

CURRICULUM VITAE

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PERSONAL BIOGRAPHY

Date & Place of Birth 22nd May 1972 – Birbhum, India

Citizenship Indian

Marital status Married

QUALIFICATIONS

2005 PhD (submitted), 'Three-dimensional borehole radar imaging', Department of Electrical Engineering, University of Cape Town, South Africa

1997 MSc Tech, Applied Geophysics, Indian School of Mines, India

1993 BSc Hons, Physics, Burdwan University, India

KEY COMPETENCIES

- (i) Experience in Synthetic Aperture/Inverse Synthetic Aperture Radar/Sonar imaging
- (ii) Experience in geophysical (radar/seismic) signal processing
- (iii) Finite Difference Time Domain (FDTD) numerical modelling (EM/Acoustic)
- (iv) Extensive exposure to LINUX operating system
- (v) Excellent programming experience in C, IDL (Interactive Data Language) and Matlab
- (vi) Parallel programming using PVM

PROFESSIONAL AND ACADEMIC INTERESTS

- (i) Synthetic Aperture/Inverse Synthetic Aperture Radar/Sonar imaging

- (ii) 3-D subsurface imaging (Radar/Seismic)
- (iii) Geophysical signal and data processing
- (iv) Numerical modelling (EM and Acoustic)
- (v) Geophysical R & D software development and parallel computing

WORK HISTORY

FEBRUARY 2005 – DECEMBER 2005

DEPT. OF ELECTRICAL ENGINEERING, UNIVERSITY OF CAPE TOWN, SOUTH AFRICA

POST DOCTORAL FELLOW (SPONSORED BY DEBEERS CONSOLIDATED MINES)

Project Title: 3-D borehole radar finite difference time domain modelling and imaging in alluvial mining applications

Summary : The main objective of this research project was to study the feasibility of using borehole radar as an imaging tool in alluvial diamond mining applications. In particular, finding the location of potholes, gullies and other favourable orebody structures was a high priority. The radar is typically deployed from directional drills (or boreholes created from such drills) and utilised to image the orebody structures in alluvial diamond mines. The reflection as well as the transmission mode imaging technique was studied to image such structures.

AUGUST 2005 – PRESENT

DEPT. OF GEOLOGICAL SCIENCES, UNIVERSITY OF CAPE TOWN, SOUTH AFRICA

PART-TIME RESEARCHER WITH MR. GEORGE C. SMITH

Project Title: Interaction of normal moveout (NMO) error on amplitude-versus-offset (AVO) analysis

Research Objectives:

- (i) Quantitative analysis of the effect of stacking velocities on AVO analysis.
- (ii) Development and implementation of new algorithms to achieve the best results.

JUNE 2000 – FEBRUARY 2005

DEPARTMENT OF ELECTRICAL ENGINEERING, UNIVERSITY OF CAPE TOWN, SOUTH AFRICA

PHD STUDENT

Thesis Title: Three-dimensional Borehole Radar Imaging

Summary: This thesis investigates the following three main aspects of high-resolution 3-D imaging of subsurface orebodies using multiple borehole radar data:

Borehole synthetic aperture radar interferometry (InSAR) for high resolution 3-D subsurface imaging. A simulation study has been conducted using a side-looking borehole radar antenna configuration for interferometric subsurface height reconstruction.

3-D orebody geometry reconstruction using magnitude images from multiple, non-parallel boreholes. This technique made use of a time-domain SAR focusing/migration algorithm to implement the azimuth focusing. The range focusing was achieved using both a matched filter and deconvolution filter.

3-D Finite Difference Time Domain (FDTD) modelling of borehole radar EM wave propagation. 3-D FDTD code was written and implemented using Uni-axial Perfectly Matched Layer (UPML) for boundary wave absorption. The code has been applied to both reflection and transmission mode EM wave propagation in a conductive host. The effect of borehole size and borehole mud properties on radar traces was studied. In order to overcome the limitations of large memory requirements and processing speed limits, a parallel version of the 3-D FDTD code was designed and implemented using PVM as 'middleware' running on a Beowulf-type Linux cluster.

1999 – 2000

CENTRE OF STUDIES IN RESOURCES ENGINEERING (CSRE), INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY, INDIA

SENIOR RESEARCH FELLOW

Project Title: Field experiment and ground truth data collection synchronous with ERS-1/2 satellite passes and development of database for SAR Interferometry

Responsibilities included:

- (i) Conducting and coordinating national and international training courses in SAR Interferometry its applications.
- (ii) Ground truth GPS data collection, processing ERS-1/2 Synthetic Aperture Radarc satellite data to produce Digital Elevation Models (DEM).

1997 – 1998

DEPT. OF EARTH SCIENCES, INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY, INDIA

RESEARCH SCIENTIST

Project Title: Integrated Geological Seismological and Co-seismic investigations in the Jawahar-Murbad region, Thane District, India

Responsibilities included:

- (i) Site selection and construction of broadband seismic stations suitable for micro- seismic events and installation of broadband digital seismometer.
- (ii) Analysis of seismogram and monitoring seismicity.
- (iii) Integration of seismic data with existing gravity and resistivity data over the study area.

