



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: IV Month of publication: April 2023

DOI: <https://doi.org/10.22214/ijraset.2023.49302>

www.ijraset.com

Call:  08813907089

E-mail ID: ijraset@gmail.com

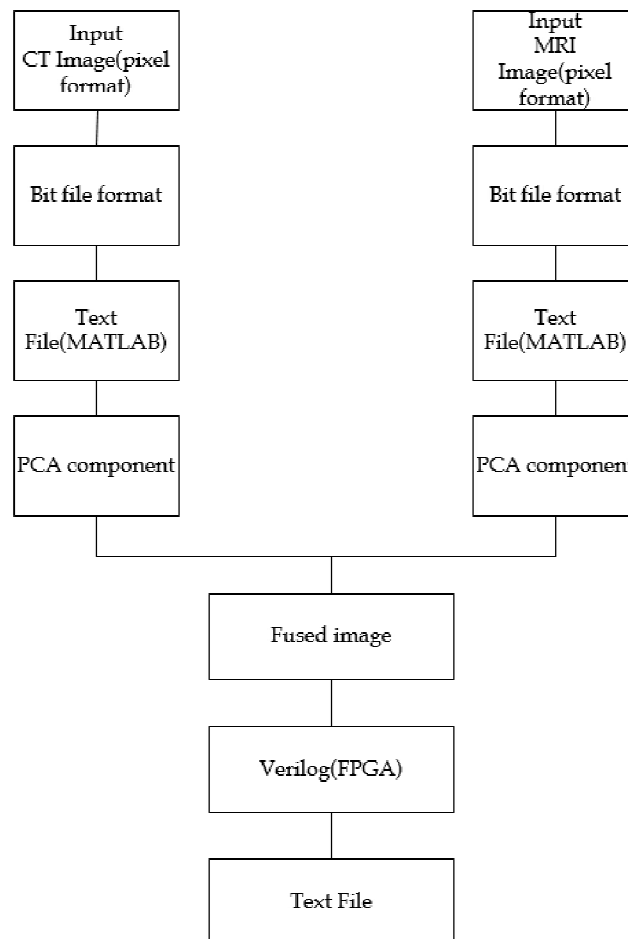
FPGA Implementation of Medical Image Fusion

P. Madhanraj¹, M. Jeshwanth Raj², Mrs Princy Magdaline P³

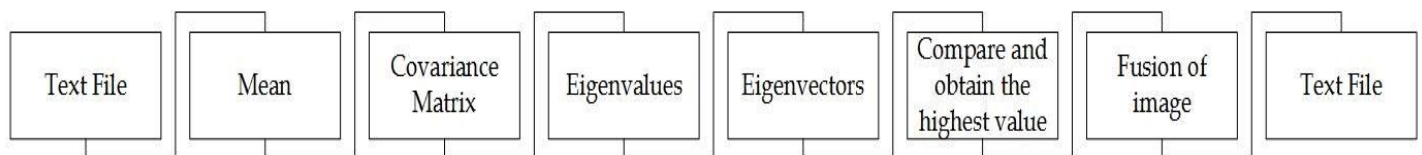
I. OBJECTIVE

- 1) To combine Computed Tomography(CT) and Magnetic Resonance Image(MRI)
- 2) To obtain clear images
- 3) To maintain the accuracy – PCA

II. BLOCK DIAGRAM



III. IMPLEMENTATION OF PCA ALGORITHM IN FPGA



IV. COVARIANCE MATRIX

- 1) To measure the amount of dependency between two variables.
- 2) A positive covariance - values are large.
- 3) A negative covariance - large values associated with small values.
- 4) Depends on the scale of the variable.

V. PROPOSED SYSTEM

Steps Involved In Obtaining Components Of Pca Algorithm

- 1) Covariance Matrix
- 2) Eigenvalues and Eigenvectors
- 3) Sorting and comparing the highest value obtained which contains most of the information
- 4) The Value is multiplied with the original image and added
- 5) The fused image will be obtained

VI. IMPLEMENTATION FLOW

- 1) Image – text file using Matlab

A. VERILOG

- 1) Text File – Hexadecimal values of image
- 2) Mean
- 3) hex values gives individual pixel intensity for entire image
- 4) Variance
- 5) to classify regions (i.e) variation between neighbouring pixels
- 6) Covariance
- 7) changes existing between neighbouring values
- 8) Output will be correlated values which reduce the dimensions of an image • In the form of a matrix

