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Qualifications: Ph.D (BITS,PILANI), B.E(ECE) 1973(First class with distinction),Andhra University.

Distinctions: College first & university rank holder in PUC. University rank holder in BE first year. State merit scholarship holder throughout schooling and national merit scholarship holder in engineering.

Special Achievement: I was one of the qualified persons for space travel (Astronaut) under the ISRO/ NASA program

Official Designation & Address: Currently working as Principal VBIT (Vignana Bharathi Institute of Technology), Aushapur(V), Ghatkesar (M), Ranga Reddy –District, Pin Code No-501301 from AUG 2008. Tel (O) 91-08415-200320.

Head DARSD & Group Head TT & IPR, N.R.S.A, Dept of Space,
Govt of India, BALANAGAR, HYDERABAD-500 037, A.P, INDIA
Tel (0) 91- 040-23884288, Fax(0) 040-23884347 Before Aug 2008.

Specialization: Chip Design, Digital and Embedded systems design and development, Satellite image processing and other Software developments, Computer interfacing, Computer networking, Storage Systems, DAS/SAN/NAS Applications, Backup, Retrieval and Disaster Management, Automated testing, Systems remote management Management of large and complex Realtime Computer Facilities etc...

Experience Total 33 years of experience in Dept of Space, Govt. of India in Research and Development. Held various positions as Design Engineer, Team Leader, Project Manager, Project Director, Director (Satellite Operations) and Head of the Department and Groups.

- Chip Designer (CPLD's &FPGA's), Software Designer and Systems Designer. Developed several Products, Systems and New Technologies.
- Associated with all the Indian Remote Sensing Satellite Missions. As a mission leader designed, developed(extensive hardwares & softwares), established and operationalised the required Data acquisition facilities for all the remote sensing satellites (25 satellite missions) including USA,ESA and French satellites at NRSA and supplied these systems internationally to 20 different countries.
- Responsible for several National/International project contracts, developed all the systems, supplied, installed and operationalised.
- Evolved variety of Technological Developmental Programmes and Research Projects resulting into the development of number of QA certified products and facilities and supplied them Internationally and Nationally.
- Developed the satellite image processing systems both hardware and software for the establishment of regional remote sensing centers in the country.
- Guided no. of projects and design teams for the appreciable completion of the projects within the schedules.
- Established and Operating the national and international satellite data acquisition and processing facilities with 100% reliability and availability for the past 29 years while applying the concepts of automation and remote management to reduce the human subjectivities.
- Developed the models for the satellite data acquisition systems and functions. Using these models implemented the online diagnostics and automation features for remote management of the systems and functions.

- Currently working on remote online hardware updates while the systems are operational.

Publications: Published 50 Research papers(International & National). Delivered several lectures/ invited talks/ keynote addresses. Chaired number of Sessions and reviewed no. of papers in national and international events/seminars/conferences.

Academics: Associated with academics for more than 25 years.

- Associated with the the universities, AICTE and NBA for academic programs of the country for more than 10 years .
- Member of Board of studies, staff selection committees and helped many institutions to set up the laboratories.
- Worked as a Professor for data processing at Indian Institute of Remote Sensing(IIRS), Dehradun for one year.
- Delivered around 200 lectures.
- Guided 240 students for their projects.
- Guided number of research projects.
- Examiner in the local universities for student projects for PG .
- Developed more than 100 digital VLSI designers and similarly the software designers.
- Visited number of other countries.
- Adviser for some of the institutions.
- Conducted/resource person for numbers of seminars and workshops.
- Worked for bridging the gap between Academics and Industry.

Awards/Appreciations: Some of the important awards/achievements are as follows.

