

## 3 Results

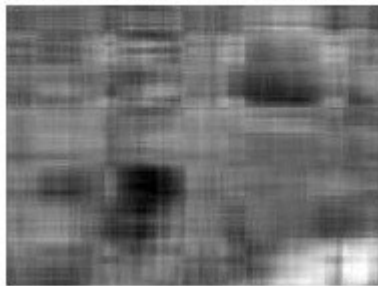
### 3.1 Figure 1



Original Image

#### 3.1.1 Eigen Value Decomposition

Image output using 5 eigen values



Error Image



Image output using 25 eigen values



Error Image



Image output using 45 eigen values



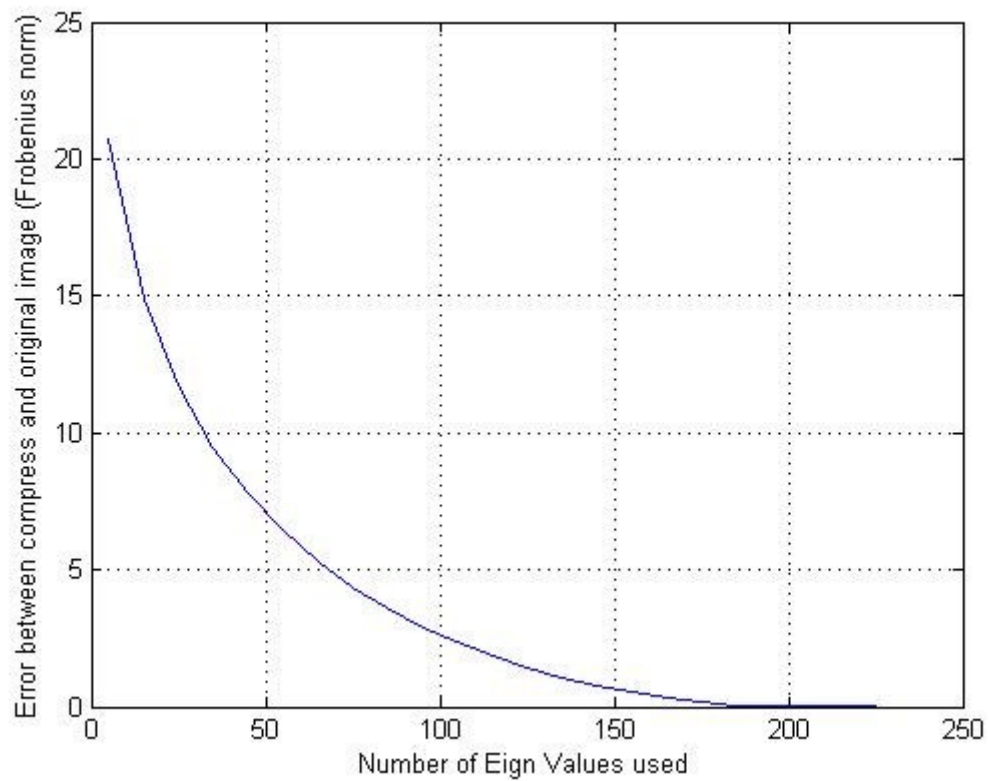
Error Image



Image output using 105 eigen values



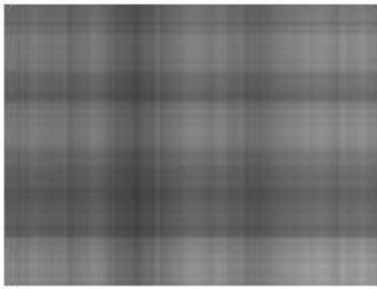
Error Image



As No: of Eigen Values Increases the Frobenius Error Reduces. At  $n = 180$  error become 0 approximately

