixels by an arbitrary algorithm. Complex models may be built by combining simpler objects, in paradigms of object-oriented programming.

[II] TWO DIMENSIONAL TRANSFORMATION

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Transformations can be considered a fundamental part of computer graphics. Transformations may be required to shape objects, to change viewing positions, to position objects & even to change how something is viewed e.g. type of perspective that is used.

There are four main types of transformations that one can perform in two dimensions:

- rotation
- shearing
- translations
- scaling

These basic transformations can be combined to obtain more complex transformations. In order to make representation of these complex transformations easier to understand & more efficient, we introduce idea of coordinates that are.

Representation of Points or Objects

A point **p** in Two Dimensional is represented as a pair of numbers: **p**= (*x*, *y*) where *x* is x-coordinate of point **p** & *y* is y-coordinate of **p** . Two Dimensional objects are often represented as a set of points, $\{p_1,p_2,...,p_n\}$, & an associated set of edges $\{e_1,e_2,...,e_m\}$. An edge/border is defined as a pair of points $e = \{p_i,p_j\}$. What are points & edges of triangle below?

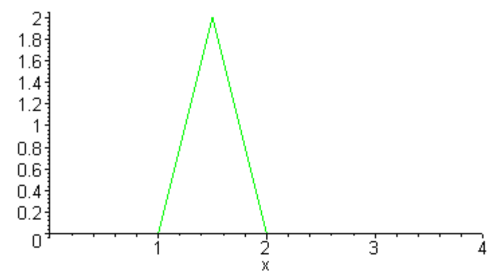

Fig 1 Two Dimensional Graphics

We can also write points in vector/matrix notation as

$$p = \begin{bmatrix} x \\ y \end{bmatrix}$$

Translations

Assume you have a point at (x,y)=(2,1). Where will point be if you move it 3 units to right & one unit up? Ans: (x',y') = (5,2). How it can be obtained? - (x',y') = (x+3,y+1). That is, to move a point by some amount *dx* to right & *dy up*, you must add *dx* to x-coordinate & add *dy* to y-coordinate.

What was required transformation to move green triangle to red triangle? Here green triangle is represented by three points

triangle = { p1=(1,0), p2=(2,0), p3=(1.5,2) }

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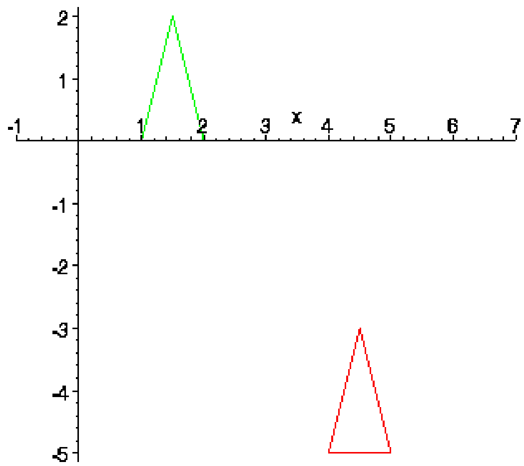

Fig 2 Two Dimensional translations

Matrix/Vector Representation of Translations

A translation may be represented by a pair of numbers, $t=(t_x,t_y)$ where t_x is change in x-coordinate & t_y is change in y coordinate. To translate point p by t, we simply add to obtain new (translated) point q = p + t.

$$q = p + t = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} tx \\ ty \end{bmatrix} = \begin{bmatrix} x+tx \\ y+ty \end{bmatrix}$$

Scaling

Suppose we want to double size of a two dimensional object. What do we mean by double? Double in size, height only, width only, along some line only? When we talk about scaling we usually mean some amount of scaling along each dimension. That's , we should specify how much to change size along each dimension. Below we see a triangle & a house that have been doubled in *both* width & height.

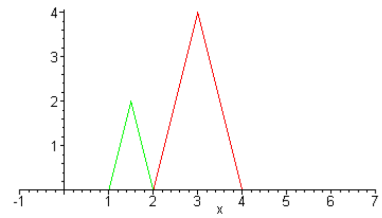

Fig 3 Scaling

For example, point p=(1.5,2) has been scaled by 2 along x & .5 along y. Thus, new point is

q = (2*1.5,.5*2) = (3,1).

Rotation

Below, we see objects that have been rotate by 25 degrees.

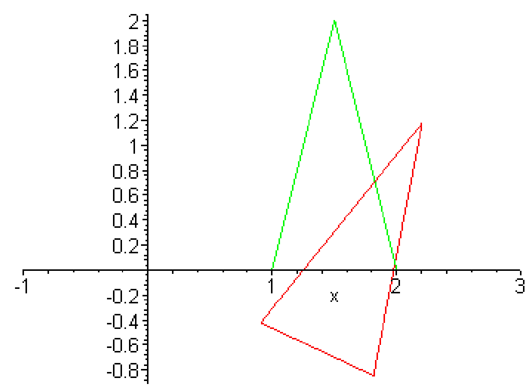

Fig 4 Rotation

[III]Survey of earlier work

Two Dimensional computer graphics started in 1950s that is based on vector graphics devices. These were largely supplanted by raster-based devices in following decades. PostScript language & X Window System protocol were landmark developments in field.

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1. A brief experience on journey through hardware developments for image processing & it's applications on Cryptography by Sangeet Saha, Chandrajit pal, Rourab paul,

The importance of embedded applications on image & video processing, communication & cryptography domain has been taking a larger space in current research era. Improvement of pictorial information for betterment of human perception like deblurring, de-noising in several fields such as satellite imaging, medical imaging etc are renewed research thrust.