1. Awarded with the distinguished achievement award for my contribution in SITE project.
2. Awarded with Best Invention Award for the Development of "Satellite Image Processing Systems".
3. Awarded with the best achievement award for the development of GPS based Timing Systems for Remote Sensing Satellite data.
4. Best Paper Award for my paper in ICSCN 2007.
5. My research publications were well appreciated by Chairman, ISRO and Secretary Dept. of Space.
6. All the technology Transfers from my end were well appreciated from Department of Space
7. Best achievement appreciation for my contributions towards ISO certification to NRSA.
8. Establishment of Landsat 4&5 and SPOT satellite ground stations at NRSA were well appreciated.
9. Management of national and international data acquisition & processing facilities was well appreciated.

BRIEF SUMMARY OF MAJOR ACHIEVEMENTS IN CHRONOLOGICAL ORDER

I. May 1974 to Sept .1974 Development Engineer

Worked at Defense Electronics Research Lab (DLRL), Hyderabad and was involved in a defense project.

II. October 1974 to May 1976 Development Engineer

Worked at Space Applications Center of ISRO/Department of Space,Ahmedabad.

- 1.Involved in the Satellite Instructional Television Experiment (SITE) using ATS-F Communication Satellite for the Development of the Limited TV Rebroadcasting Transmission Systems for the introduction of Satellite TV in the country. **This was appreciated by the Secretary, Department of Space, Prof. Satish Dhawan.**
- 2.Developed the graphic overlay Systems for over laying the map information/Annotation etc. on to the satellite images using TPA-70 Hungarian Computer as a part of Bhaskara Satellite Image Processing System.

III. June 1976 to 1978 Development Engineer

- 1.Developed of PDP 11/04 based System for plotting Remote Sensing Satellite image data on Gould Printer/Plotter to generate A1 size hard copies with overlays.
- 2.Developed the system for displaying the Satellite images (Black and White 512 X 512) from CCT (Computer Compatible 9 Track Tape) around PDP 11/04.
- 3.**These developments provided the direction for the establishment of Regional Remote Sensing Service Centers in different parts of the country.**

IV. December 1978 to July 1983

1.Development Engineer

Involved in the development of the realtime data acquisition and processing system configured around PDP 11/55 for Landsat (MSS and RBV) and Meteorological Satellites NOAA series as a part of the team at **Ford Aerospace Corporation, Houston, Texas, USA.**

2.Head of Data Processing at NRSA

On return from USA, established the data processing facility for Landsat and Metsat at NRSA and was given the responsibility for the Satellite Data Acquisition in realtime from Landsat 2 and 3 and Metsat Series of satellites, processing the data, generation of film products, film processing and quality assurance as **Head of Data Processing Systems. This was well appreciated.**

- 3.Involved in establishing Indian Landsat Earth Station at Shadnagar, NRSA

V. August 1983 to August 1984 Faculty Data Processing at IIRS,Dehradun.

- 1.Worked as a faculty member at Indian Institute of Remote Sensing, Dehradun, U.P. for teaching Remote Sensing Satellite Image Data Acquisition and Processing.
- 2 Responsible for the Multispectral Interactive Data Analysis

VI. September 1984 to February 1987

1.Project Coordinator and Chief Designer

- Designed and developed the Satellite Image Processing Systems (SIPS) configured around Micro PDP and subsequently around PC. These Systems (both hardware and software) were designed and developed in-house for the analysis of multiband satellite images.
- This system development fetched me **"The Best Invention Award"** of the year.

2. Coordinator Technology Transfer and Industry Interface

The technology was transferred to an industry and 48 Systems were developed and supplied to Regional Remote Sensing Centers and State Remote Sensing Centers.

- 3 Involved in establishing Landsat 4 &5 earth stations at NRSA which was well appreciated.
- 4.Established the SPOT data recording and quick look facility. Operated for 3 years regularly.
- 5.Established the Landsat data archival facility for NASA at Shadnagar, NRSA and supplied the data to NASA as per MOU for 4 years.
- 6.**I was one of the 7 qualified for space travel from India and trained for astronaut under NASA/ISRO Collaboration program during 1986-87.**

VII. March 1988 till date

working as **Head of Data Archival and Realtime Systems Division** with the following responsibilities. 50 Senior Scientists/Engineers are working with me.