### 3.1.1 Singular Value Decomposition

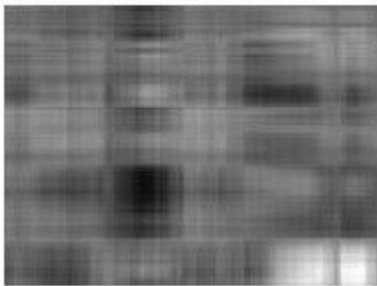
Image output using 1 singular values



Error Image



Image output using 3 singular values



Error Image



Image output using 55 singular values



Error Image

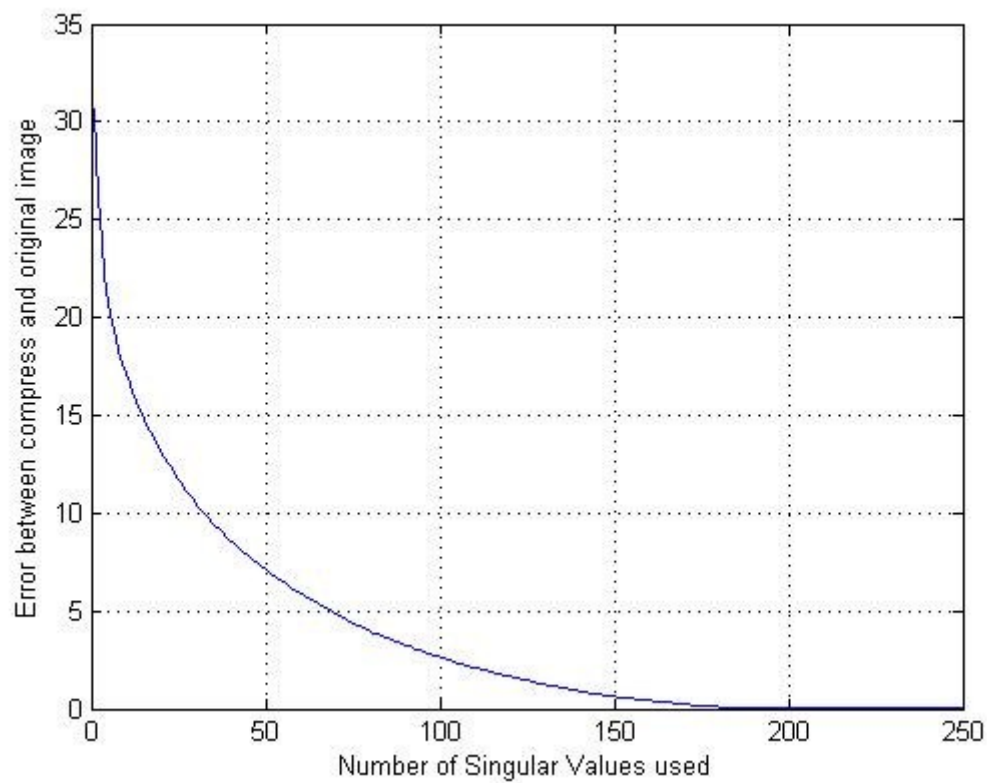


Image output using 105 singular values



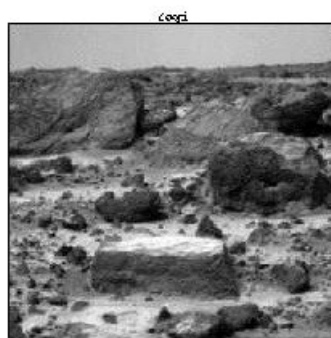
Error Image





As No: of Singular Values Increases the Frobenious Error Reduces. At  $n = 180$  error become 0 approximately . Singular Error for a given  $n$ , is approximately equal to Error for Eigen value decomposition.

