

TECHNICAL QUALIFICATIONS STATEMENTS

Dr. Brian Prasad

Brian Prasad is the Visiting Professor at California Institute of Technology (Caltech), Pasadena, author of several books, and editor-in-chief of the most premier multidisciplinary Int. J. of Concurrent Engineering: Research & Applications. He is a senior executive consultant (UGS), chief technology officer (Spec2Market) and on the Board of Advisors to many large fortune 500 companies including AIAA, GM/EDS, Delphi, GE and UGS. He has secured and managed large funded research projects in multidisciplinary optimization fields from many (Government and Private) sources. He is a syndicated columnist for publications including Advances in Concurrent Engineering, Structural Optimization, and Industrial Knowledge Management, and taught at UCI and California State University Fullerton, School of Engineering. He holds many adjunct faculty positions at Oakland University, Rochester; Wayne State University, Detroit; West Virginia University, Morgantown; to list a few. During 2001, Dr. Prasad served as the Director of the Engineering, Information Technology and Sciences Department- a Multidisciplinary Unit of the University of California at Irvine Extension (UNEX), CA where he managed over \$5M Corporate Training business. He was an **Adjunct Professor** of Mechanical & Aerospace Engineering at West Virginia University, Morgantown, WV. He also taught at Wayne State University, California Institute of Technology, Pasadena, and Oakland University, MI.

Until December of 2000, Dr. Prasad was the *Director, a Multidisciplinary Optimization Product Business Unit (called Knowledge-based Engineering) at Electronic Data Systems (previously Unigraphics Solutions (UGS)) in California, USA where he was in charge of \$20M business. Before joining EDS/UGS in 1998, he was the Principal Consultant and Director of Product Optimization Services at Electronic Data Systems (EDS) (an ex-subsiary of General Motors), where he was in charge of Life-cycle Optimization consulting Group since 1985. Dr. Prasad's research interests include: Multidisciplinary Structural Optimization, Mathematical Programming, Structural analysis and aerodynamics structures controls interaction in an optimization environment, Knowledge-based Engineering, e-Optimization and e-Manufacturing, CAE, Intelligent Vehicle/Highway Systems, Systems Identification, CAD/CAM, and Concurrent Engineering.*

In 1985, Dr. Prasad joined the new Engineering Design/Optimization *department of EDS. Within a short time, he moved through several departments and ranks to the Senior Systems Engineering/Optimization consultant position. Prior to this assignment, he was Special Projects Manager for Artificial Intelligence Services Group of EDS, where he was responsible for expert systems development using Multidisciplinary Optimization technologies and tools. He presently consults on multidisciplinary technologies, structural optimization methodologies, Knowledge-based Optimization, Parametric engineering, CAD/CAM, and expert systems. He also directs simultaneous optimization initiatives for automating product's design and engineering process. He also conducts advanced and applied research, to study novel issues in intelligent optimization, capturing of design (life-cycle) intent, concurrent engineering/optimization and aerodynamic structural controls interactions/integration issues.*

He has written or co-authored over **110 technical (refereed) publications**, including 100 archival papers and a dozen books. He wrote a new **Textbook** on "Concurrent Engineering Fundamentals," -- a two-volume set-- published by Prentice Hall, USA The textbook is followed in many national and international universities. His most recent edited text is *Modern Manufacturing: Information Management and Control (1994)*, published by Springer Verlag. In 1989, he edited a set of three-volume book entitled *CAD/CAM, Robotics and Factories of the Future, 1989*, Springer-Verlag. He has served as editors for several additional texts, monographs and proceedings. He supports professional societies in several editorials and organization roles. He served as the **General Chairperson** on two International Conferences: *ISPE's CARS & FOF'88 Conference* held in Detroit, MI (1988) and *31st, AIAA/ASME/ASCE/AHS/ASC Structural, Structural Dynamics and Materials Conference (SDM'90)*, held in Long Beach, CA (1990). He was the **President of the International Society for Productivity Enhancement (ISPE)**. He has presented several short courses, and has consulted frequently with external organizations. He has received three awards: AIAA's **Survey Paper Citation Plaque & Award (1982)**, a **NASA Award** and a **Certificate for Creative Development of a Technical Innovation** on "*PARS- Programs for Analysis and Resizing (optimization) of Structures* (1981), and the ABI (American Biographical Institute) **Commemorative Medal of Honor (1987)**.

Dr. Prasad was the **Founding Editor-in-Chief** for the International J. of Systems Automation: Research & Applications (SARA). He is the **Editor-in-Chief** for the International J. of Concurrent Engineering: Research & Applications (CERA).