- To plan, design, develop, integrate, test, evaluate and operationalise the data archival and Realtime Computer Systems for all sensors of all Remote Sensing Satellites- Indian (IRS) as well as Foreign – US and European. Developments include the realtime Frame Synchronizers, Look Display Systems, Data handling and processing softwares and associated interfaces, drivers, schedulers etc.. for each satellite.

- Operation and management of these facilities for all the Sensors/Satellites on round the clock basis to cater to all the satellites and to generate all the data products as per the time line for 100% availability and efficiency.
1. **IRS-1A Satellite Mission (LISS-1, LISS II A + LISS II B Sensors) : (1986-88)**
Project Manager – IRS-1A Data archival and Quick look System(DAQLS)
 - Developed and established VAX 11/730 based DAQLS for the first Indian operational remote sensing satellite IRS-1A and pre-processing facilities (LISS-I, LISS 2A and LISS2B sensors data). I was responsible for the operations and maintenance data acquisition facility and generation of products for IRS-1A satellite uninterruptedly.
 - Accuracy of ground time and the timing systems are critical for the Remote Sensing Ground Station and data processing as it affects the location accuracy of data directly. **Established the GPS based timing systems for IRS-1A. This was appreciated by the then Project Director of IRS-1A Dr.Kasturirangan.**
 2. **IRS-1B and P2 Satellite Missions (LISS 1, LISS IIA + LISS IIB Sensors) : (1988-92)**
Project Manager IRS-1B & IRS-P2 Satellite Missions
 - Developed VAX11/750 based Quick look system and operationalised data acquisition facilities for IRS-1B and P2
 - Operational Director for the data acquisition and real-time functions . Also Member of the Mission Management Board to oversee the IRS-1B & P2 satellite missions .
 3. **IRS-1C Satellite Mission (PAN, LISS III + WIFS Sensors) : (1993-96) Project Manager**
 - Planned, developed, established and operationalised the realtime frame synchronization, realtime data archival and quick look facilities for IRS-1C satellite, configured around VAX 3400 System (the data rates are 84.9 Mbps and 42.45 Mbps).
 - **Visited USA during 1991 for the acceptance of High Density Digital Tape Recorders from M/S Metrum for IRS-1C Satellite Data Recording in real-time.**
 - **Member of the Mission Management Board for IRS-1C satellite Mission.**
 - **Operations Director for the data acquisition system of IRS-1C satellite mission.**
 - 4 **Established the networking of all the realtime systems with other ISRO centers.**
 - 5 **Project Coordinator – IRS-P3 Satellite Mission (MOS + WIFs Sectors) (1996-1998)**
 - Introduced the concept of direct data recording on to the disk in realtime. Established the DEC- Alpha based direct archival and realtime systems and data acquisition facilities for IRS-P3 satellite including the MOS (DLR) German payload.
 - **Operations Director for Data Acquisition of IRS-P3**
 - **Member Mission Management Board of IRS-P3 satellite mission**
 - **Chairman of the Test &Evaluation and software kit preparation committee for the supply of Realtime data archival and processing systems for IRS-P3 to four International Ground Stations under NASA (USA) and DLR(Germany).**
 - 6 **IRS-P4 (Oceansat-1) (OCM + MSMR Sensors) Satellite Mission : (1998-99)**
 - **Deputy Project Director and Focal person from NRSA for IRS-P4 Satellite Mission for the Development, Establishment and Operationalisation of Data Acquisition Systems.**
 - **Introduced the new concept of real-time data recording on FC-RAID and the real-time data recording systems configured around Silicon Graphics Octane Systems.**
 - **Operational Director for IRS-P4 Satellite Data Acquisition and Real-time Functions and Member of the Mission Management Board .**
 - **Developed the system for displaying the OCM data(multiband/single band) in realtime at remote locations by transferring the data through broadband from NRSA Shadnagar.**
 7. **IRS-1D(PAN, LISS III + WIFS Sensors) Satellite Mission (1997-1998) Deputy Project Director**
 - Direct Archival of the real-time data on RAID System has been implemented using Octane and established the data acquisition facilities.
 - **Operational Director for Data Reception, real-time data acquisition, Quick Look and browse facilities for IRS-1D. All the necessary systems were developed and operationalised.**
 - **Member of the Mission Management Board .**
 - 8 **Chief Designer: Development of the Direct Archival, quick look and browse Systems (1999-2000) Introduced the concepts of direct data archival on RAID in realtime.**
 Developed the Direct Archival, Quick Look and Browse Systems around Octane and RAID(EMC and Clarian) for IRS-1C, 1D, P4 and IRS-1B Satellite missions. **I am the first person in India to develop and establish the mass storage systems in the remote sensing community in the world for realtime high speed satellite image data handling with a volume of 1 TB/day.**