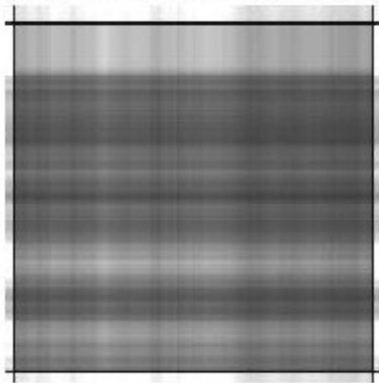
### 3.2 Figure 2



Original Image

### 3.1.1 Eigen Value Decomposition

Image output using 1 eigen values



Error Image

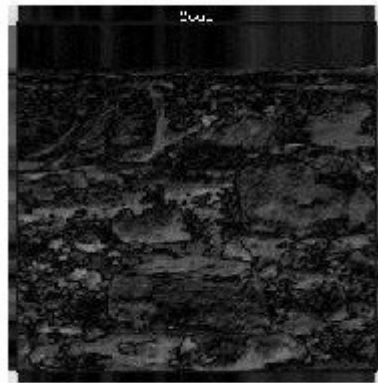
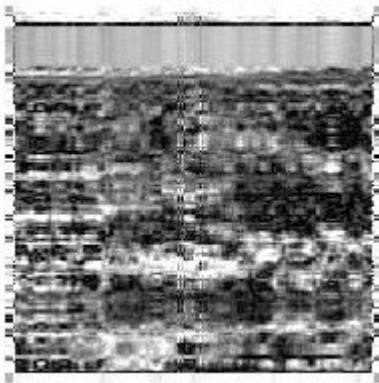


Image output using 16 eigen values



Error Image

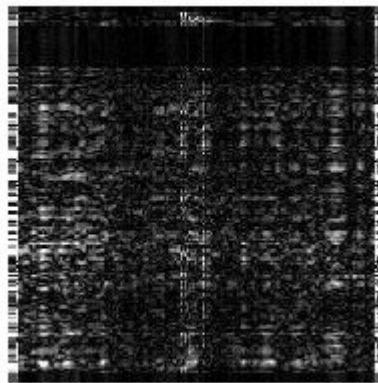


Image output using 76 eigen values



Error Image

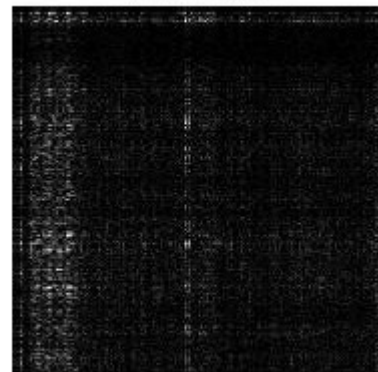
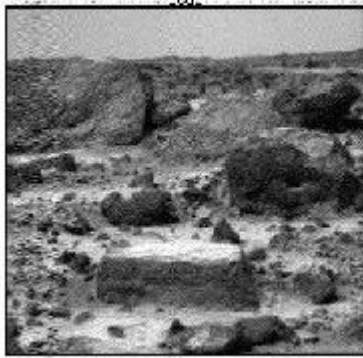
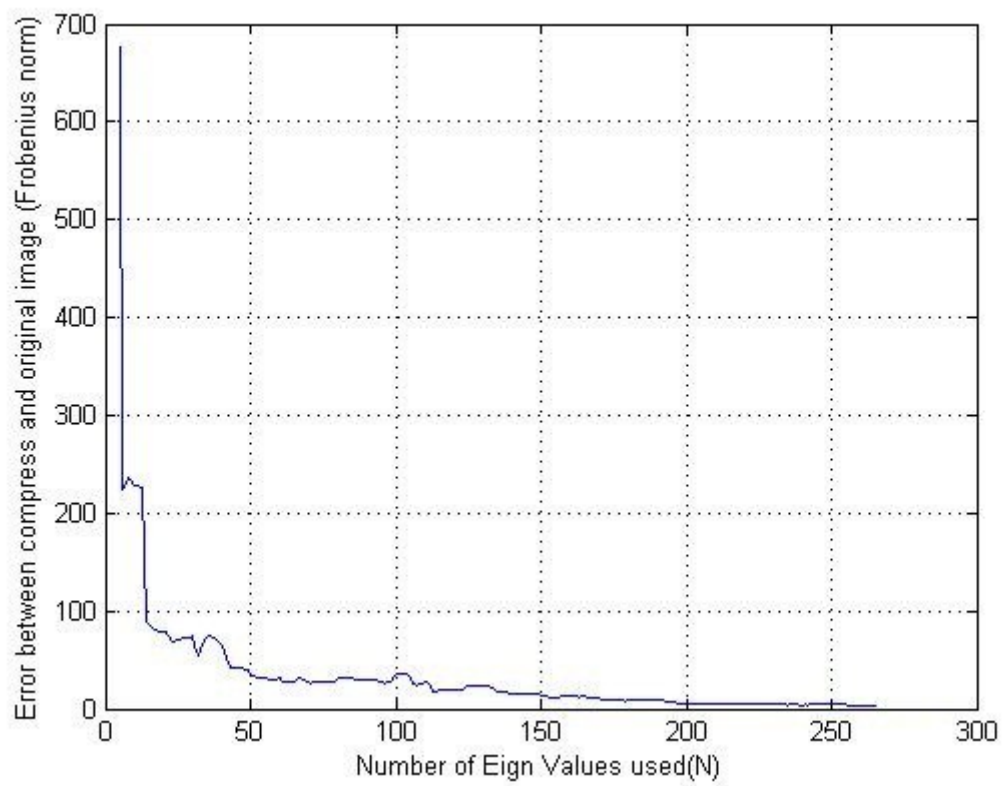
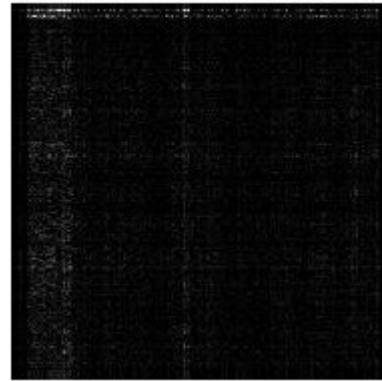


