

PROF. BISWA NATH CHATTERJI,
 Flat No. - 78 CC/1, Anupama Housing Complex
 Phase-2, VIP Road, Kolkata-700052.
 Email – bnchatterji@gmail.com.

Date of Birth : November 10, 1942.

Present Position : Professor (Computer Science & Engineering)
 & Academic Advisor
 B.P.Poddar Institute of Management And
 Technology- !37 VIP Road, Kolkata-52

Academic Qualifications :

Sl. No.	Degree	Year	University/Institution
1.	B.Sc. 1 st Class 81% 3 rd rank	1961	Univ. of Allahabad
2.	B.Tech.(Hons) 85% 2 nd rank	1965	IIT Kharagpur
3.	Ph.D.	1970	IIT Kharagpur
4.	Post-Doctoral	1972-1973	Univ. of Erlangen,Germany

Positions Held (in chronological order) :

Sl. No.	University/Institution	Year	Position
1.	Telerad Pvt.Ltd.	1965	Asst. Development Engineer
2.	Central Electronics Engg. Research Inst. Pilani.	1965-1966	Senior Research Fellow
3.	IIT Kharagpur, Department of Electronics & Elect. Communication Engg.	1967-1970	Assoc. Lecturer
		1970-1973	Lecturer
		1973-1980	Asst. Professor
		1980-2005	Professor
		1987-1991	Head of the Department
4.	IIT Kharagpur	1994-1997	Dean of Academic Affairs
5.	IIT Kharagpur	1999-2001	Member of Board of Governors
6.	B.P.Poddar Institution of Management and Technology	2005- 2018	Dean (Academic Affairs)
7.	B.P.Poddar Institution of Management & Technology	2005- till date	Professor

Field of Specialization :

Electronics and Electronics Communication Engineering with Specialization in
 Image Processing, Computer Vision, Pattern Recognition and Current Interest

Content Based Image Retrieval, Watermarking, 3-D Image Processing, Neural Networks, Multimedia Image Processing, Medical Image Processing, Speech Processing.

Academic Honors :

1. Received the prestigious Shri Hari Om Ashram Prerit Dr. Vikram Sarabhai Award consisting of a medal and cash prize in the year 1983 for his achievement in the field of Electronics and Communication.
2. Received the prestigious National Crime Records Bureau's prize for his research papers in Fingerprint Related Techniques and Technologies for **three years 1990, 1991, 1992.**
3. Received Bharat Jyoti Award of India International Friendship Society in the year 2003 for his contributions in Electronics and Communication Engineering.
4. Received Certificate of Achievement of Indian Society for Technical Education and Larson & Turbo Ltd., Bombay for supervising best M.Tech thesis (II Prize) for the year 2003.
5. Received Best Citizens Award in the year 2004 by International Publishing House, New Delhi in recognition of exceptional caliber and outstanding performance in Electronics and Communication Engineering.
6. Received Rashtriya Gaurav Award of India International Society, New Delhi in the year 2004 for obtaining great excellence in Electronics and Communication Engineering.
7. Indian Conference on Vision Graphics and Image Processing (ICVGIP-2002), Ahmedabad arranged B.N.Chatterji lecture and honored him after completion of 60 years of age.
8. National Conference on Vision , Graphics and Image Processing, NVGIP-05 Shimoga, Karnataka, March 2-3, 2005, Felicitated Prof. B.N.Chatterji for his Research and Academic Contribution and arranged a special session in his honor.
9. IEEE International Conference on Signal and Image Processing, Hubli (7-9, Dec 2006)Facilitated Prof. B.N.Chatterji by presenting him Life Time Achievement Award in Signal and Image Processing.