He is a well-recognized International authority on the subject of multidisciplinary technologies like Concurrent Engineering/Optimization with articles and market insights appearing frequently in national and international Journals and Magazines. He is named one of the industry's ten most sought consultants by System Automation Magazine. You may have read or seen his insights on Structural Optimization, Knowledge-based Optimization, intelligent Manufacturing and analysis of the multidisciplinary design technologies in refereed publications ranging from AIEDAM; **Encyclopedia of Microcomputers**, to Journal of Systems Research and Behavior Science; Industrial Management and Data Systems; J. of Engineering Design; Journal of Systems Integration; APICS, CIDAC, Journal of Production Planning and Control; and numerous other refereed publications.

His insights into the future of multidisciplinary optimization technologies, knowledge-based optimization, and e-Manufacturing may be revolutionary to some but they are often real. Their purpose is simply to provide a thought-provoking context for understanding the dramatic changes in e-knowledge and e-world that is shaping the new economy. He is one of the industries most sought after speakers in multidisciplinary technologies, concurrent engineering optimization, and integrated product development. His hallmark is rich content presentation that goes beyond technology buzzwords by offering insights that are thoughtful, entertaining and memorable.

Dr. Prasad' books include, **Concurrent Engineering Fundamentals: Volume I** -- "Integrated Product and Process Organization," (PTR Prentice Hall, New Jersey); **Concurrent Engineering: Fundamentals: Volume II** – "Integrated Product Development" (PTR Prentice Hall, New Jersey). **Advances in Concurrent Engineering/Optimization Series – CE 96; CE97; CE98; CE99; CE2000** (Technomic Publishing, Lancaster, PA). **Modern Manufacturing: Information Control & Technology**, (Springer Verlag, London) **ASME Engineering Information Management**, (ASME Press); **Database: Integrating the Enterprise**: (ASME Press, NY). **Structural, Structural Dynamics & Materials Proceedings** (AIAA, NY). **Integration/Optimization of Design, Analysis and Manufacturing** (Springer Verlag); **Automation of Design, Analysis and Manufacturing** (Springer-Verlag), **Robotics & Plant Automation** (Springer Verlag). **CAD/CAM Robotics & Factories of the Future**, Springer-Verlag.

Dr. Prasad has served on numerous committees for AIAA, ASCE, ASME and SAE. He is the Ex-chairman of the AIAA/SDM Conferences and SAE's Computer Readers' Committee. His **professional honors** include: Associate Fellow of AIAA, Fellow of ASME, ASCE, SAE, AAAI, and fellow and life member of ISPE. He is listed in Who's Who in America (2002), Who's Who in Engineering, **International Men of Achievement**, International Biographical Center (IBC), England (1986), **Dictionary of International Biography**, IBC (1986), **Who's who in Frontier Science & Technology**, (1985), **Who's who in Technology Today** (1985), **Who's who in Aviation & Aerospace** (1983), **International Directory of Engineering Analysts (IDEA)**, (1983), **Personalities of America**, (1986).

Dr. Prasad holds a Ph.D. degree in Aerospace and Mechanical Engineering from Illinois Institute of Technology, Illinois, Chicago. He also graduated from the Stanford University, School of Engineering with a Degree of Engineering in Applied Mechanics, California. He received a Master (M.S.) degree from Indian Institute of Technology, Kanpur and a B.E. Degree from Bihar College of Engineering, Patna, both from India. While completing studies for his D'Engineer, he worked at *Xerox Research Center*, and *Failure Analysis Associates*, both at Palo Alto, California.

Dr. Prasad possesses a thorough knowledge of the physical and mathematical modeling, analysis and optimization covering major disciplines in aerospace and mechanical engineering. He also has a good understanding, both theoretical and practical, of the engineering sciences and optimization techniques and their applications to Aerospace, Mechanical, and Automotive products. Dr Prasad have at least 10 years of specialized experience in multidisciplinary design technology research and development including topics such as the integration of structures, aeroelasticity, stability and control, aircraft performance, aircraft design, and product integration and mathematical optimization. Out of those, at least 5 years he has spent in planning and executing difficult constraint approximation research activities resulting in outstanding attainments of second order convergence for a class of large-scale optimization problems. This led him to develop a specialized program (called PARS: Programs for Analysis and Resizing/Optimization of Structures), which achieved national significance (having won a NASA award for Excellence in 1999) in exploratory and advanced development of multidisciplinary design technology.

The following are brief outlines of some of the Projects that Dr. Prasad's has worked in the past.

