

## Conversion of a 2-D Image into a 3-D Image Using Histogram Equivalent Function

S Madhura

Dayananda Sagar College of Engineering  
Bangalore, Karnataka, India  
madhu4tulip@gmail.com

k Suresh

Dayananda Sagar College of Engineering  
Bangalore, Karnataka, India  
ksecel@gmail.com

**Abstract:** *There are many methods to convert a 2-D image into a 3-D image. In this paper, we are presenting one of the possible solutions to enhance an image. We are taking a noisy 2-D image, and then removing the noise using filters like Average filter and Median filter. Then we are converting this denoised 2-D image into a 3-D image using Histogram Equivalent Function. In order to enhance the quality of converted 3-D image, we are using Median filter which give smoothing image, to remove noise from it.*

**Keywords:** *Image processing, noisy 2-D image, Average filter, Median filter, Histogram Equivalent function*

### 1. INTRODUCTION

An image is an array or a matrix of square pixels (picture elements) arranged in columns and rows. The image can be a 2-D or a 3-D image. An example for 2-D image is a photograph and that for 3-D image is a video. Image processing is nothing but, processing some form of signals by taking image as its input to get a processed image or a set of parameters related to the input image as output. Generally, image processing refers to DIP (Digital Image Processing). DIP is using the computer algorithms to process digital images. Mainly DIP is used to avoid noise in the image, to increase its quality and in signal distortion during processing of signal.

Generally, an image refers to a 2-Dimensional figure. There are many formats to represent an image. A 2-D image can be represented in .jpg, .gif, .png, .tif, .bmp, .psd, .pdd, etc. formats and a 3-D image is represented in .mp4, .avi, .flv, .3gp, .mkv, .divx, etc.

There are many types of images, like:

- Real image: This is the one which we can see and feel it actually.
- Volatile image: This is the one which remain for a longer time.
- Mental image: This is the one which in individual's mind. It is also called as imagery.
- Moving image: It includes movies, videos, etc.
- Grayscale image: This is coded using one number per pixel representing one of 256

different gray tones ranging from black to white.

- Palette image: This is coded using one number per pixel, where the number specifies which colour in a palette of up to 256 different colours should be displayed for that pixel.
- RGB image: Here, RGB indicates Red, Green and Blue respectively. This uses the above mentioned three colours as three numbers for each pixel, allowing possible use of millions of colours within the image at the cost of requiring three times as much space as Grayscale or palette images. They are often called True Colour RGB images in Microsoft applications.

- Binary image: Here, an image is represented in binary digits, that is, 0 and 1.

An image has certain characteristics, like:

- Virtual image: This means a false image. This is formed in locations where light does not reach. Virtual image is an image where outgoing rays from a point on the object (image) is diverge. Ex.: Shadow of an object.
- Erect image: It correspond an inverted image. Various methods are used to achieve this. Ex.: image formed in the river, when a person is standing on the bank of the river.
- Size of image: It is represented in terms of Pixels and Bytes. Generally, all images are represented in pixels. Some of the images like TIFF (.tif format) images are represented in bytes.

