# Project 1

## Zooming with Replication, Interpolation, Cubic Spline

**EE5356 Digital Image Processing**

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## Zooming with interpolation

**Apply the following 3 interpolators to a test image (8bpp 256 level gray scale) to zoom it by 2.**

1) **Replication (See Figure 7.28 in the textbook pp.254)**
2) **Linear interpolator (See Figure 7.29 in the textbook pp.255)**
3) **Cubic spline interpolator (See Figure 7.30 in the textbook pp.255)**

**NOTE:**

**You may choose a test image from the UTA DIP website at http://www.uta.edu/faculty/krrao/dip or Dr.Rafael Gonzalez's web site at http://www.imageprocessingbook.com/downloads/book_images_downloads.htm . (All the images are in jpeg format.) Also, go to database in the class website.**

**References:**


1) **Textbook pp.253-255**
2) **Rafael C. Gonzalez and Richard E.Woods, "Digital image processing", Prentice Hall, III Edition, 2008.**
3) **Gonzalez, Woods and Eddins, "Digital Image Processing with MATLAB".**
4) **Practical image and video processing using MATLAB by Marques, Oge**

```
clc;
clear all;
Img=imread('D:\STUDY\DIP\Test img\cameraman.bmp');
subplot(2,3,1);
imshow(Img);
title('Original Image');
[x,y] = size(Img);
R = 2;
Z = uint8(zeros(R*x,R*y));


% Zero interlacing
for x = 1:256
for y = 1:256
Z(R*x,R*y) = Img(x,y);
end
end
% Replication
M = [1 1;1 1];
REP_Img = uint8(conv2(Z,M));
subplot(2,3,2);
imshow(REP_Img);
title('Zoomed image using replication');

% Linear Interpolation
M_2 = conv2(M,M);
N = 0.25.*M_2;
LI_Img = uint8(conv2(Z,N));
subplot(2,3,3);
imshow(LI_Img);
title('Image Zoomed using linear interpolation');
M_3 = conv2(M_2,M);
M_4 = conv2(M_3,M);
M_5 = 0.015625*(M_4);
CS_Img = uint8(conv2(Z,M_5));
subplot(2,3,4);
imshow(CS_Img);
title('zoomed image using cubic spline technique');
```

Original Image

**Zoomed Image using replication**

Zoomed Image using linear interpolation

Zoomed Image using cubic spline interpolation

**Observation:**

The Zoomed Image obtained using Replication technique was noticed to have sharp edges and somewhat blurry as compared to the original image.

The Zoomed Image that is obtained using Linear Interpolation method was observed to be much smoother as compared to Image using replication method.

The Zoomed Image using Cubic Spline Interpolation method was observed to be the smoothest of all images but had a severe loss of data as can be seen in the result.

**Conclusion:-**

Thus from the above result it can be inferred that the Zoomed image that is obtained using Linear interpolation technique was smoother compared to the images obtained using Replicated image, and had more of its data intact compared to Cubic method where some loss of data was observed.

Hence Spline Interpolated Image. Hence, concluding it to be the best option based on the results obtained in this particular project.