9. **Technology Experimental Satellite Mission (TES) (2000-2001) (Dual PAN Sensors) Deputy Project Director and Coordinator from NRSA**
- The first high resolution Indian satellite on par with the best satellites in the World Space.
 - *Developed and operationalised the Data Acquisition and Real-time Facilities.*
 - **Operations Director** for Data Acquisition Systems and I was awarded for my contribution.
 - **Member of the Mission Management Board** for this mission.
 - *Member of the Committee appointed for marketing of TES data to international customers.*
10. **IRS-P6 (Resourcesat) Satellite Mission (LISS IV, LISS III + AWIFS Sensors) with two data streams 105 Mbps each : (2001-2003)**
- Developed and established the origin based Direct Satellite Data Archival, Quick Look and Browse Facilities for handling LISS 4, LISS 3 and AWIFS data.
 - A new concept of quick data quality evaluation of remote sensing satellite data in realtime was introduced which was used for online diagnostics too.
 - **Member of the Mission Management Board** for Resourcesat-I (IRS-P6 Mission).
 - Developed PC based direct archival, quick look and Browse systems keeping in view of international user requirements.
 - Developed the PC based system to acquire the onboard GPS data for the deduction of satellite orbit precisely.
- 11 **Cartosat (IRS-P5) Satellite Mission : (Two Sensors 105Mbps each)(2003-2004)**
- Developed the Direct Archival and Quick Look and Browse System and established data acquisition and processing facilities for Cartosat.
 - **Member Mission Management Board (MMB)**
- 12 **Cartosat – II (2005-2006) Satellite Mission :**
- Developed the DAQLB Systems and established the satellite data acquisition facilities for Cartosat-II Data Archival and Level '0' processing. Established the 65Mb satellite link to transfer the data to users directly from acquisition facility for immediate use .
- 13 **RISAT, Oceansat II, Cartosat- IIA & IIB Satellite Missions(2006-2008)**
- DAQLB Systems are planned for Direct archival and level '0' processing for these satellites and the developments are in progress for the establishment of data acquisition facilities. More than 1TB data to be handled per day.
- 14 **NATIONAL LEVEL PROJECTS FOR OTHER DEPARTMENTS (MOD):**
(1999-2006) **Deputy Project Director (Data Acquisition Systems)**
- Developed and established the Remote Sensing satellite data acquisition facility for IRS IC for MOD at Delhi.
 - Proposed and updated the data acquisition for IRS 1D satellite and executed the same in 2000 at Delhi.
 - Proposed and updated the data acquisition for TES in record time in 2001 at Delhi.
 - Subsequently proposed and established the Second Data Reception Station and the acquisition facility (2001-2003) at Delhi.
 - Proposed and upgraded the Delhi facilities for IRS-P6 satellite data acquisition during 2005-2006. Also upgraded the systems for remote operations to have the least manual interaction.
- 15 **MAJOR PROJECTS OUTSIDE THE COUNTRY (2000-2007):**
- Involved in finalizing the contract for the establishment of **Multi Mission Remote Sensing Ground Station(MMRSGS) at Tehran IRAN** by ANTRIX, DOS for IRS-1C and IRS-1D data acquisition and processing.
 - **Deputy Project Director, Data Acquisition facility for the MMRSGS Project for IRAN .** Planned, procured, developed and established this facility in record time during 2002-03. The facility was augmented for IRS-P6 too and subsequently for IRS-P5.
 - **Guiding the teams to establish similar facilities at Algeria**
- 16 **ESTABLISHMENT OF GROUND STATIONS INTERNATIONALLY :**
- Responsible for the development and supply of Direct Archival, Quick Look, Browse and processing Systems along with software kits to the international IRS Ground Stations as per International QA standards.
 - Member of the team appointed for identifying the requirements for International Ground Stations for IRS P5 & P6.
 - Chairman T&E Committee for PC based IRS-P6 and P5 DAQLB and Data Processing Systems for Ecuador. **Systems were supplied to Norman, Alaska in USA, Euro map in Germany, Beijing & Eastdawn in China, Scannex (Russia), Svalbard (Norway), Tehran**