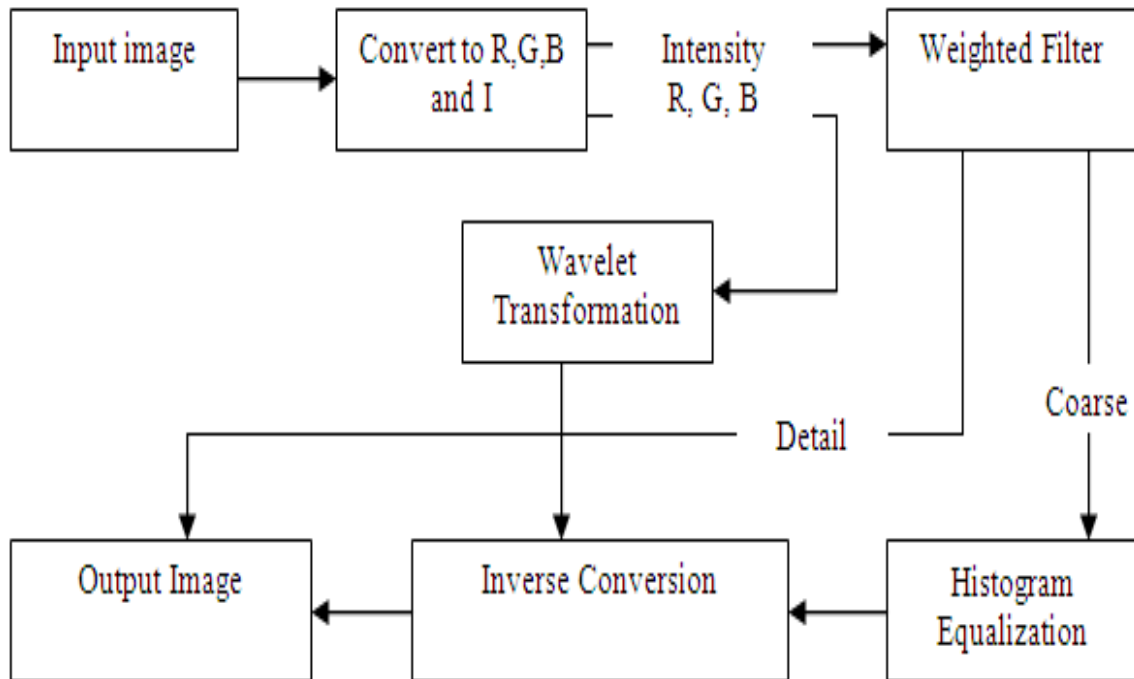
- Resolution: it is determined by multiplying pixel wide and pixel high. Ex.: let an image is 2448 pixel wide and 3264 pixel high, then resolution is (2448X3264) which equals to 7990272 pixels and can be represented as 8Mp (Mega pixel).

**2. RELATED WORKS**

There are many methods to enhance the image and to convert a 2-D image into a 3-D image.

**2.1. Enhancing image of digital cameras by changing contrast**

According to [1], the figure-1 explains the proposed method i.e., enhancing image of digital cameras by changing contrast. An input image is divided into Red, Green, and blue (RGB) format and in Intensity format. Intensity is processed using Weighted Filters and output ‘the course’ is fed into Histogram Equalization.



**Figure 1.** The Proposed Algorithm

On the other hand, RGB is processed under Wavelet Transformation. Output of this is combined with the output of Histogram Equalization to produce Inverse Conversion. Output of this stage is combined with the ‘details’ of Weighted Filters to get enhanced image as output.

**2.2. Image enhancement using Alpha Rooting based Hybrid Technique**

According to [2], an input image is transformed using Discrete Cosine Transform (DCT), and separate the magnitude and phase of the

transform coefficients. Apply Alpha Rooting to magnitude coefficients and combine phase angle to Alpha Rooted magnitude. Then apply inverse orthogonal transform to return from frequency domain to spatial domain. For the output, apply log transform to each pixel location, and then apply power law transformation. Then, an enhanced image will be produced as the output.

Then, fuse ‘k’ corresponding to depth fields and align the fused depth with the 2-D query. The presented result in figure-2 demonstrate that online repositories of 3-D content can be used for effective 2-D to 3-D image conversion.

