Digital Image Processing: Lab Assignment 1

#1: Image Transformations [100points]

Issue date: 3-1-2020 Due date: 10-01-2019

Instructions

- Do not copy code from any other source (internet or friend). In case, any plagiarism detected, strictly zero mark will be assigned for that assignment.

- Show your results on sample images given in the assignment. Any other won't be considered for evaluation.

- Clearly state your name and Entry number on the lab report.

- Any additional materials used during the completion of the assignment must be cited. Failure to correctly reference sources will result in mark deduction(-10p/day).

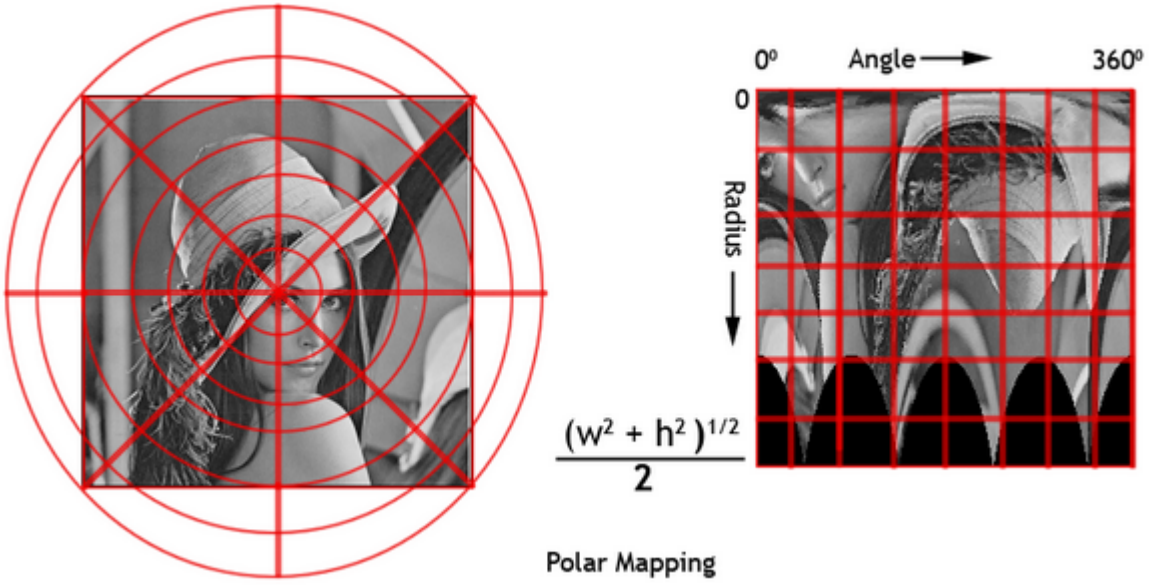
- Submit a PDF file with proper. If the report is handed in more than three days after the deadline, the assignment will be marked zero marks. Up to fifty bonus points may be awarded to the student for very good lab assignments that comply with the criteria described below:

  +10p ← Report is clearly written and easy to follow.
  +10p ← Code is well documented.
  +10p ← Explanations and Observations are well written.
  +10p ← For overall exceptional reports, that confirm to all scientific writing standards.
  +10p ← Extra experiments performed on other set of images for better understanding.

1 Image Transformation

1.1 Write a program (in MATLAB or PYTHON) to perform the polar transformation on an image. File name should be "EntryNo_polarT". **[10point]**

NOTE: Do not use inbuilt function



Polar Mapping

2 Transformations

2.1 Perform geometric rotation, scaling, and translation on the image.

(a) Rotate the original object by 45 degrees and then flip it. Make

(b) Translate the object by an offset of 32 in both the width and height dimensions (towards positive axis).

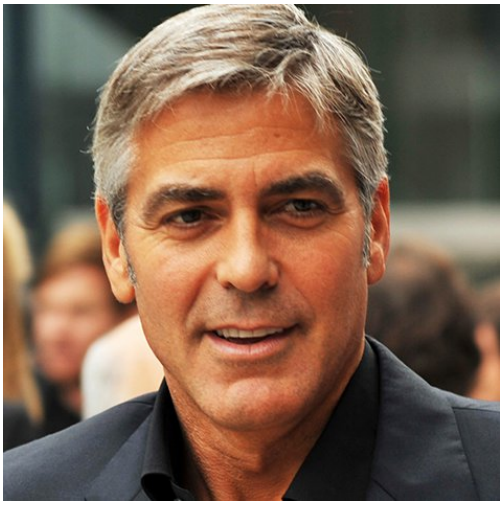
(c) Geometrically scale the object by a factor of three. Consider the origin as the center of the image.

(d) Perform shear transformation with 0.2 scale (in x direction), then rotate image by 90 degrees, and at last scale it by a factor of 2.

NOTE : Do not use inbuilt functions.

Display output images for all the above operations. **[40point]**

Sample Images:



Assignment 3

Part 1

- Implement a window to viewport transformation to put the origin at the center of the screen, and the y-axis pointing upward.
- Implement the following 3D transformations: translate, scale and rotate
- Implement a perspective transformation (observer is looking straight at the view-plane).
- Implement an "arbitrary rotation function", which rotates around any axis at any point in space.

All these should be implemented as **matrix multiplications, using homogeneous coordinates**. The above **order** is probably a good order to implement things in. The window to viewport is, e.g., needed to get things at the center of the screen, so we can see them.

Part 2

When you have implemented all the transformations above, you should use these to build a small program for viewing 3D scenes/objects made of triangles.

- It should be possible to move the observer in x,y,z direction of the world coordinate system.

- It should be possible to move forward/backward, rotate left/right, up/down and tilt your head left/right (roll) in the view coordinate system. When you tilt your head left, the object will tilt right on the screen. It should be like that.
- It should be possible to rotate the object around it's own axises (object coordinate system).

Marks (50)