10. Department of Electronics and Telecommunication Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, Maharashtra, organized Workshop on Texture Analysis and Applications on his 67th birthday on 10th Nov. 2009 in his honor where he was the key note speaker.
11. Department of Electronics and Communication Engineering of Jawaharlal Nehru University of Technology Kakinada honored Prof.B.N.Chatterji during their International Conference on Electronics and Communication Engineering at Vijaynagaram on July 29-30, 2016.
12. Prof.B.N.Chatterji was the Chief Guest & Guest of Honor of more than 50 National & International Conferences. He has delivered the Keynote addresses and Invited Lectures in more than 100 International & National Conferences.

Highlights of Major Academic Research Contributions :

Dr. Chatterji has significant research contributions in Pattern Recognition, Image Processing and Computer Vision. He has developed new techniques in Content Based Image Retrieval. He has developed new Rotation, Translation and Scale Invariant Image Matching Technique which is very widely referred even in slandered text books. He has worked extensively in Digital Watermarking and Cryptography for Image Security. He has original contribution in Wavelet Based Image Compression. He has developed a new method for Stereo Image Matching using Zernike Moments and Fuzzy set theory. He has worked extensively for the use of Neural Networks and Fuzzy Sets in 3-D Image Processing. He has original research contributions in Splines and Spline Transforms for Signal and Image Processing. He has given new Algorithms for Rotation and Scale Invariant Texture Classifications. He has developed Image Processing Transforms for Multiprocessor Architecture. He has found out new Algorithms for Segmentation and Classification of Range Images. He has very significant research contributions in Level Sets for Low Level Vision and Image Segmentation. He has worked extensively for Metallographic Image analysis and Synthesis. He has done a significant research work or Medial Axis and Medial Sphere Representation of 3-D Images.

His work on Paths and Distances in Digital Geometry is original and has tremendous potential for solving Complex Multi-Dimensional Pattern Recognition Problems. He has introduced novel concept of De-enhancement and Forced Enhancement and has developed Adaptive Generalized Spatial Domain Techniques for Image Enhancement. He is one of the first workers of 3-D Image Analysis. He has utilized Abstract Mathematics, Fuzzy Similarity, Splines and Viterbi Algorithm and is the first Scientist to work for the Recognition of Oriya and Kannada Characters. He has used the Pattern Recognition Concept for the

Identification of Distributed Parameter Systems. His work on Data Reduction Algorithm, Recursive Digital Filters, Microprocessors Based System for Scanner and ECG Signal Recognition is significant R & D contribution in Pattern Recognition. He has contributed in the use of Wavelet, Curvelet, Contourlet and other transforms for Image Processing. He was one of the first few Scientist to use successfully the concept of Stochastic Resonance for various Image Processing Algorithms. He has significant research contributions in Medical Image Processing. Dr. Chatterji has published about 280 papers in Journals and Conference Proceedings. He has worked as chief Investigators of 24 Sponsored Projects. He has supervised 50 Doctoral, about 150 M.Tech and about 300 B.Tech theses.

Dr. Chatterji has more than 50 years of experience of teaching various undergraduate / postgraduate subjects like Basic Electronics, Linear Electronics, Digital Electronics, Control Systems, Signal Processing, System Identification, Optimal Control, Adaptive Control, Industrial Electronics, Pattern Recognition, Image Processing, Computer Vision, Neural Networks, Microprocessor, Introduction to Computers, Computer Technology and Medical Electronics at IIT Kharagpur and BPPIMT, Kolkata. He has introduced some of these subjects in the Curricula and Syllabi of IIT Kharagpur. He has introduced the M.Tech course on Automation and Computer Vision at IIT Kharagpur and is the key person for setting up the Laboratories like (i) Image Processing and (ii) Computer Vision.

Membership of Professional Societies :

Fellow of the Institution of Engineers
Fellow of the Institution of Electronics and Telecommunication Engineers.
Life Member of Indian Society for Technical Education.
Life Member Indian Unit of Pattern Recognition and Artificial Intelligence.
Member Indian Society of Fuzzy Mathematics and Image Processing.