COMPUTER SKILLS

Operating System	UNIX (Linux, Solaris), Windows
Languages	C, IDL and Matlab; familiar with FORTRAN 77, C++ and JAVA
Software Written	<ol style="list-style-type: none"> 1. Simulation of 3-D FDTD borehole EM wave propagation using UPML boundary absorber (in IDL and C) 2. Parallel 3-D FDTD EM simulator using PVM Linux Cluster 3. Time domain SAR migration/focusing algorithm (in IDL) 4. FDTD acoustic wave simulator (in C)
Misc	PVM (Parallel Virtual Machine); ProMAX (Linux)

PUBLICATIONS

P.K. Mukhopadhyay, A.J. Wilkinson and M.R. Inggs, 'Synthetic Aperture and Inverse Synthetic Aperture Sonar Imaging of Point Targets in Air and Water Media – Part 1: Two Dimensional Image Processing', (submitted).

P.K. Mukhopadhyay, A.J. Wilkinson and M.R. Inggs, 'Synthetic Aperture and Inverse Synthetic Aperture Sonar Imaging of Point Targets in Air and Water Media – Part 2: Three Dimensional Imaging using Multiple, non-Parallel Boreholes', (submitted).

P.K. Mukhopadhyay, T. Bennett, M.R. Inggs and A.J. Wilkinson, 'Borehole Radar EM Wave Simulation for Mining Applications using a Parallel Implementation of the 3-D FDTD Algorithm', South African Geophysical Association, Cape Town, SA, 2005.

P.K. Mukhopadhyay, A.J. Wilkinson and M.R. Inggs, 'Synthetic Aperture Sonar 3-D Imaging of Targets in Air using Multiple, non-Parallel Shot Lines', International Geoscience and Remote Sensing Symposium, Seoul, South Korea, 2005.

P.K. Mukhopadhyay, M.R. Inggs and A.J. Wilkinson, 'FDTD Modelling of a Borehole Radar Wave Propagation: a 3-D Simulation Study in a Conductive Media', International Geoscience and Remote Sensing Symposium, Seoul, South Korea, 2005.

P.K. Mukhopadhyay, M.R. Inggs, and A.J. Wilkinson, 'Three-dimensional finite difference time domain modelling of borehole radar in mining applications', in Proceedings of the 15th Annual Symposium of the PRASA, Cape Town, SA, 2004.

A.J. Wilkinson, P.K. Mukhopadhyay, N. Lewitton and M.R. Inggs, 'Inverse Synthetic Aperture Imaging using a 40 kHz Ultrasonic Laboratory Sonar', in Proceedings of the 15th Annual Symposium of the PRASA, Cape Town, SA, 2004.

P.K. Mukhopadhyay, M.R. Inggs, A.J. Wilkinson and R.T. Lord, 'Three-dimensional borehole radar imaging using synthetic aperture time-domain focusing', 72nd SEG Annual meeting, Salt Lake City, USA, 2002.

P.K. Mukhopadhyay, M.R. Inggs and A.J. Wilkinson, 'Borehole Radar Interferometry', South African Geophysical Association, Drakensberg, SA, 2001.

M.R. Inggs, P.K. Mukhopadhyay and A.J. Wilkinson, 'Borehole Interferometric SAR: A preliminary study', International Geoscience and Remote Sensing Symposium, Sydney, Australia, 2001.

K.S. Rao, P.K. Mukhopadhyay and R.K. Midha, 'Shuttle Radar Topography Mission: Indian Experience', National Conference on Study of Land Using Radio Techniques, Jodhpur, India, 2000.

AWARDS RECEIVED

- (i) Post Doctoral Research Fellowship, DeBeers Consolidated Mines, February 2005 to December 2005
- (ii) PhD Research Fellowship, DeBeers Consolidated Mines, June 2000 to January 2005
- (iii) Postgraduate University Scholarships Committee Award for International Students, University of Cape Town, 2003

MEMBERSHIPS

Member SEG, IEEE

TRAINING COURSES ATTENDED

SEISMOLOGY

- 2005 Interpretation of 3-D Seismic Data, Cape Town, South Africa
(One week by Mr. Alistair R. Brown, USA)
- 2004 Seismic Data Acquisition, Processing and Interpretation, Cape Town, South Africa
(One week by Mr. Michael Schoenberger, USA)
- 1998 Seismic Data Acquisition, Processing and Interpretation, IIT Bombay
(Two weeks by Refraction Technology, Inc., USA)

SAR INTERFEROMETRY

- 2000 SAR Data Processing and Interpretation, IIT Bombay
(Two weeks by Dr. Didier Massonnet, CNES, France)
- 1999 SAR Data Processing and Interpretation, IIT Bombay
(Two weeks by Radar Remote Sensing Group, UCT, South Africa)

REFEREES

Prof. Michael R. Inggs
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Dr. Andrew J. Wilkinson
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Mr. George C. Smith
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