- (*IRAN, UAE, Taiwan, Thailand, Myanmar, Algiers, etc.*) Totally 16 systems were supplied through Antrix Corporation, Dept. of Space.
- Further 10 more systems are under supply to International Ground Stations for P6 and P5.
 - 17 **DATA BACKUP AND RETRIEVAL MANAGEMENT SYSTEM** : As I handle large volumes of image data while operating variety of realtime satellite image data acquisition systems on 24/7 basis, developed the backup and retrieval systems using process automation concepts.
 - 18 **AUTOMATED REALTIME INFORMATION SYSTEMS**: Developed extensive softwares for the automated status and information for the online systems diagnosis and remote management
 - 19 **DISASTER RECOVERY SYSTEMS** :Softwares were developed to handle disasters and data recovery
 - 20. **FOREIGN SATELLITE MISSIONS** :
 - Planned, designed, developed and established the DAQLB systems for Meteorological satellites(NOAA series), Landsat 4 & 5 NASA, ERS1 &2 and SPOT (upto 1997).
 - Operated and maintained the ERS data acquisition facility of ESA (European Space Agency) at NRSA as per MOU for ERS1 & 2 satellites.

VIII.ACADEMIC : *Associated with academics for the past 25 years.*

- *Delivered number of Guest lectures in different universities and engineering institutions in AP and Maharastra.*
- *Delivered number of invited talks in Seminars /workshops/events.*
- *Guided 240 students(ME,MCA, M.Sc.(Tech)) for projects from IITs,IISc,,NIITs,and other institutions. Developed several digital VLSI and software designers. In addition to this around 30 graduate engineers carried out projects under my guidance during the last 5 years.*
- *Examiner (Project) for B.Tech, M.Tech and M.Sc(C.Sc) final year students of OU and JNTU colleges on number of occasions. Conducted several student paper contests .*
- *Chief guest for numbers of seminars and workshops and delivered keynote addresses on the current technologies and research trends.*
- *Adviser for some of the premier institutes for establishing the labs and conducting the seminars/work shops etc..*
- *I am also associated with All India Council of Technical Education (AICTE) and with National Board of Accreditation for specific Programmes from 1997 .*
- *Member of Board of Studies for Computer Science, Embedded Systems, VLSI. for B.Tech, M.Tech., M.Sc.(CSC) in the local universities.*
- *Chaired number of sessions in national and international seminars/events.*
- *Reviewed some papers(national and international).*
- *Conducted 5 national seminars/workshops.*

IX.PUBLICATIONS :

Published 50 Research Papers in International/national Journals/Seminars . Published several technical reports.

X. Other Major Technological Developments :Developed the following and supplied them internationally to several countries and nationally to MOD, Min of Home & DRDO.