Publications (Vide annexure-I)

(a)	In Referred Journal	130
(b)	In Conferences with Proceedings	150
	Books	- 4
	Books Chapters	- 8

Research Projects Coordinated and the Name of the Sponsoring Body (Vide Annexure II)

Total - 24

Doctoral (PhD) Thesis Supervised:

Total number of Doctoral Thesis - 50

Number of Scholars working for PhD degree at present - 7

Awards Received by Some of the Doctoral Students of Prof.B.N.Chatterji on the Basis of their PhD work

1. Dr. P.P.Das - INSA (Indian National Science Academy) Young Scientist Award, 1991, IASC Young Assoc., UGC Young Teacher Award, INAE young Engineer, UNESCO/ROSTSCA Young Scientist.
2. Dr. B.Mehtre - National Crime Records Bureau Prize, 1992.
3. Dr. J.Mukhopadhyay - INSA (Indian National Science Academy) Young Scientist Award, 1993.
4. Dr. B.K.Das - INSE (Indian National academy of Engineers) Young Scientist Award, 1997. Orissa Vigyan Academy Award 1998, National Research & Development Award 2000.
5. Dr. S.Mahapatra - Orissa Vigyan Academy Award, 2002.
6. Dr. R.K.Jha - Indian Society for Technical Education and Larsen & Turbo Ltd., Bombay National Award for best M.Tech thesis (ii prize) in the year 2003. ISTE Award for supervising best M.Tech thesis (Electical & Electronic Engg.), 2012. Dr Jha has received the Sir Visvesvarya Young Faculty Research Fellowship for five years in 2017.
7. Dr. M.Kokare – AICTE Career Research Award for Young Teacher in Image and Signal Processing-2005.
8. Dr. Rabi Mahapatra, Indo-US Young Scientist Award 1995, IEEE Computer Society's Distinguished Visitor Award 2005-2007.
9. Dr. Rutuparna Panda, Gold Medal of Institution of Engineer's (India) Orissa Centre, 1997, Rastriya Ratna Award of India International Society for Unity, Delhi, 2001.
10. Many Ex Doctoral Scholars of Prof B.N.Chatterji are Fellows of National Academia like INSA, INAE etc. as well as State Academy of Science & Technology of India.
11. A large numbers of Indian & US patents were awarded to several Ex Doctoral Scholars of Prof.B.N.Chatterji.

Short Term Course Organized :

Number of Short Term Course Coordinated for Engineering College Teachers and Industry Engineers – 30.

Conferences Organized :

Number of International Conferences Organized as chairman – 3.

Number of National Conferences Organized as Chairman – 10.
Number of Advisory / Program / Organizing Committees – More than 100.

ANNEXURE I

LIST OF SOME PUBLICATIONS OF PROF. BISWA NATH CHATTERJI

A) Some of the JOURNAL PUBLICATIONS

- 1.M Saha, M.K.Naskar and B.N.Chatterji, `Darier Disease-A Genetic Disorder Detection in the light of Computer Vision`, International Journal of Enhanced Research in Science,Technology & Engineering, Vol.5, No.2, p-149-155, Feb.2016.
- 2.Tapas Bandopadhyay, B.Bandopadhyay, and B.N.Chatterji, `Security of Images through Secret Coding in Bit Plane Watermarking and Encryption`, Wulfenia Journal, Vol.22, No.9, p-214-222, 2015.
- 3.M.Saha,M.K.Naskar and B.N.Chatterji,`Soft,Hard and Block Thresholding Techniques for Denoising of Mammogram Images` IETE Journal of Research,Vol.61,No.2,p-186-191,Feb.2015.
- 4.Rajib Kumar Jha, P.K.Biswas and B.N.Chatterji, `Contrast Enhancement of Dark Images Using Stochastic Resonance` Journal of IET Image processing, Vol.6, No.3,p-230-237,2013.
- 5.Tapas bandopadhyay,, B.Bandopadhyay and B.N.Chatterji, `Attacks on Digital Watermarked Images in the Internet Environment and their Counter Measures`, International journal of Advanced Research in Computer science,Vol.4, No.4, p-155-159,2013.
- 6.Tapas Bandopadhyay, B.Bandopadhyay and B.N.Chatterji, `Image Security through Combined Watermarking and Encryption Techniques`, International Journal of Electronics and Communication, Vol.1, No.1,p1-7, 2013.
- 7.Tapas Bandopadhyay, B.Bandopadhyay and B.N.Chatterji,`Image Security through DWT and SVD based Watermarking and Masking with Encryption`, Internatonal Journal of Recent development in Engineering and Technology, Vol.1, No.1, p-6-11, 2013.
- 8.Tapas Bandopadhyay, B.Bandopadhyay and B.N.Chatterji, `Secure Image Encryption Through Key Hashing and Wavelet transform Techniques`, International Journal of Emerging Technology and Advanced engineering, Vol.2, No.2, p-26-31, 2012.