Image output using 140 eigen values



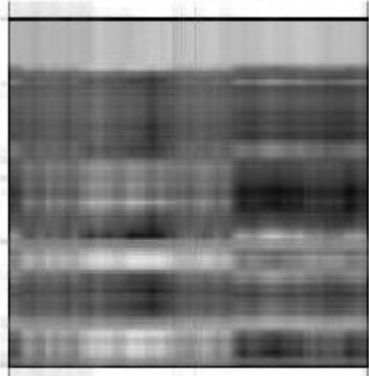
Error Image



As No: of Eigen Values Increases the Frobenious Error Reduces but not uniformly.

### 3.1.1 Singular Value Decomposition

Image output using 3 singular values



Error Image

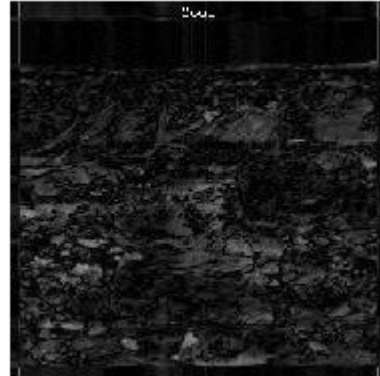
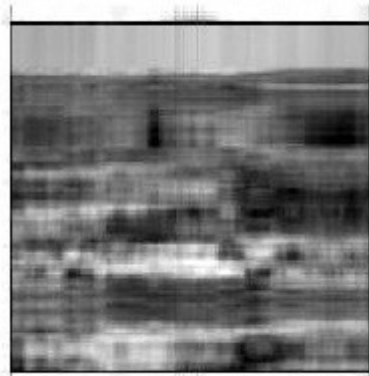


