

IMAGE APPROXIMATION BY USING EDGE DIRECTED IMAGE INTERPOLATION

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Abstract - The method of interpolation is one of the fundamental operations in image processing. The image quality exceedingly depends on the utilized interpolation technique. High resolution images with fine details are always required in numerous visual tasks. For this reason the interpolation functions are utilised in post processing of images. In the proposed strategy using edge directed image interpolation reconstruction of the image is superior to the conventional interpolation strategies. We also apply MSE, PSNR, Correlation parameters for the performance estimation.

interpolation functions satisfy all these 3 properties which are desirable properties for interpolation. B-Spline polynomial can be calculated by using n convolution of box filter. The cubic B-Spline can be defined as

$$B_{0,4}(t) = \begin{cases} \frac{t^2}{6} & 0 \leq t < 1 \\ -3t^2 + 12t^2 - 12t + 4 & 1 \leq t < 2 \\ \frac{4-t^2}{6} & 3 \leq t < 4 \\ 0 & \text{otherwise} \end{cases} \quad \text{-----(1)}$$

This interpolation method is employed to obtain the unknown data points. usually this interpolation method is used to reconstruct the image from its down sampled version. But with this methods many drawbacks is there such as jaggedness, blurriness and computation time.

1.INTRODUCTION

Image interpolation, found applications in biomedical applications, image processing and in computer vision. the resolution of ultrasound image is low which can be expanded by interpolation. The quality of regenerated image depends on the precision of the algorithm. Most of the interpolation algorithms enhance both detailed region as well as the smooth region. This process degrades the quality of the image. B-Spline interpolation is a form of interpolation where the interpolant is a special type of piecewise polynomial called a spline. a B-spline, or basis spline, is a spline function that has minimal support with respect to a given degree, smoothness, and domain partition. Any spline function of given degree can be expressed as a linear combination of B-splines of that degree.

the interpolation function should have a finite region of support. That means when we do the interpolation, we should not consider the sample values from say minus infinity to plus infinity. Then the second property which this interpolation operation must satisfy is it should be a smooth interpolation. That means by interpolation, we should not introduce any discontinuity in the signal. Then the third operation, the third condition that must be satisfied for this interpolation operation is that the interpolation must be shift invariant. B-Spline

II PROPOSED METHOD

In the edge-directed interpolation to estimate high resolution edge map from the original image a sub-pixel edge estimation is used.the final high resolution version is generated from low resolution image by interpolating according to the high resolution edge map.

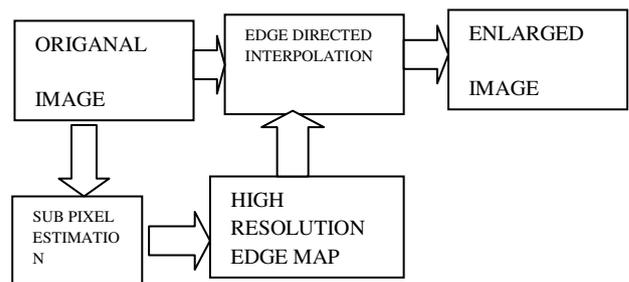


FIGURE 1 Edge directed interpolation structure

The rendering and correction are the two steps for interpolating low resolution images into higher resolution using edge detection.in this method the points on high and low resolution lattices are denoted by p and q respectively $f(p)$ and $f'(p)$ are used to represent the true sensor data corrected sensor data by $f'(p)$ the sensor model by the operator s and the edge directed rendering step by the operator R ,the estimated sensor data by $f''(q)$ and the interpolation image by $g(p)$. the term k represents the iteration index.

$$g_k(p) = R(f'_k(q)) \quad \text{-----(1)}$$

$$f_k''[p] = s(g_k(p)).....(2)$$

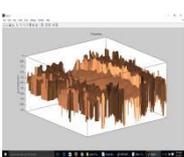
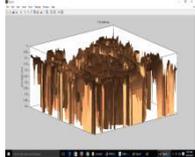
$$f_{k+1}'(q) = f_k'(q) + \lambda(f_k'(q) - f(q)).....(3)$$

The gain of the correlation process is controlled by a constant λ and the iteration starts with initial condition $f_0'(q) = f(q)$. The value of λ depends on computing the probability of edges in a region.