9. Tapas bandopadhyay, B. Bandopadhyay and B.N. Chatterji, 'Image Security through SVD based Robust Watermarking and Compression Techniques', International Journal of Emerging Trends and Technology in Computer Science (IJETTCS), Vol.1, No.3, p-160-165, 2012.

10. Rajib Kumar Jha, P.K. Biswas, B. Gupta, D. Mishra and B.N. Chatterji, 'Logo Extraction Using Combined Discrete Wavelet Transform and Dynamic stochastic Resonance' International journal on Image and Graphics, World Scientific, 2012.

11. Rajib Kumar Jha, P.K. Biswas and B.N. Chatterji, 'Image Segmentation Using Suprathreshold Stochastic Resonance' International Journal of Signal Processing, World Academy of Science and Engineering, Vol.72, pp.695-709, 2010.

12. Rajib Kumar Jha, P.K. Biswas, B.N. Chatterji and S. Shrivastav, 'Logo Detection Using Combined Discrete Wavelet Transform and Dynamic Stochastic Resonance' Journal of Signal, Image and Video Processing, Springer, 2010.

13. Ambar Dutta, B.N. Chatterji and Avijit Kar, 'Fuzzy Set Theoretic Approach to Image Thresholding', International Journal of Computer Science and Engineering, Vol.11, No.6, Dec.2011.

14. Ambar Dutta, Avijit Kar and B.N. Chatterji, 'A New Approach to Corner Matching from Image Sequence using Fuzzy Similarity Index', Pattern Recognition Letters, Vol.32, No.5, p-712-720, April 2011.

15. Ambar Dutta, B.N. Chatterji and Avijit Kar, 'Adaptive Corner Detection Algorithm and its Extension using Window-based Approach for Gray Scale Images', IETE Journal of Research, Vol.57, No.3, p-286-293, May 2011.

16. Ambar Dutta, B.N. Chatterji and Avijit Kar, 'A Two Stage Approach to Corner Matching using Fuzzy Similarity Measure', International Journal on Information Processing, Vol.4, No.3, p1-8, 2010.

17. S. Dutta, A. Kar, N.C. Mohanti and B.N. Chatterji, 'Network Security Using Biometric and Cryptography', Advanced Concepts For Intelligent Vision systems, Lecture Notes on Computer Science, Springer, Berlin-Hydelberg, LNS559, pp38-44, 2008.

18. Ambar Dutta, B.N. Chatterji and Avijit Kar., 'Comparing and Evaluating Intensity Based Spatial Domain Corner Detectors', International Journal of Information Processing, Vol.2, No.4, 2008

19. Ambar Dutta, B.N. Chatterji and Avijit Kar, 'Corner Detection Algorithms in digital images in last three decades', IETE Technical Review, Vol 25, No.3, pp. 123-134, May-June 2008.