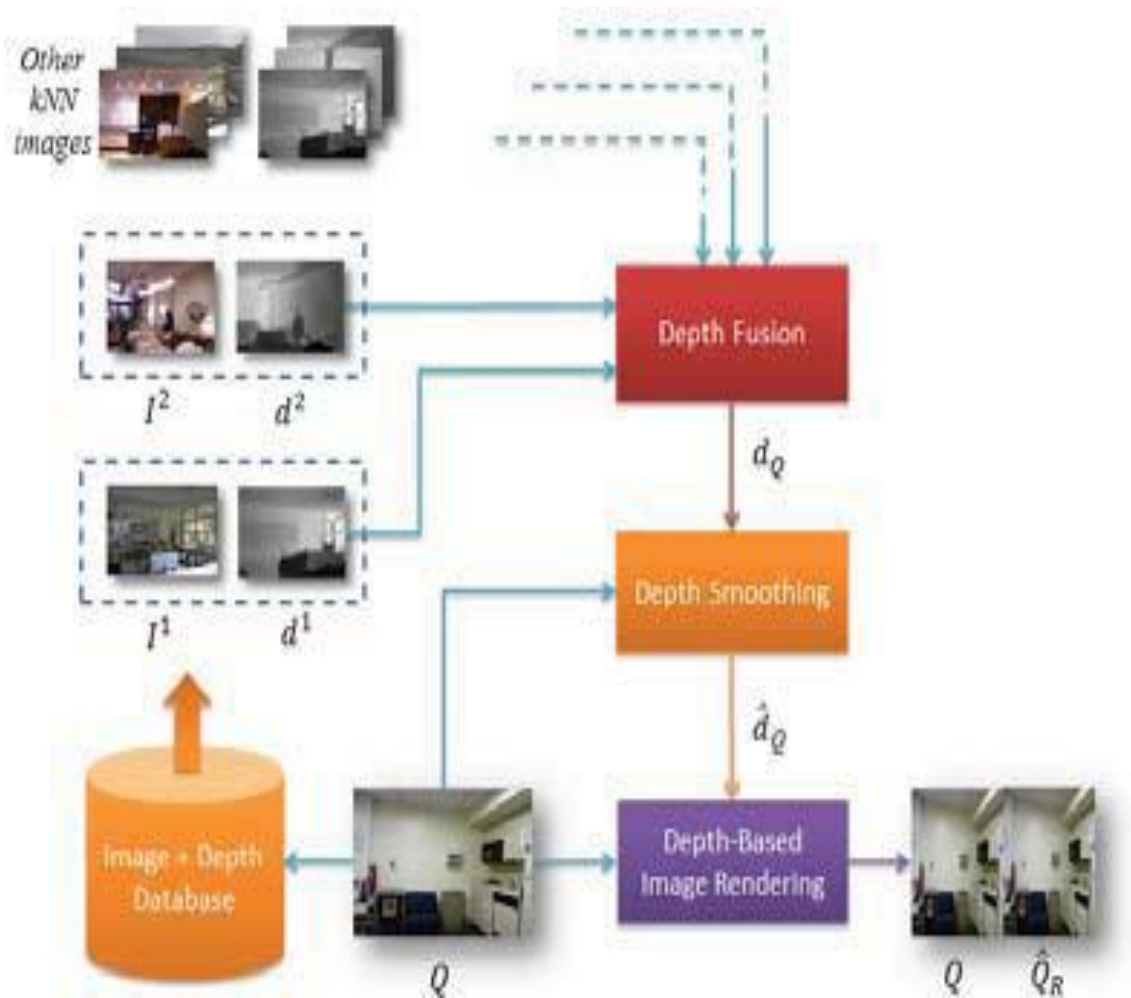


Figure 2. Block diagram of the overall algorithm

### 2.3. Adaptive 2-D to 3-D image conversion

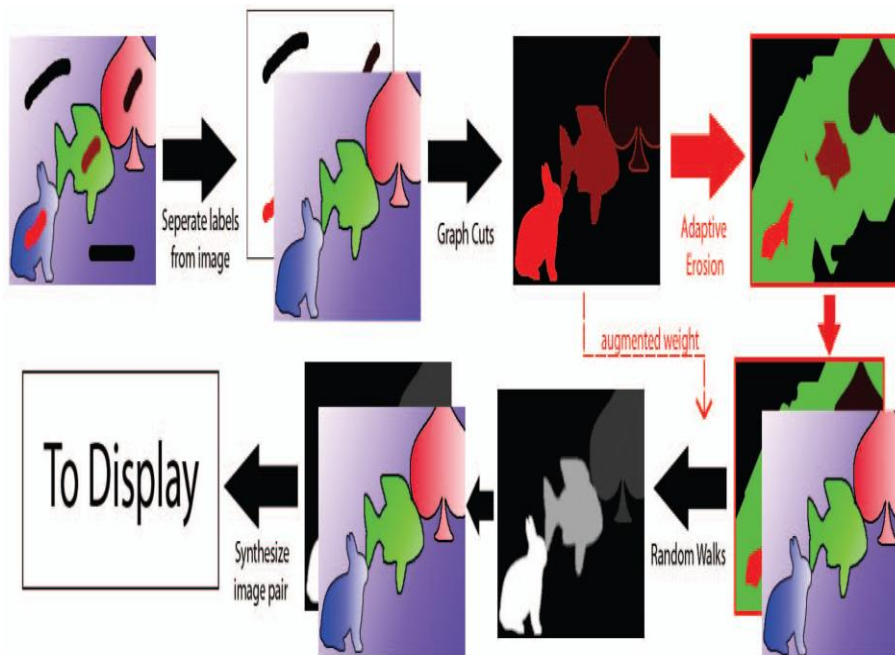


Figure-3: Adaptive 2D to 3D conversion system

According to [4], it is an adaptive for 2-D to 3-D conversion of images using a user-aided process based on Graph Cuts and Random Walks. Given user-defined labelling that correspond to a rough estimate of depth, the system produces a depth map as shown in figure-3 which, combined with the 2-D image can be used to synthesize a stereoscopic image pair. Feed the information from the Graph cut result into the Random Walks process at two different stages, and using edge and spatial information to adapt various weights. The result of this shows that it can produce a good quality stereoscopic 3-D image pairs using a simple adaptive approach.