VII. IMPLEMENTATION FLOW (CONTD)

- 1) Eigenvectors
- 2) Direction of the new space
- 3) Eigenvalue
- 4) Magnitude of the new space
- 5) Sorting the eigenvalues and eigen vectors in descending order
- 6) Eigenvector with highest eigenvalue is significant • Contains the maximum information of the image
- 7) Image fusion
- 8) Highest value is multiplied with the original image
- 9) Original image is fused
- 10) Convert to text file
- 11) Values are converted to text
- 12) Output is verified in Matlab by converting the text file to an image

VIII. TOOLS REQUIRED

A. Software

- 1) Matlab
- 2) Xilinx ISE (Verilog)

B. Hardware

- 1) Spartan3 FPGA
- 2) PC

IX. APPLICATION

- 1) Medical Diagnosis
- 2) Clinical Application
- 3) Research analyse in image processing

Output

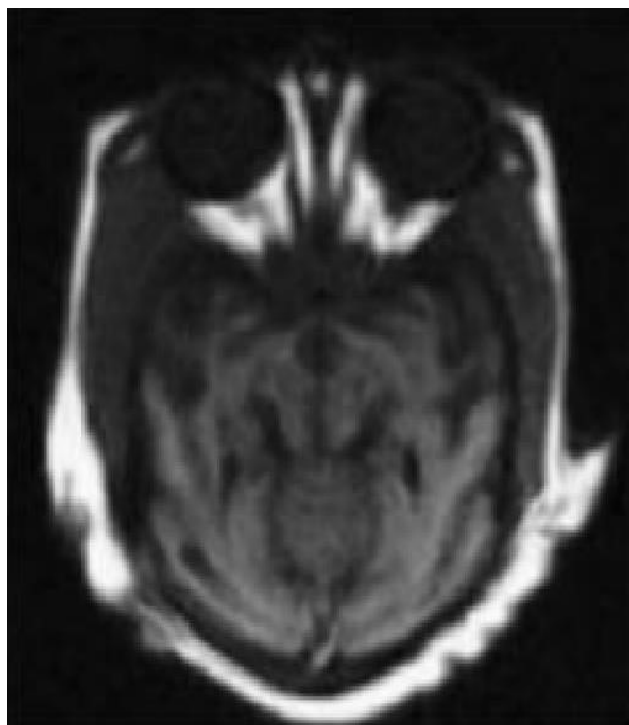
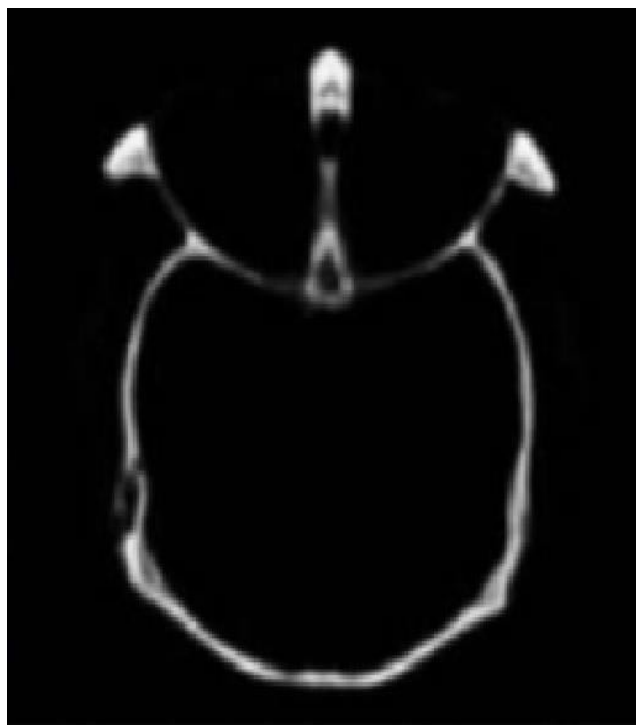


Figure 1: Input image (CT) Figure 2: Input image (MRI)

Figure 3: Output image (CT+MRI)