Image output using 7 singular values



Error Image

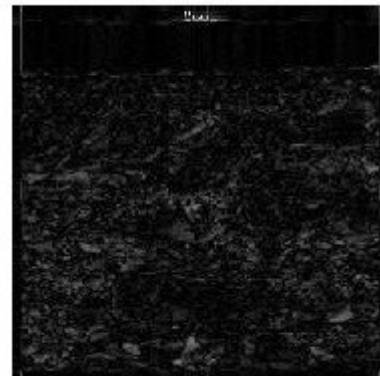
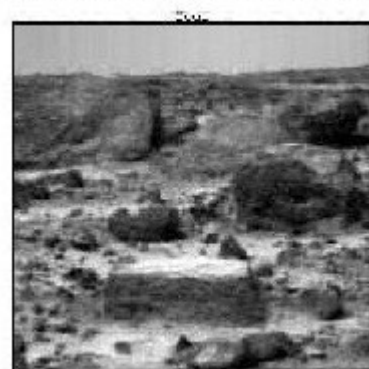


Image output using 35 singular values



Error Image

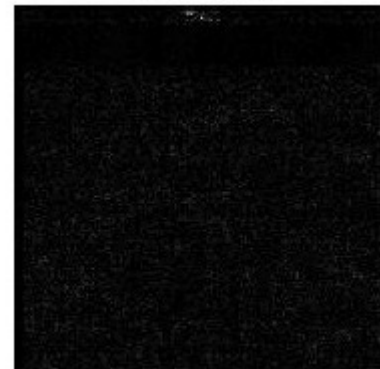
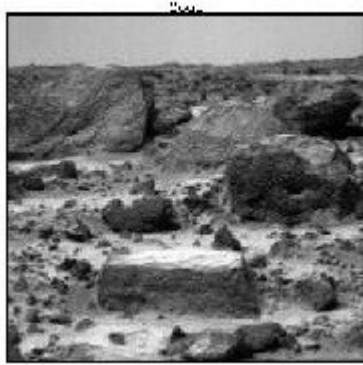