### 3. PROPOSED METHOD

In this paper, we are going to convert a 2-D noisy image which is in the format .tif. Its resolution is 308X242, that is 74536 pixels and is a Grayscale image. The below block diagram narrates our proposed methodology. As shown in figure 4, first we are taking a 2-D noisy image and remove noise from it by using Average and Median filters. Then convert it into 3-D image using Histogram Equivalent function and then remove noise from it using Median filter. This results into a Denoised 3-D image which is converted from a 2-D noisy image.

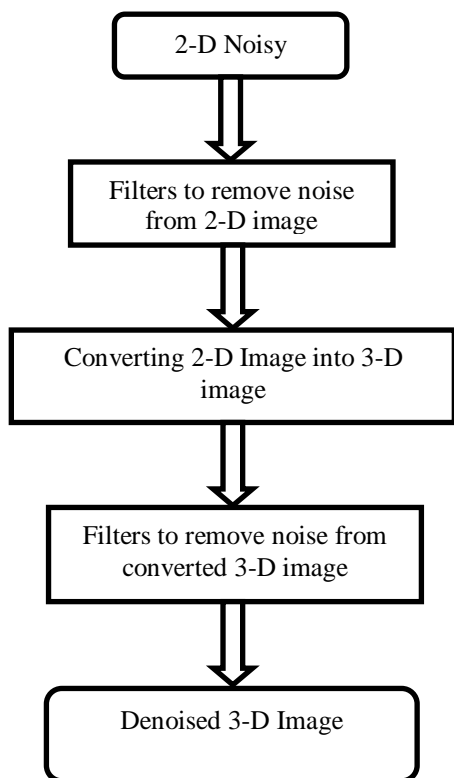


Figure 4. Block Diagram of Proposed Methodology

#### 3.1. Denoising 2-D image

The below block diagram represents the steps involved in denoising a noisy 2-D image. Average filter is used to remove the noise. To improve the quality and clarity of the image the image is again demonised by passing the image through median filter. The better denoised image is taken for processing further as shown in figure 5.

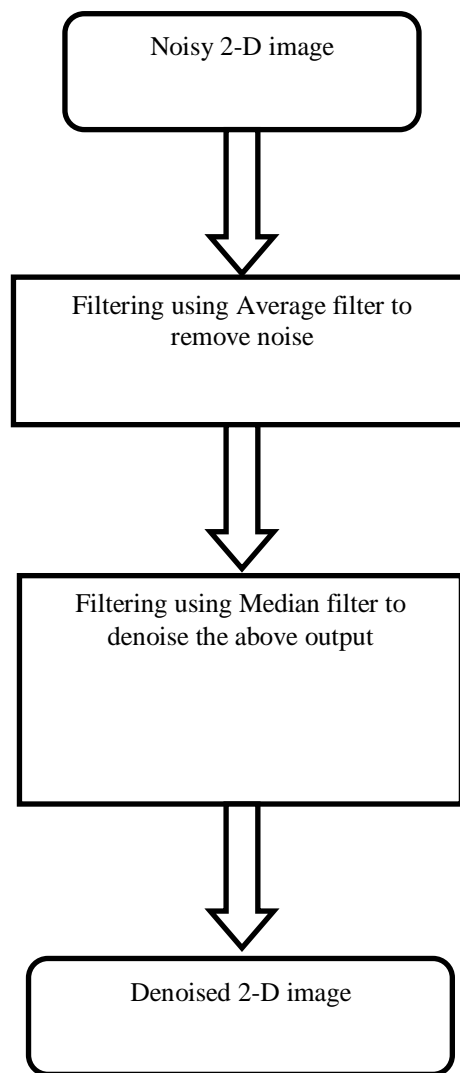


Figure-5: Block diagram representing the steps involved in denoising a noisy 2-D image



Step-1: Take a noisy 2-D image.

