

Lecture Notes in Mechanical Engineering

Series Editors

Francisco Cavas-Martínez, Departamento de Estructuras, Universidad Politécnica de Cartagena, Cartagena, Murcia, Spain

Fakher Chaari, National School of Engineers, University of Sfax, Sfax, Tunisia

Francesco Gherardini, Dipartimento di Ingegneria, Università di Modena e Reggio Emilia, Modena, Italy

Mohamed Haddar, National School of Engineers of Sfax (ENIS), Sfax, Tunisia

Vitalii Ivanov, Department of Manufacturing Engineering Machine and Tools, Sumy State University, Sumy, Ukraine

Young W. Kwon, Department of Manufacturing Engineering and Aerospace Engineering, Graduate School of Engineering and Applied Science, Monterey, CA, USA

Justyna Trojanowska, Poznan University of Technology, Poznan, Poland

Lecture Notes in Mechanical Engineering (LNME) publishes the latest developments in Mechanical Engineering—quickly, informally and with high quality. Original research reported in proceedings and post-proceedings represents the core of LNME. Volumes published in LNME embrace all aspects, subfields and new challenges of mechanical engineering. Topics in the series include:

- Engineering Design
- Machinery and Machine Elements
- Mechanical Structures and Stress Analysis
- Automotive Engineering
- Engine Technology
- Aerospace Technology and Astronautics
- Nanotechnology and Microengineering
- Control, Robotics, Mechatronics
- MEMS
- Theoretical and Applied Mechanics
- Dynamical Systems, Control
- Fluid Mechanics
- Engineering Thermodynamics, Heat and Mass Transfer
- Manufacturing
- Precision Engineering, Instrumentation, Measurement
- Materials Engineering
- Tribology and Surface Technology

To submit a proposal or request further information, please contact the Springer Editor of your location:

China: Dr. Mengchu Huang at mengchu.huang@springer.com

India: Priya Vyas at priya.vyas@springer.com

Rest of Asia, Australia, New Zealand: Swati Meherishi at swati.meherishi@springer.com

All other countries: Dr. Leontina Di Cecco at Leontina.dicecco@springer.com

To submit a proposal for a monograph, please check our Springer Tracts in Mechanical Engineering at <http://www.springer.com/series/11693> or contact Leontina.dicecco@springer.com

Indexed by SCOPUS. The books of the series are submitted for indexing to Web of Science.

More information about this series at <http://www.springer.com/series/11236>

Mahavir Singh · Yasser Rafat
Editors

Recent Developments in Acoustics

Select Proceedings of the 46th National
Symposium on Acoustics

 Springer

Editors

Mahavir Singh
Department of Physico-Mechanical
Metrology
CSIR-National Physical Laboratory
New Delhi, Delhi, India

Yasser Rafat
Mechanical Engineering Department
Aligarh Muslim University
Aligarh, Uttar Pradesh, India

ISSN 2195-4356

ISSN 2195-4364 (electronic)

Lecture Notes in Mechanical Engineering

ISBN 978-981-15-5775-0

ISBN 978-981-15-5776-7 (eBook)

<https://doi.org/10.1007/978-981-15-5776-7>

© Springer Nature Singapore Pte Ltd. 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Contents

Speech Hearing and Perception

Voice as a Parameter to Assess <i>Mizāj</i>	3
Huma Noor, Ferasat Ali, and Yasser Rafat	
Neuro-Physiological Correlates of Voice Onset Time in Kannada and Tamil Speaking	17
T. Jayakumar and Vijay Kumar Narne	
Entropic Analysis of Garhwali Text	43
Manoj Kumar Riyal, Rajeev Kumar Upadhyay, and Sanjay Kumar	
Effect of Age on Formant Frequencies in Kannada Speakers	51
V. Namitha, V. Namratha, and R. Rajasudhakar	
Evaluation of Temporal Resolution Around the Tinnitus Frequency in Adults with Tonal Tinnitus	59
Prithivi Thanikaierasu, Udhayakumar Ravirose, and Prashanth Prabhu	
Acoustic Analysis of Voice of Temple Priests	67
V. Priyadharshini, M. Vasupradaa, and K. Yeshoda	
Perceptual Judgments of Resonance, Speech Understandability, and Speech Acceptability in Children with Repaired Cleft Palate Across Words and Sentences	75
M. Pushpavathi, Ajish K. Abraham, S. R. Mahadeva Prasanna, and K. S. Girish	
Continuous Speech Recognition Technologies—A Review	85
Shobha Bhatt, Anurag Jain, and Amita Dev	
Effect of Number of LPCs and Formant Deletion Methods of Inverse Filtering on Acoustic Parameters of Voice	95
Vimala J. Kasturi, Rashika Sharma, and Santosh Maruthy	