Output

Name	Value	1,005,455 ps	1,005,456 ps	1,005,457 ps	1,005,458 ps	1,005,459 ps	1,005,460 ps	1,005,461 ps	
[1,0:10]	[14460.0600	[14460.060000,14448.040000,14436.020000,14424.000000,14411.980000,14399.960000,14387.940000,14375.920000,14363.900000,14351.880000]	14448.030000	14436.020000	14424.010000	14412.000000	14399.990000	14387.980000	14375.970000
[2,0:10]	[14448.0300	[14448.030000,14436.020000,14424.010000,14412.000000,14399.990000,14387.980000,14375.970000,14363.960000,14351.950000,14339.940000]	14436.000000	14424.000000	14412.000000	14400.000000	14388.000000	14376.000000	14364.000000
[3,0:10]	[14436.0000	[14436.000000,14424.000000,14412.000000,14400.000000,14388.000000,14376.000000,14364.000000,14352.000000,14340.000000,14328.000000]	14423.970000	14411.980000	14399.990000	14388.000000	14376.010000	14364.020000	14352.030000
[4,0:10]	[14423.9700	[14423.970000,14411.980000,14399.990000,14388.000000,14376.010000,14364.020000,14352.030000,14340.040000,14328.050000,14316.060000]	14411.940000	14399.960000	14387.980000	14376.000000	14364.020000	14352.040000	14340.060000
[5,0:10]	[14411.9400	[14411.940000,14399.960000,14387.980000,14376.000000,14364.020000,14352.040000,14340.060000,14328.080000,14316.100000,14304.120000]	14399.910000	14387.940000	14375.970000	14364.000000	14352.030000	14340.060000	14328.090000
[6,0:10]	[14399.9100	[14399.910000,14387.940000,14375.970000,14364.000000,14352.030000,14340.060000,14328.090000,14316.120000,14304.140000,14292.160000]	14387.880000	14375.920000	14363.960000	14352.000000	14340.040000	14328.080000	14316.120000
[7,0:10]	[14387.8800	[14387.880000,14375.920000,14363.960000,14352.000000,14340.040000,14328.080000,14316.120000,14304.160000,14292.200000,14280.240000]	14375.850000	14363.900000	14351.950000	14340.000000	14328.050000	14316.100000	14304.150000
[8,0:10]	[14375.8500	[14375.850000,14363.900000,14351.950000,14340.000000,14328.050000,14316.100000,14304.150000,14292.200000,14280.240000,14268.280000]	14363.820000	14351.880000	14339.940000	14328.000000	14316.060000	14304.120000	14292.180000
[9,0:10]	[14363.8200	[14363.820000,14351.880000,14339.940000,14328.000000,14316.060000,14304.120000,14292.180000,14280.240000,14268.280000,14256.320000]	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]	
[10,0:10]	[0.000000,0	[0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000,0.000000]							
i[31:0]	000000000000								
j[31:0]	000000000000								
totala[31:0]	000000000000								
totalb[31:0]	000000000000								
meana	1204.000000								
meanb	1204.000000								



REFERENCES

- [1] C. T. Johnston, K. T. Gribbon, and D. G. Bailey, "Implementing image processing algorithms on FPGAs," in Proc. of Eleventh Electronics New Zealand Conference, Palmerston North, New Zealand, pp. 118–123, November 2004.
- [2] M. I. AlAli, K. M. Mhaidat, and I. A. Aljarrah, "Implementing image processing algorithms in FPGA hardware," in Proc. of Applied Electrical Engineering and Computing Technologies (AEECT), Amman, Jordan, pp. 1–5, December 2003.
- [3] A. E. Guzel, V. E. Levent, M. Tosun, M. A. Ozkan, T. Akgun, D. Buyukaydin, C. Erbas, and H. F. Ugurdag, "Using high-level synthesis for rapid design of video processing pipes," in Proc. of East– West Design & Test Symposium (EWDTS), Yerevan, Armenia, pp. 1–4, October 2016.
- [4] A. Cornu, S. Derrien, and D. Lavenier, "HLS tools for FPGA: faster development with better performance," in Proc. of International Conference on Reconfigurable Computing: Architectures, Tools and Applications, Belfast, UK, pp. 67–78, March 2011.
- [5] J. L. Bittner, M. T. Schill, F. Mohd-Zahid, and L. M. Blaha, "The effect of multispectral image fusion enhancement on human efficiency," *Cognitive Research*, vol. 2, pp. 1–18, March 2017.
- [6] A. Toet, M. A. Hogervorst, S. G. Nikolov, J. J. Lewis, T. D. Dixon, D. R. Bull, and C. N. Canagarajah, "Towards cognitive image fusion," *Information Fusion*, vol. 11, pp. 95–113, April 2010.
- [7] A. Toet, "Natural colour mapping for multiband nightvision imagery," *Information Fusion*, vol. 4, pp. 155–166, September 2003.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)