Major UGS/Client PROJECTS

Dr. Prasad applied critical judgment in developing Client applications at UGS. While working on UGS projects, a high degree of originality and creativity were used in the resolution of scientific problems. He created a JAD (joint applications development) team consisting of key clients of UGS, namely, Northrop Grumman, General Motors (GM), Pratt & Whitney, General Electric, GM Power train, and a few more). On the JAD team, he established good working relationships with people, both within and outside of UGS including government. Dr. Prasad frequently communicated with the team and with other executive level personnel.

- **Development of UG/Knowledge-based Optimization Software Systems. (Dec 98- Jan'00):** The UG/KF software systems had three multidisciplinary components: (i) a non-procedural language INTENT!, (ii) a Knowledge-based Optimization Pipeline and (iii) Visual development Environment (VDE). The team deeply integrated into UG, a state-of-the-art Knowledge-based Engineering (KBE) language (Heide's Intent! software), created utilities (access points), developed geometric functions and macros.
- **Development of Optimization Pipeline System (Feb '00- Dec'00):** It allowed multidisciplinary engineers to use third party knowledge agents/sources to optimize the design and engineering boundaries beyond the walls of the rules-sets captured through VDE and Intent! language.
- **Tools for Life-cycle Knowledge Capture and Optimization: (Jan'00- Dec' 00)** We developed a four-layer framework for Knowledge-Fusion: (a) UG, IMAN and Knowledge Databases (b) "Definition of a core KBE architecture" and (c) "Definition of reusable Fusion objects" framework that communicates with each other. (d) KBE Process Optimization Wizards: The KBE team would develop KF-based optimization wizards that will enable users to capture and optimize product life-cycle functions (such as engineering, assembly, CAM, CAE) onto a UG-based generative model.
- **Gear Engineering/Optimization Wizard (GEW): (March'00-Sept'00):** Created a system for users to design and optimize Gears from Initial Users Specifications.
- **Designing Templates for Creating Wizard-type Optimization Application (Nov 00-Current)–** The generic template of the Gear design/Optimization system is an extension of the KF product. We created a flexible "user-modifiable" Gear Engineering/Optimization wizard where new design/optimization of the Gear evolves automatically from the sequence of input dialogues. Inputs were only required in a top down manner and only for those design configuration alternatives that were gradually selected.

Major EDS/GM PROJECTS in Optimization

The following optimization projects outline specific examples of Dr Prasad's involvements with EDS and their clients (General Motors and Delphi). It exemplifies his accomplishments on the projects and the roles he played.

- **Concurrent Optimization Process Roadmap. Roles: Chief Technologist, ACE Consultant, Cross Functional Team, Delphi: (Feb. 1997- 1998):** Completed the evaluations of standard SLC 3 process to determine its applicability for building ACE applications. Develop a variation of SLC 3 and PM 3, which gives the Expert life-cycle methodology.
- **Concurrent Optimization Tools Evaluation. Roles: Chief Technologist, ACE Consultant, Cross Functional Team, Delphi: (January 1997- 1998):** Completed the evaluations of possible tools to be utilized for optimizing Concurrent Engineering applications, develop criteria metrics for tools selection and a fitness matrix for Applications suitability and their relative merits.
- **Delphi/ Knowledge-based Optimization (KBO) Projects: Saginaw Division, Saginaw, MI (August 93-Nov. 1996). Roles: Special Business Development & Engineering Manager/ACE Consultant:-** Worked with GM and EDS experts to identify the KBO requirements for problem solving and applications of ACE methodology. Worked on Projects at several Delphi accounts: Delphi-I, Troy, MI (Chris Farnum & Tarun Maini), Ypsilanti, Powertrain on Clutch Plate, GM Engineers, ICAD, and GM Experts; EDS Packard Electric on Wire Harness Design; and AC Rochester, MI on Fuel Tank Adviser.
- **DMG/Formability Design Optimizer/Adviser Project: CPC Account, DMG (Sept. 92-Aug. 93). Roles: Project and SE Manager:-** Worked with GM and EDS experts to identify the formability requirements for Addendum and Binder development for sheet metal forming. Management consulting and Proposal.
- **DMG/Die Engineering Process Optimization: CPC Account, DMG (Dec. 91-Feb. 92-). Roles: Manger/Facilitator:-** Interviewing the DES experts about their work flow. Charting the data and work flow through ABC Flowchart, eliminated bottlenecks, optimized processes, Management presentation and documentation. First time introduced to the customer, the method of schematically capturing and defining the data flow. This resulted into DMG saving over \$20M through streamlining and realignment.
- **Design/Optimization of Brake Master Cylinder, Delco Moraine, Dayton (Sept. 87- Feb. 88) Roles: SE Supervisor/Marketing, presentation, projects definition, feasibility and meeting coordination (with S. Rhodes).**