Impact of Timing of Surgery on the Development of Speech in Toddlers with Repaired Cleft Lip and Palate	105
M. Pushpavathi, V. Kavaya, and V. Akshatha	
Acoustics Materials	
Sonic Crystals for Highway Noise Reduction	119
Debasish Panda and A. R. Mohanty	
Acoustic Properties of Additive Manufactured Porous Material	129
Deepak C. Akiwate, Mahendra D. Date, B. Venkatesham, and S. Suryakumar	
Sound Transmission Characteristics Through Multi-panel Structures of Wooden Doors and Uncertainty Components in the Measurements	139
Kirti Soni, Mahavir Singh, and Yudhisther K. Yadav	
Prediction of Acoustical Performance with and Without Airflow Resistivity of Fibrous Natural Materials	149
Manish Raj, Shahab Fatima, and N. Tandon	
Dependence of Macro-Scale Response of Fibrous Materials on Polygonal Arrangement of Fibers	161
Sagar Deshmukh and Sripriya Ramamoorthy	
Acoustic Streaming in a Porous Media	173
Neetu Srivastava and Yasser Rafat	
Acoustic Noise and Vibration	
Experimental Studies on Twelve Bladed Fan Vibration Considering Flexibility of Shaft	185
Shashank Shekhar Singh and Ahmad Ali Khan	
Dynamic Analysis for Healthy and Defective Gears: A Review	193
Swati Gautam, Sidra Khanam, and N. Tandon	
Non-Cavitating Noise Control of a Marine Propeller by Optimizing Number and Pitch of Blades	207
V. Ramakrishna, P. Bangaru Babu, and Ch. Suryanarayana	
Noise Control of a Marine Propeller by Modifying the Skew Angle	219
V. Ramakrishna, D. A. Rao, Ch. Sankara Rao, P. V. S. Ganesh Kumar, T. Gunasekhar, and V. Mani kumar	
Acoustic Signature of Square Cylinder in a Compressible Flow	231
Mohd Masoom Ali and Syed Fahad Anwer	

Instrumentation and Signal Processing

Direction of Arrival Estimation for Speech Source Using Closely Spaced Microphones 243
 Mohd Wajid, Arun Kumar, and Rajendar Bahl

Investigations into Some Parameters of Vibration Signal of Faulty Bearings with Wavelet Transform 251
 Sidra Khanam and N. Tandon

Standard Practices for Acoustic Emission Measurement on Rotating Machinery 263
 Surojit Poddar and N. Tandon

Acoustic Analysis of Timbre of Sarasvati Veena in Comparison to Simple Sonometer 275
 Chandrashekhar Chauhan, P. M. Singru, and Radhika Vathsan

A Simultaneous EEG and EMG Study to Quantify Emotions from Hindustani Classical Music 285
 Uddalok Sarkar, Soumyadeep Pal, Sayan Nag, Shankha Sanyal, Archi Banerjee, Ranjan Sengupta, and Dipak Ghosh

Studies Different Structure of Atmospheric Boundary Layer Using Monostatic SODAR 301
 Nishant Kumar, Kirti Soni, Ravinder Agarwal, and Mahavir Singh

Editors and Contributors

About the Editors

Dr. Mahavir Singh is the Head of the Acoustics, Ultrasonics and Vibration (AUV) section of the CSIR - National Physical Laboratory, New Delhi, India. He has over 25 years of experience in acoustics and vibration. He received his Ph.D in acoustics from IIT, Delhi. His main research interests are in the field of building acoustics, noise and vibration control, calibration and testing of electro-acoustic equipment, acoustical products and devices, maintenance, up-gradation and realization of national primary standards for acoustics and vibration. Dr. Singh has published over 125 research papers in journals and conference proceedings as well as authored a book on noise control in buildings. He is a fellow of the Acoustical Society of India (ASI), Ultrasonics Society of India (USI), Metrology Society of India (MSI), the Institution of Engineers (IEI) and the International Institute of Acoustics and Vibration (IIAV-USA).

Dr. Yasser Rafat is a faculty in the Mechanical Engineering department of the Aligarh Muslim University, India. He received his B. Tech. in Mechanical Engineering from the Aligarh Muslim University, India. For further studies, he moved to Canada where he pursued his M. Tech. from Concordia University and his Ph.D from McGill University. Dr. Rafat has authored several publications and delivered talks in the area of thermofluids and thermoacoustics. He has served as a reviewer for POMA (Acoustical Society of America). He has also filed and published three patents in the area of charging infrastructure of xEVs and cloud based health management system. His research interests include thermoacoustic refrigerators and engines, building acoustics, ride vibration analysis, sports projectile aerodynamics, and heat management of Li-ion batteries. He is a life member of the Acoustical Society of India (ASI).