Figure 6. Noisy 2-D image

Step-2: Filter the noisy 2-D image using an averaging filter and display the result.

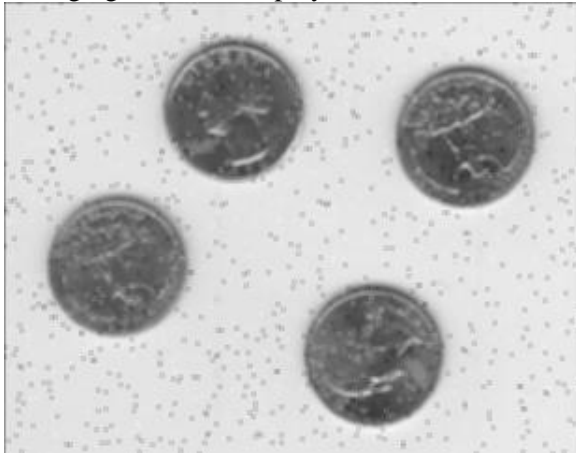


Figure 7. Filtering the noisy 2-D image

Step-3: Again filter the output of above process using median filter to denoise the noisy 2-D image in order to get denoised 2-D image.



Figure 8. Denoised 2-D image

### 3.2. Converting denoised 2-D image into 3-D image

Below block diagram narrates the steps involved in converting denoised 2-D image into a 3-D image.

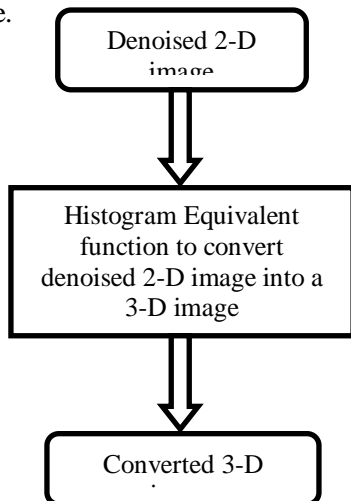


Figure-9: Block diagram to represent conversion of denoised 2-D image into a 3-D image

Step-1: Take denoised 2-D image



Figure-10: Denoised 2-D image

Step-2: Apply Histogram Equivalent function to convert denoised 2-D image into 3-D image.

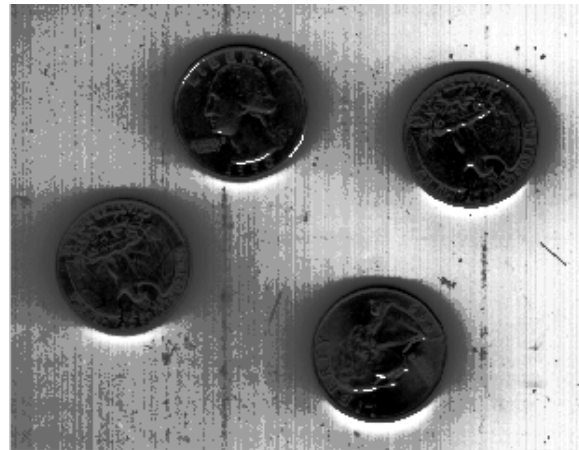
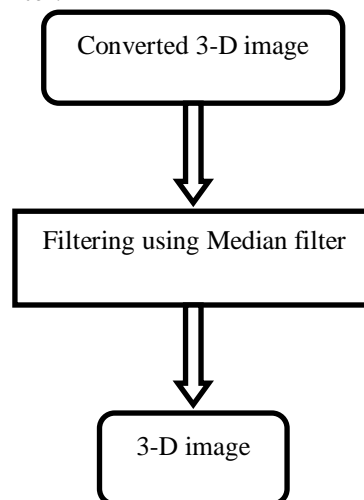


Figure 11. Converted 3-D image

### 3.3. Removing noise from converted 3-D image

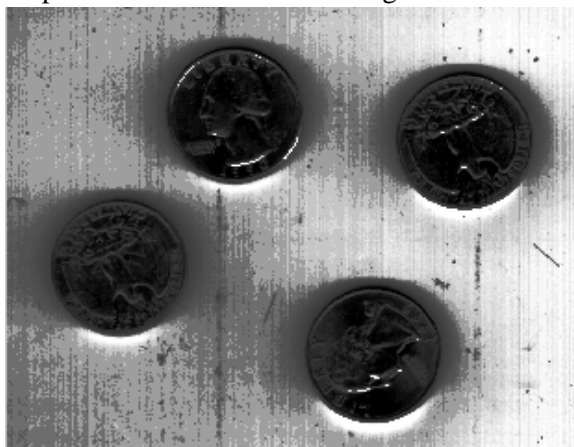
Since there will be some amount of noise, after the conversion of denoised 2-D image to 3-D image, we are filtering the 3-D image using Median filter.