- **Design/Optimization for Leaf Spring**, Inland Division, Dayton (Aug. 85- June 86). Roles: SE Supervisor:- complete SLC - from marketing to Spring mold program development and maintenance, system saved \$0.5 M a year in operating costs while in use (with S. Solarte and K. Subramaniam).
- **Wheel Bearing Assembly Optimization Project**, NDH, Sandusky, Ohio (Dec. 87- Aug. 89). Roles: Project Manger Sales:- Defined requirements and prepared project plan including manpower requirements (with M. Shami and M. Fischer)
- **Die Cast Optimization Project, Central Foundry, Saginaw** (Nov. 87- Aug. 88). Roles: SE Manger/Project Leader:- Defined requirements, prepared project plan, estimates and proposed technical solutions for parametric design portion of the project (with R. Krishnaswami).
- **Vacuum Actuator Design/Optimization Project, Delco Remy, Anderson, IN** (Dec. 86-Aug. 87). Roles: SE/ Project Manager:- Proof of concept, from art to part demo, GEOMOD/Ideas application, FEA, PC-EWS NFS interface, Solid Modeling, CV/NC (with Shah, Subramaniam, Abraham and Dalling). Report # VAPD_DR_001-004.
- **Coil Spring Design/Optimization Project, Delco Products, Livonia** (Jan. 86- Sept. 88). Roles: SE Supervisor & Project Manager:- Customer interface, Design/ analysis, Manufacturing Integration, Pre- & Post Processing (FEA) (with P. Sengupta, M. Phan, and M. Gonzalez)
- **Clutch Spring Design/Optimization Project, NDH, Sandusky, Ohio** (Aug. 87-Nov. 87). Roles: SE Supervisor:- Project definition, planning and compressed geometry manipulations (with M. Shami and M. Fischer).
- **CAVIP: Pipe Optimization Project, HRD, Lockport, NY** (Jan. 87- May 87). Roles: SE Supervisor & Project Manager:- Definition, secured funding, monitoring, presentation, report (with M. Shami)
- **Seat System Optimization Project** (Jan. 86- June 86) Inland Division, Design Staff & Fischer Guide. Roles: SE Supervisor & Project Manager, definition, funding, monitoring, requirements, customer interface, wrote specification report (with M. Fischer) # SSAP-IND-001.

Multidisciplinary Optimization

Dr/. Prasad is recognized as the pioneer in the field of multidisciplinary Optimization. He has worked for several years as senior research scientist (Ford), and principal researcher (General Motors/EDS) in the field of multidisciplinary optimization technology. He has significantly contributed research and development efforts by combining structural analysis (FEA) and aerodynamics structures controls with a large scale Optimization environment called PARS. PARS, which stands for Program for Analysis and Resizing/Optimization of Structures – was a NASA funded project. PARS incorporated mechanical, thermal and aerodynamics constraints for the design of highly advanced and highly survivable and affordable aeronautical systems. AT General Motors and Ford, he directed an Advanced Center for Vehicle Optimization Research. He was responsible for conceiving, planning, and advocating major research and development activities for this center. He developed an agreed research plan by consulting everyone involved including division chiefs and staff concerning the mission, objectives and the expected outcomes. He is on Editorial Boards of several refereed Journals; He monitors and guides the quality of scientific and technical resources; and provides expert technical advice to members of Air Force organizations, DoD and government agencies. He has many adjunct appointments at Universities including Caltech, and he on the Advisory Boards of several universities, Government, and industries panels. He is an internationally recognized authority in the field of multidisciplinary Optimization and Concurrent Engineering Technologies. The Optimization and Design Research communities' worldwide refer his refereed papers widely.

Dr. Prasad has made significant contributions to the advancement of knowledge in the Optimization and Concurrent Engineering Field. His numerous important scientific publications in AIAA, ASME, CERA Journal, Engineering Optimization Journal, Journal of Vehicle Design, Advances in Engineering Software Journal, Engineering Structures Journal., J. of Computer Methods in Applied Mechanics and Engineering, J. of Numerical Methods in Engineering, Engineering Structures, and Journal of Mechanical Design. His work is heavily cited by optimization gurus (Dr. Lucent Schmidt, Dr. Venkayya, Dr. Yarik Sobieski, Dr. Ramana Grandhi, Dr. Vanderplatts, Dr. Miura, and Professor R.T. Haftka). In addition the patents and/or awards that he has received from General Motors and Ford are concrete evidences of his great success and accomplishments.

Dr. Prasad has written or co-authored over **120 technical publications**, including 100 archival papers and a dozen books. Dr. Prasad has co-authored a number of papers with Dr. Haftka in structural optimization and penalty methods areas.