2. Comparative Study & Implementation of Image Processing Techniques Using MATLAB by Sukhjinder singh, R.k Bansal, Savina Bansal

Image enhancement aims at improving quality of image for better visualization. This paper presents three methods of image enhancement: - GHE, LHE & DSIHE that improve visual quality of images.

3. A Study on Image Edge Detection Using Gradients by Pinaki Pratim Acharjya, Ritaban Das, Dibyendu Ghoshal

A study on image edge/border detection using gradients is presented in this paper. In image processing & image analysis edge/border detection is one of most common operations. Edge/borders form outline of an object & also it is boundary between an object & background.

4. Mie Sato et al., (2000) have experimented gradient magnitude based region growing algorithm for accurate segmentation.

"They express that undesirable partial-volume – effect which lies on boundary between a high intensity region & a low intensity region, makes unerring boundary determination a difficult task. A new approach to segmentation is required for removing adverse effect on boundary, which is unwanted especially from point of view of volume rendering.

5. Stoyan Donchev. (2000) has performed adaptive threshold-gradient method for segmentation of areas & objects of grey scale images.

"The segmentation of an image, i.e., separation of object from its background is one of most important procedures in image processing. Two basic types of segmentations exist at present realized with respect to intensity & to intensity gradient, & two basic types of segments areas & borders.

6. Chi Chang-Yanab, et al., (2008) have done a study on methods of noise reduction in a stripped image.

Through their analysis they have found out by image spectrum that its difference can help us to choose different methods to do noise reduction while information of image is reduced to be least. They have also illustrated some methods of noise reduction & taken one test image as an example.

7. Mariusz Leszczyński (2010) has worked on image preprocessing for illumination invariant face verification.

"Performance of face verification system depends on many conditions. One of most problematic conditions is varying illumination condition. They have compared 14 normalization algorithms based on histogram normalization, illumination properties & human perception theory using 3 verification methods. results obtained from experiments shows that illumination preprocessing methods significantly improve verification rate & it is a very important step in face verification system".

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8. Mythili, C.and V. Kavitha (2011) have done good study on various types of noise in images especially in digital color image.

"Noise can occur during image capture, transmission, etc. Noise removal is an important task in image processing. In general, results of noise removal have a strong influence on quality of image processing technique. Several techniques for noise removal are well established in color image processing. nature of noise removal problem depends on type of noise corrupting image.

[IV] PROPOSED IMPLEMENTATION

Geometric Transformation, Spatial Referencing & Image Registration

Rotate, Scale perform other N-Dimensional transformations provide spatial information, align image/graphics using automatic or control point registration

The toolbox supports functions to perform simple geometric transformations, such as rotating, resizing & cropping, as well as more complex Two Dimensional geometric transformations, such as affine & projective. Toolbox also provides tools for aligning a pair of image/graphics automatically using intensity-based registration or control point registration techniques.

1. GEOMETRIC TRANSFORMATIONS

Resize, rotate, & crop image/graphics; perform geometric transformation of multidimensional arrays

imcrop	Crop image/graphic
imresize	Resize image/graphic
imrotate	Rotate image/graphic
imtranslate	Translate image/graphic
impyramid	Image/graphic pyramid reduction & expansion
imwarp	Apply geometric transformation to image/graphic
fitgeotrans	Fit geometric transformation to control point pairs
imtransform	Apply 2-D spatial transformation to image/graphic
findbounds	Find output bounds for spatial transformation
fliptform	Flip input & output roles of TFORM structure
makeresampler	Create resampling structure
maketform	Create spatial transformation structure (TFORM)
tformarray	Apply spatial transformation to N-D array
tformfwd	Apply forward spatial transformation
tforminv	Apply inverse spatial transformation

Table 1

2. SPATIAL REFERENCING

Associate spatial information with an image/graphic, use this information in image/graphic processing operations. There are several ways to refer to locations in an image/graphic. Spatial referencing enables you to specify location information in relation to a world coordinate system. For more information, read Expressing Image/graphic Locations.

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functions list all accept or return spatial referencing information.

imwarp	Apply geometric transformation to image/graphic
imregister	Intensity-based image/graphic registration
imregtform	Estimate geometric transformation that aligns two 2-D or 3-D image/graphics
imshow	Display image/graphic
imshowpair	Compare differences between image/graphics
imfuse	Composite of two image/graphics

Table 2

3. AUTOMATIC REGISTRATION

Align two image/graphics using automatic intensity-based registration. Align two image/graphics using automatic intensity-based registration

Imregister	Intensity-based image/graphic registration
Imregconfig	Configurations for intensity-based registration
Imregtform	Estimate geometric transformation that aligns two 2-D or 3-D image/graphics
Imregcorr	Estimates geometric transformation that aligns two 2-D image/graphics using phase correlation
Imregdemons	Estimate displacement field that aligns two 2-D or 3-D image/graphics
Imfuse	Composite of two image/graphics
Imshowpair	Compare differences between image/graphics

Table 3

4. CONTROL POINT REGISTRATION

Align two image/graphics using control point mapping

cpselect	Control Point Selection Tool
fitgeotrans	Fit geometric transformation to control point pairs
cpcorr	Tune control-point locations using cross correlation
cpstruct2pairs	Convert CPSTRUCT to valid pairs of control points
normxcorr2	Normalized 2-D cross-correlation
cp2tform	Infer spatial transformation from control point pairs

Table 4

[V] FUTURE SCOPE & CONCLUSION

In our research we will use graphic transformation mechanisms in order to improve the quality of graphics by integrating existing graphics transformation techniques. During this research we will use existing Matlab Function as well as user defined functions. Moreover we will make the comparative analysis of quality of image and simulate the noise ratio. Here we have also discussed various edge detection mechanisms and these would be beneficial in improving existing biometric techniques.

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