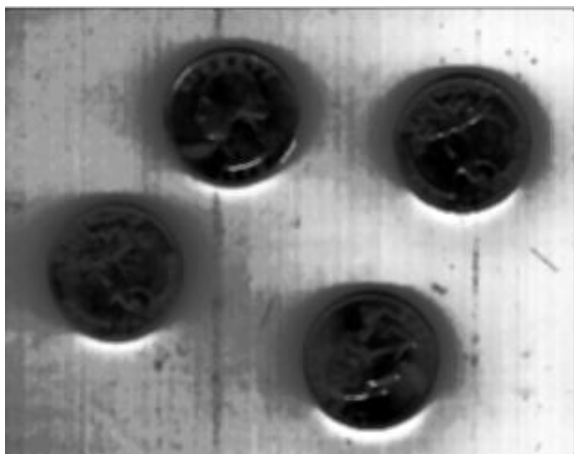
**Figure-12.** Block diagram to represent denoising 3-D image

Step-1: Take converted 3-D image.



**Figure-13.** Converted 3-D image

Step-2: denoise the 3-D image using Median filter.



**Figure 14.** Denoised 3-D image

#### 4. CONCLUSIONS

The main objective of this paper is converting of a noisy 2-D image into 3-D image using Histogram Equivalent function. It is a humble effort to convert 2-D image into 3-D image in a better way. Average and Median filters are very useful and simple filters to denoise a 2-D image. Median filter is also used to denoise 3-D image, which produce smoothing image. Histogram Equivalent function is a simple function to convert a 2-D image into a 3-D image. By using this, we can get a denoised 3-D image.

#### REFERENCES

[1] “A New Enhancement Approach for Enhancing Image of Digital Cameras by Changing the Contrast” by Dr. Muna F. Al-Samarai published in IJAST Vol. 32, July, 2011.

- [2] “An Alpha Rooting Based Hybrid Technique for Image Enhancement” by Arun R, Madhu S. Nair, R. Vrinthavani, Rao Tatavarti published in Advance Online Publication on 24th August 2011.
- [3] “2-D to 3-D conversion by learning depth from examples” by J. Kornad, Meng Wang, P. Ishwar published in CVPRW, 2012 IEEE International Conference.
- [4] “Adaptive 2D to 3D image conversion using a hybrid Graph Cuts and Random Walks approach” by M. Fawaz, R. Phan, R. Rzeszutek, D. Androutsos published in ICASSP, 2012 IEEE International Conference
- [5] [www.ece.cet.ac.in](http://www.ece.cet.ac.in)
- [6] [www.physicsclassroom.com](http://www.physicsclassroom.com)
- [7] [www.nhphotography.com](http://www.nhphotography.com)
- [8] [www.microscope-microscope.com](http://www.microscope-microscope.com)
- [9] [www.georeference.org](http://www.georeference.org)
- [10] A book, “Getting Started with MATLAB, A Quick Introduction for Scientists and Engineers”, by Rudra Pratap published by OXFORD University Press.

#### AUTHORS’ BIOGRAPHY



**Madhura Shivaraju** was born in Bangalore, Karnataka, India in 1986. She received M.Tech degree from the Department of ELECTRICAL AND ELECTRONICS,

MSRIT, Visveshwaraiya University in 2011. She is currently pursuing the Ph.D. degree at Department Of Electronics and Communication. Her research area includes Digital Signal Processing and Video/ Image processing.



**Dr Krishnappa Suresh** acquired his PhD degree from University (BDT) College of Engineering, Davanagere, Under Kuvempu university during March 2010. He has two Mater Degrees to his credit, one in Power System during

1985 and second in Digital Electronics and Communication Systems during 1989 both from University of Mysore. He is now Principal in SDM institute Of tecnology, Ujire , Karnataka.