- "Organization of PARS - A Structural Resizing System", Advances in Engineering Software Journal, Vol. 4, No. 1, Jan. 1982, pp. 9-19. (with R. T. Haftka)

- "Optimum Structural Design with Plate Bending Elements - A Survey", AIAA Journal, Vol. 19, No. 4, April 1981, pp. 517-522. (with R. T. Haftka)
- "Optimum Design of An Abrasive Disk", Journal of Mechanical Design, ASME, Vol. 103, No. 4, Oct. 1981, pp. 818-822. (with R. T. Haftka and M. S. Bao)
- "Organization of PARS - A Structural Resizing System", Advances in Computer Technology - 1980, Vol. 2, ASME Century 2 Publication, Editor A. Seireg, 1980, pp. 261-273. (with R.T. Haftka)
- "Optimum Design of the Sides of A Railroad Car", Engineering Structures, Vol. 2, Oct. 1980, pp. 230-236. (with R. T. Haftka)
- "Minimum Weight Design of the Sides of A Typical 100-Ton High Side Gondola Car", Proc. of Third International Conference on Vehicle Structural Mechanics, P-83, Troy, Michigan, 1979, pp. 11-18. (with R. T. Haftka)
- "PARS - User Manual: Programs for Analysis and Resizing of Complex Structures", NASA CR-159007, NASA Langley Research Center, Hampton, Virginia, April. 1979, (with R. T. Haftka, et al.)
- "Optimal Structural Design with Plate Finite Elements", The Journal of the Structural Div., ASCE, Vol. 105, No. ST11, Proc. Paper 15004, Nov. 1979, pp. 2367-2382. (with R. T. Haftka)
- "A Cubic Extended Interior Penalty Function for Structural Optimization", Int. Journal for Numerical Methods in Engineering, Vol. 14, Sept. 1979, pp. 1107-1126. (with R. T. Haftka)
- "Programs for Analysis and Resizing of Structures: PARS", Trends in Computerized Structural Analysis and Synthesis, edited by A. K. Noor, et al., Pergamon Press, London, Nov. 1978, pp. 323-330, Also in :Computers and Structures, Vol. 10, Nos. 1&2 , April 1979, pp. 323- 330. (with R. T. Haftka)

Some of his aforementioned papers were based on his Ph.D. work at Illinois Institute of Technology, Chicago.

CAD/CAM/CAE/CIM Tools Optimization -- Infrastructure Development

Dr. Prasad has managed a large-scale technology base Integration Efforts at General Motors called C4 tools Optimization – an Infrastructure Development Program in 1987-1990. With his through understanding of the needs, and the coordinated deployment efforts, he has prevented duplication of efforts, promoted standardization across the enterprise, and leveraged advanced technology to and from HP, Dell, EDS, IBM and external sources. By advanced planning and seamless coordination, he was successful in making critical business decisions, advocating proposed C4 plans, and finishing the C4 program within the stated time period and budget. In order to have better control on cost, he employed agency-level staff and/or private sector equivalent to satisfy the C4 project's tactical and operational needs. He kept control of strategic needs of the project.

NIST/RRM Shape Optimization:

This was a government funded Project on Rapid Response Manufacturing (RRM). Brian developed a revised project plan to go into the Stage II of Shape Optimization project. Customers have **bought our plan** of approach. RRM have approved a funding of @200K/annually. We contracted with EDS/CAE Group to do FEA/Optimization. Dr. Prasad decomposed the projects into a variety of technologically discrete subsystems, which led him to finish the project on time and within budget.. By working on this project he developed a great appreciation of the technological, financial, and procurement processes used in Government and elsewhere and how to handle the complexities.

NIST/ATP Vehicle Configurator/Optimizer

Brian wrote a 60 page (10M shared funding) proposal for NIST/ATP on "A Vehicle Planner and a Generic Vehicle Configurator/Optimizer." Sought and win support from EDS/UG for (\$0.5M). He received support from Deneb Robotics (@\$0.5M), Mechanical Dynamics (@\$0.3M), and Delphi-I/ADG Group (@\$0.25M). He also received "letters of support" from Wayne State University, University of Michigan and Oakland University to work as partners. Though everyone worked very hard to get to this point, due to business reasons, EDS were not able to submit this to NIST/ATP on time.

The proposal showed a great example of his ability to and experience in applying state-of-the-art engineering principals, philosophy, and tools to large-scale, distributed architectures. In writing/developing the vehicle configurator proposal, we leveraged the Knowledge of U.S. and allied engineering, intelligence, and scientific communities, resources, and capabilities.