20. S.Srinivas Kumar, B.C.Mohan and B.N.Chatterji, 'A Robust Digital Watermarking Scheme Using Singular Value Decomposition (SVD), Dither Quantization and Edge Detection', Signal and Image Processing, Jan.2008.
21. Ch Srinivas Rao, S.Srinivaskumar and B.N.Chatterji, 'Content Based Image Retrieval Using Contourlet Transform', ICGST-GVIP, Vol 7, No-3, pp. 9-15, Nov 2007.
22. K.Veerawamy, S.Srinivaskumar and B.N.Chatterji, 'Lossless Image Compression Using Topological Pixel Re-ordering and Switched Predictor', IETE Journal of Research, Vol 53, No. 6, pp. 505-512, Nov-Dec, 2007.
23. K.Veerawamy, S.Srinivaskumar and B.N.Chatterji, 'Designing Quantization Table for Hadamard Transform Based on Human Visual System for Image Compression', ICGST-GVIP, Vol 7, pp. 31-38, Nov 2007.
24. Ivy Majumdar, Avijit Kar, B.N.Chatterji, 'Texture Feature Matching Methods for Content Based Image Retrieval', IETE Technical Review, Vol 24, No.4, pp. 257, July-August 2007.
25. Manesh Kokare, P.K. Biswas and B.N. Chatterji, 'Texture Image Retrieval Using Rotated Complex Wavelet filters', Pattern Recognition Letters, Vol 28, pp. 1240-1249, March 2007
26. B.C.Mohan, S.S.Kumar and B.N.Chatterji, 'A Robust Digital Image Watermarking Scheme Using Singular Value Decomposition (SVD), Dither Quantization and Edge Detection', ICGST Graphics Vision and Image Processing (GVIP), Vol 8, No. 2, pp. 17-23, 2007.
27. Manesh Kokare, P.K. Biswas and B.N. Chatterji, 'Rotation-Invariant Texture Image Retrieval Using Rotated Complex Wavelet filters', IEEE Trans on Systems, Man and Cybernetics, Part B : Cybernetics, Vol 36, No:6, pp. 1273-1282, Dec 2006.
28. Manesh Kokare, P.K. Biswas and B.N. Chatterji, 'Texture Image Retrieval Using New Rotated Complex Wavelet Filters', IEEE Trans on Systems, Man and Cybernetics, Part B : Cybernetics, Vol 35, No:6, pp. 1168-1178, Dec 2005
29. Manesh Kokare, P.K. Biswas and B.N. Chatterji, 'Cosine Modulated Wavelet Packet Based Texture Features Content Based Image Retrieval', IETE Journal of Research, Vol 51, pp. 477, Nov-Dec, 2005.
30. A. Adhipathi Reddy and B.N. Chatterji, 'A New Wavelet Based Logo Watermarking Scheme', Pattern Recognition Letters, Nov. 2004.
31. S. Srinivas Kumar and B.N. Chatterji, 'Robust Similarity Measures for Stereo Correspondence', Journal of IE(India), CP, Vol. 85, pp.44-51, Nov. 2004.