III RESULTS AND DISCUSSION

We use Logitech c920 webcam is a video camera that feeds or streams an image or video in real time to computer to computer network such as the internet. Various lenses are available, the most common in consumer-grade webcams being a plastic lens that can be manually moved in and out to focus the camera.

We compared the proposed method with traditional B-spline interpolation method. the performance is evaluated using two global statistical matrices. Root mean square error(RMSE) and correlation. higher the correlation value and lower the RMSE and correlation values for real time images captured by Logitech c920 web camera. it can be observed that for the proposed method the RMSE value is the lowest and the correlation value is the highest among others. Hence the proposed method performing better than the existing approach.

Real time images captured by logitech C920	B-spline interpolation	Edge directed image interpolation
		
		
		
		
		

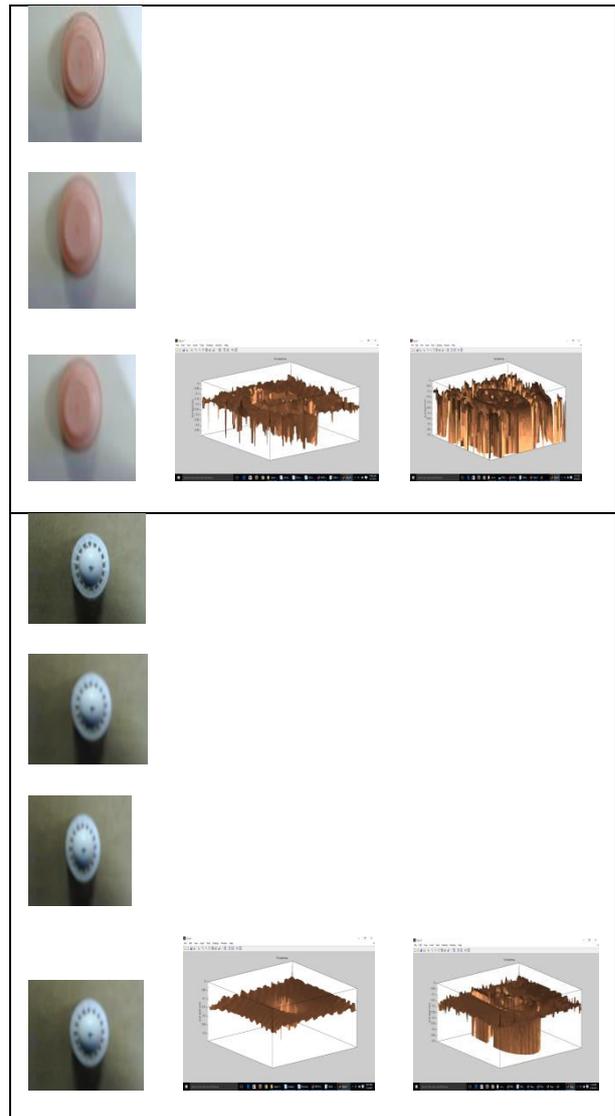


Figure 2 image interpolation images

S.NO	RMSE	MSE	PSNR	Normalised cross-correlation
Image1	0.1549	0.0240	64.3291	0.4968
Image2	0.1177	0.0139	66.7133	0.6039
Image3	0.2085	0.0435	61.7491	0.4082

S.NO	RMSE	MSE	PSNR	Normalised cross-correlation
Image1	0.765	0.0058	70.4603	0.8323
Image2	0.0775	0.0060	70.3464	1.1484
Image3	0.1196	0.0143	66.5727	0.6163

Table 2.statistical performance evaluation by using edge detected image interpolation.

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