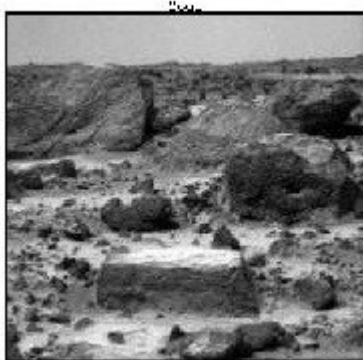
Image output using 85 singular values



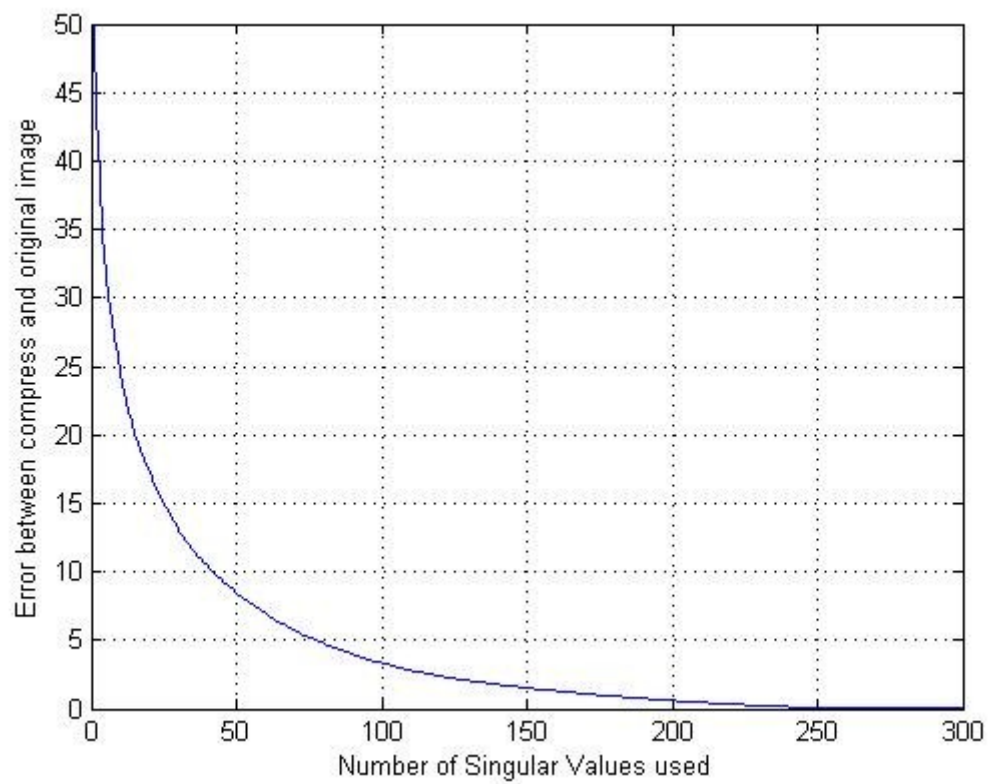
Error Image



Image output using 185 singular values



Error Image





As No: of Singular Values Increases the Frobenious Error Reduces. At  $n = 230$  error become 0 approximately .

### 3.2 Figure 3

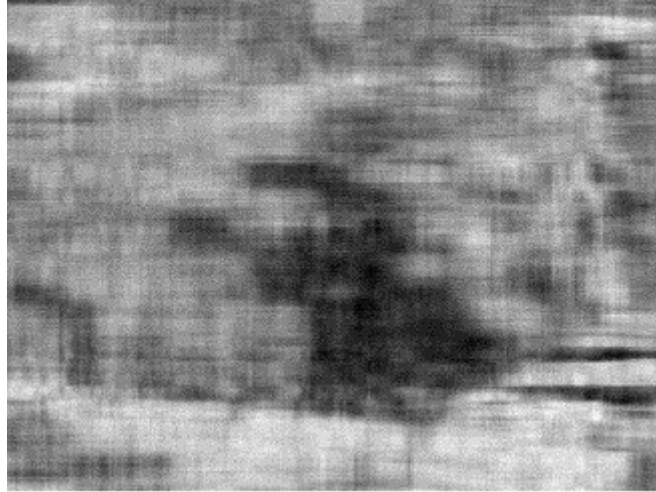


Original Image

Since size of Image is large, I reduce image to gray scale and Eigen value decomposition and Singular Value decomposition is done for Selected Values. Errors are also calculated but plotting is not done

### 3.1.1 Eigen Value Decomposition

Image output using 10 Eigen values



Error = 313.3213

Image output using 20 Eigen values



Error = 262.9781

Image output using 40 Eigen values



Error = 216.0367

### 3.1.1 Singular Value Decomposition

Image output using 10 Singular values (Error = 313.321)

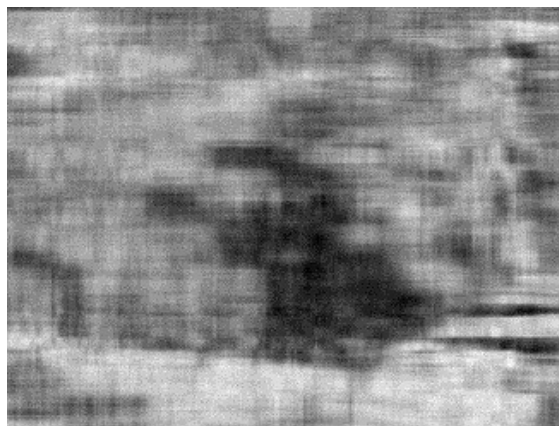


Image output using 20 Singular values (Error = 262.9781)



Image output using 80 Singular values (Error = 171.1420)



## 4 Inferences

Eigen Value decomposition and Singular Value Decomposition produce a large amount of data compression. Error between Compressed image and original image is more for smaller  $N$ , but as  $N$  increases error reduces exponentially.

For a given Image (Square) Singular Value Decomposition will provide finer image than Eigen Value Decomposition for a given  $N$ . More over Error curve of Singular Value decomposition is smoother than that of Eigen Value decomposition. Eigen Value decomposition curve has some local peaks.

For Non-Square Image Eigen Value decomposition of  $\mathbf{A}^T \mathbf{A}$  will give almost same error as Singular Value decomposition.