32. Manesh Kokare, B.N. Chatterji and P.K. Biswas, 'Cosine Modulated Wavelet Based Texture Feature for Content Based Image Retrieval', Pattern Recognition Letters, Vol.25(4), p 391-398, Mar 2004.
33. S. Srinivas Kumar and B.N. Chatterji, 'Two-Frame Stereo Matching Algorithms — A Review', IETE Journal of Research, vol. 50(1), p 49-62, Jan. 2004.
34. A. Adhipathi Reddy and B.N. Chatterji, 'Texture Image Compression using Tree Structure Wavelet Transform', IETE Journal of Research, vol.50(1), p 63-68, Jan. 2004.
35. Ramchandra Manthalkar, P.K. Biswas and B.N. Chatterji, 'Rotation and Scale Invariant Texture Features using Discrete Wavelet Packet Transform', Pattern Recognition Letters, vol. 24, p 2455- 2462, Oct.2003.
36. Ramchandra Manthalkar, P.K. Biswas and B.N. Chatterji, 'Rotation Invariant Texture Classification using Even Symmetric Gabor Filters', Pattern Recognition Letters, vol.24, pp. 2061- 2068, 2003.
37. S. Srinivas Kumar and B.N. Chatterji, 'Stereo Matching Algorithms Based on Fuzzy Approach', International Journal on Pattern Recognition and Artificial Intelligence, vol. 16, No.7, pp. 883- 899, 2002.
38. Manesh Kokare, B.N. Chatterji and P.K. Biswas, 'A Survey On Current Content Based Image Retrieval Methods', IETE Journal of Research, vol. 48, No. 3&4, pp. 261-271, May-Aug 2002.
39. S. Kulkarni and B.N. Chatterji, 'Anisotropic Diffusion in Image Processing', IETE Journal on Research, vol.48, No. 3&4, pp. 171-180, May-Aug. 2002.
40. J.Mukherjee, PPDas, M.Aswatha Kumar & Chatterji,B.N. 'Use of Medial Axis Transforms for Computing normals at Boundary points` Pattern Recognition Letters, Vol23, No 14, p1649-1656, 2002.
41. B.N. Chatterji and S.Kulkarni, 'Accurate Shape Modelling With Front Propagation Using Adaptive Level Sets', Pattern Recognition Letters, 23, 1559-1568, 2002.
- 42 B.N. Chatterji and R. Panda, 'Least Squares Generalized B-Spline Signal/Image Processing', Signal Processing, 81(10), 2005-2017, Sep/Oct 2001.
43. B.N. Chatterji and R. Panda, 'Wavelet Decomposition using Fast Recursive Generalized hR Filters', IETE Journal on Research, 47(3&\$), 137-139, Aug. 2001.

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46. Mukherjee, J., Aswatha Kumar, M., Chatterji, B.N. and Das, P.P., 'Discrete Shading of Three — Dimensional Objects From Medial Axis Transform, Pattern Recognition Letters', Vol. 20, 1999 pp., 1533-1544.
47. Panda, R. and Chatterji, B.N., 'B-Spline Signal Processing using Harmonic Basis Function, Signal Processing', Vol. 72, No. 3, 1999, pp. 147-166.
48. Patra, J.C., Pal, R.N. and Chatterji, B.N., 'Identification of Nonlinear Dynamic Systems using Functional Link Artificial Neural Networks', IEEE Trans. Systems, Man and Cybernatics, vol 29, No. 2, 1999, pp. 254-262.
49. Mahapatra, S., Mahapatra, R.N. and Chatterji B.N., 'Mapping of Neural Network Models onto Massively Hierarchical Computer Systems', Journal of Systems Architecture, vol. 45, No. 10, 1999, pp. 919-929.
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51. Panda, R. and Chatterji, B.N., 'The L² Polynomial Spline Wavelet Transform: A Signal and Image Processing Prospective', IETE Technical Review, vol 15, No. 3, 1998, pp. 153-164.
52. Panda, R. and Chatterji, B.N., 'Unsupervised Texture Segmentation Using Tuned Filters In Garborian Space', Pattern Recognition Letters, vol. 18, 1997, pp. 445-453.
53. Rastogi, A.K., Chatterji, B.N. and Ray, A.K., 'Design of a Real-Time Tracking System for Fast Moving Objects', IETE Journal of Research, vol.43, No. 5, 1997, pp. 359-370.
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66. Biswas P.K., Biswas S.S. and Chatterji. B.N., An SIMD Algorithm for Range Image Segmentation, Pattern Recognition, vol. 28, no. 2, 1995, pp. 255-267.
67. Mukherji, D. and Chatterji. B.N., Adaptive Neighbourhood Extended Contrast Enhancement and its Modification. Computer Vision and Image Processing, vol. 57, no. 2, March 1995, pp. 1-12.