- 1.* Bit Error Test Systems—supplied nationally and internationally.
- 2.* Satellite Data Format Simulators for IRS 1A,1B,1C,1D,P4,TE5,P5 (Cartosat-I) , Cartosat 2, IRS P6 (Resourcesat-I) and ERS 1&2. Supplied these systems internationally.
- 3.* Developed High frequency cross point switches catering to 8x8, 16x16, 32x32
- 4.* Developed the following IRIG-A/B Timing Instruments
Time Code Generator, Time Code Translators, Time Displays, Serial and Parallel Time Distribution System, Count Down IRIG Time Display Systems
*Supplied 60 of these systems to several countries in the world including USA, Germany, China etc., for the past 7 years and similar quantities within the country.
5. Realtime high speed Frame Synchronizers working up to 150 Mbps/channel to cater to all the remote sensing satellites.
6. Developed PC based data archival, quick look and browse systems for remote sensing satellites. Supplied these systems to 16 countries and to number of users within India.
7. Developed the concepts of computer controlled intelligent tracking systems for Remote Sensing satellites to overcome the tracking limitations based on the system models. Functional models were developed and implemented for elevation independent computer controlled error free tracking to cater to the elevations of 0° to 180°.

- 8 Bit Errors were modelled based on which a system was developed to quickly evaluate the remote sensing satellite data acquisition in realtime during image data download
9. Developed the systems for the remote management of data acquisition systems and functions to facilitate satellite operators to establish unmanned data acquisition facilities near poles .
- 10 Handling the Realtime Data acquisition systems involving multiple satellite with multiple cameras and visibilities is an extremely complex issue. Hence developed the concepts of automation, automated report generation and dissemination etc..and eliminated human subjectivities.
- 11 Established the Tape recycling facility to ensure error free guaranteed media for data recording and for recycling. This has provided 11.7 crores to NRSA.
- 12 Developed a new operational model. for the quality estimation of satellite down link during the Image data download from RS satellites.
- 13 Currently working on remote management of Hardwares using reconfigurable logics.
- 14 Evolved and guided number of research projects.

XI Technology Transfers and Intellectual Property Rights: I am responsible for this group functions at NRSA

XII. Awards/Appreciations:

1. Awarded with the distinguished achievement award for my contribution in SITE project.
- 2 Awarded with Best Invention Award for the Development of "Satellite Image Processing Systems".
- 3 Awarded with the best achievement award for the development of GPS based Timing Systems for Remote Sensing Satellite data.
- 4 Best Paper Award for my paper in ICSCN 2007. My research publications were well appreciated by Chairman, ISRO.
- 5 All three technology Transfers from my end were well appreciated from Department of Space
- 6 Best achievement appreciation for my contributions towards ISO certification to NRSA.
- 7 Establishment of Landsat 4&5 ground stations at NRSA were well appreciated.
- 8 Management of data processing systems was well appreciated.

XIII Involvement in several Task Teams / Committees :

- Member/Chairman of several Technical Committees, Test and Evaluation Committees, Ground Segment Committees, Mission and other design Review Committees, Computer Configuration Committees etc., pertaining to all NRSA/DOS Projects.
- Member / Chairman of several Administrative and Operational Teams Recruitment Committees, Purchase Committees, Indent Review Committees, Maintenance Committees, Expenditure Monitoring, Transport Committees etc.,

XIV. Membership with Scientific / Technical Institutions :

- Fellow IETE (Institution of Electronics and Telecommunication Engineers)
- Senior Member CSI (Computer Society of India)
- Life Member Instrument Society of India and Vice Chairman Hyderabad Chapter(2005-07). Currently Chairman for 2007-2009.
- Life Member ASI (Aeronautical Society of India)
- Fellow IEI (Institute of Engineers India)

XV Project Management & Budgets

I handled several projects as above involving more than 100 engineers/scientists from 4 different centers of dept. of space as project manager, leader, focal person from NRSA and project director etc.. during last 25 years.

I am deeply involved in budget planning, obtaining sanctions, monitoring, procurements etc.. I handled budgets around 200 million rupees per year for my department. Developed different software modules for the automation of budget planning, procurements and monitoring tasks.