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83. Das, P.P., Mukherjee J. and Chatterji, B.N., The t-cost Distance in Digital Geometry, Information Sciences, 1991, vol. 59, no. 1, pp. 1-20.
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ANNEXURE-II

SPONSORED / CONSULTANCY PROJECTS COMPLETED BY

PROF. BISWA NATH CHATTERJI

1 Technology for Engineering Critical Assesment — Planning Commission Project Costing Rupees 15 Crores by ten organ igations in network mode namely

National Metallurgical Laboratory Jamshedpur, Central Glass and Ceramic Research Institute Kolkata, Central Mechanical Engineering Research Institute Durgapur, Regional Research Laboratory Bhopal, Central Building Research Institute Roorkee, Central Road Research Institute Delhi, Structural Engineering Research Centre Chennai, I.I.T. Kharagpur (B.N. Chatterji) and IGCAR Kalpakkam (2004-2009).

2 Digital Watermarked Based Cryptography, Bharat Electronics Limited Bangalore (2004-2005). Project Cost Rs 2.2 lakhs.

3 Development of Speaker verification software for single to three registrad users, Indian Space Research Organization, Bangalore (2003 to 2006)— Project cost 10.833 lakhs.

4 Digital Watermarking for Wavelet Based Compressed Images, Bharat Electronics Limited Bangalore (2003-2004) — Project cost Rs. 2.8 lakhs.

5 Wavelet Based Image Compression for Multimedia Applications, Bharat Electronics Limited, Bangalore (2001-2002) — Project Cost Rs. 3.6 lakhs.

6 Development of Video Data Analysis System sponsored by Interim Test Range, Chandipur (1998-2000). — Project cost Rs. 24.7 lakhs.

7 Design and Development of Fuzzy Analysis System Sponsored by Intel Corp. U.S.A. (1998-2004). Project Cost US \$ 50000.

8 Development of Video Codec using Model - Based Techniques Sponsored by Intel Corp. U.S.A. (1998-2000). Project Cost US \$ 59300.

9 Development of Video Codec using Wavelet Transform Techniques Sponsored by Intel Corp. U.S.A. (1998-2000). Project Cost US S 60000.

10 Feasibility Studies for Indigenization of Electro optical Tracking System at ITR Chandipur. (1996-98)— Project cost Rs. 9.5 lakhs.

11. Scene Correlation Area Navigation (Feature Based Real Time Image Matching) sponsored by Research Centre Imarat Hyderabad (1993-96). — Project Cost Rs. 20 lakhs.

12. Finger Print Classification and Recognition Computer Maintenance Corporation Hyderabad (1992-93)

13. Automatic Control of Steel Sheet Flatness / Bowness on Continuous Electroplating Line — The Tinplate Co. of India Ltd. Jamshedpur(1990-91).

14. Interpretation of Industrial Scenes sponsored by DRDO New Delhi. Project Cost — Rs. 40 lakhs. (1987-90)
15. Digital Picture Processing Phase II (Analysis of 3D images) sponsored by DRDO New Delhi. Project Cost Rs. 20 lakhs (1987-89).
16. Digital Picture Processing Phase I (Analysis of Static and Dynamic scenes) sponsored by DRDO New Delhi. Project Cost Rs. 25 lakhs (1984-87).
17. Path and Distance in Digital Geometry sponsored by CSIR New Delhi 1986-89. Project cost Rs 2 lakhs.
18. 3D Object Recognition sponsored by CSIR New Delhi 1987-90 Project Cost Rs 2 lakhs.
19. Dynamic Scene Analysis sponsored by CSIR New Delhi 1989-92. Project Cost Rs 2 lakhs.
20. Magnetic Anomaly Detection sponsored by DRDO New Delhi 1978-83. Project cost Rs. 10 lakhs.
21. Manpower Training and Research in the Area of Digital Image Processing sponsored by Department of Electronics New Delhi 1977-80. Project Cost Rs 8 lakhs.
22. Pattern Recognition and Image Processing sponsored by Department of Science and Technology New Delhi 1977-1980 — Project cost Rs. 8 lakhs.
23. Data Reduction Sponsored by Department of Electronics New Delhi 1975-76. Project cost Rs. 1.5 lakhs.
24. Block Diagram Simulation Language sponsored by Department of Electronics New Delhi 1974-76. Project cost Rs. 2 lakhs.