Contributors

Ajish K. Abraham Department of Electronics, All India Institute of Speech and Hearing, Mysuru, Karnataka, India

Ravinder Agarwal Thapar University, Patiala, India

Deepak C. Akiwate Indian Institute of Technology Hyderabad, Telangana, India

V. Akshatha Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, India

Ferasat Ali Department of Kulliyat, Ajmal Khan Tibbiya College, A.M.U, Aligarh, UP, India

Mohd Masoom Ali Computational Aerodynamics Lab, MED, ZHCET, AMU, Aligarh, India

Syed Fahad Anwer Computational Aerodynamics Lab, MED, ZHCET, AMU, Aligarh, India

Rajendar Bahl Centre for Applied Research in Electronics, Indian Institute of Technology Delhi, New Delhi, India

Archi Banerjee Sir C.V. Raman Centre for Physics and Music, Jadavpur University, Kolkata, India;
Rekhi Centre of Excellence for the Science of Happiness, IIT Kharagpur, Kharagpur, India

P. Bangaru Babu National Institute of Technology, Warangal, Telangana, India

Shobha Bhatt U.S.I.C.T, Guru Gobind Singh Indraprastha University, Dwarka, Delhi, India

Chandrashekhara Chauhan BITS Pilani K K Birla Goa Campus, Goa, India

Mahendra D. Date Indian Institute of Technology Hyderabad, Telangana, India

Sagar Deshmukh Department of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, India

Amita Dev Indira Gandhi Delhi Technical University for Women, New Delhi, India

Shahab Fatima Center of Automotive Research & Tribology (Formerly ITMMEC), Indian Institute of Technology Delhi, New Delhi, India

P. V. S. Ganesh Kumar Naval Science and Technological Laboratory, Visakhapatnam, India

Swati Gautam ITMMEC, IIT Delhi, New Delhi, India

Dipak Ghosh Sir C.V. Raman Centre for Physics and Music, Jadavpur University, Kolkata, India

K. S. Girish Department of Electronics, All India Institute of Speech and Hearing, Mysuru, Karnataka, India

T. Gunasekhar JNTU Kakinada-University College of Engineering, Vizianagaram, India

Anurag Jain U.S.I.C.T, Guru Gobind Singh Indraprastha University, Dwarka, Delhi, India

T. Jayakumar Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Mysuru, India

Vimala J. Kasturi Department of Speech Language Pathology, All India Institute of Speech and Hearing, Mysuru, India

V. Kavya Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, India

Ahmad Ali Khan Department of Mechanical Engineering, ZHCET, AMU, Aligarh, Uttar Pradesh, India

Sidra Khanam ZHCET, Aligarh Muslim University, Aligarh, Uttar Pradesh, India;

Department of Mechanical Engineering, Aligarh Muslim University, Aligarh, India

Arun Kumar Centre for Applied Research in Electronics, Indian Institute of Technology Delhi, New Delhi, India

Nishant Kumar Thapar University, Patiala, India

Sanjay Kumar Government Senior Secondary Boys School, Phagwara, Punjab, India

S. R. Mahadeva Prasanna Department of Electrical & Electronics Engineering, IIT, Guwahati, Guwahati, Assam, India

V. Mani kumar JNTU Kakinada-University College of Engineering, Vizianagaram, India

Santosh Maruthy Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Mysuru, India

A. R. Mohanty Mechanical Engineering Department, IIT Kharagpur, Kharagpur, India

Sayan Nag Department of Electrical Engineering, Jadavpur University, Kolkata, India

V. Namitha Department of Speech-Language Sciences, All India Institute of Speech & Hearing, Mysuru, India

V. Namratha Department of Speech-Language Sciences, All India Institute of Speech & Hearing, Mysuru, India

Vijay Kumar Narne Department of Clinical Research, Faculty of Health, South Denmark University, Sønderborg, Denmark

Huma Noor Department of Kulliyat, Ajmal Khan Tibbiya College, A.M.U, Aligarh, UP, India

Soumyadeep Pal Department of Electrical Engineering, Jadavpur University, Kolkata, India

Debasish Panda Mechanical Engineering Department, IIT Kharagpur, Kharagpur, India

Surojit Poddar Centre for Automotive Research & Tribology (formerly ITMMEC), Indian Institute of Technology Delhi, New Delhi, India

Prashanth Prabhu All India Institute of Speech and Hearing, Mysore, Karnataka, India

V. Priyadharshini All India Institute of Speech and Hearing, Mysore, Karnataka, India

M. Pushpavathi Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, Karnataka, India

Yasser Rafat Department of Mechanical Engineering, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

Manish Raj Center of Automotive Research & Tribology (Formerly ITMMEC), Indian Institute of Technology Delhi, New Delhi, India

R. Rajasudhakar Department of Speech-Language Sciences, All India Institute of Speech & Hearing, Mysuru, India

V. Ramakrishna Scientist 'E', Naval Science and Technological Laboratory, Visakhapatnam, India

Sripriya Ramamoorthy Department of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, India

D. A. Rao Naval Science and Technological Laboratory, Visakhapatnam, India

Udhayakumar Ravirose All India Institute of Speech and Hearing, Mysore, Karnataka, India

Manoj Kumar Riyal Department of Physics, Government Post Graduate College, Kotdwara, Pauri Garhwal, Uttarakhand, India

Ch. Sankara Rao Naval Science and Technological Laboratory, Visakhapatnam, India

Shankha Sanyal Sir C.V. Raman Centre for Physics and Music, Jadavpur University, Kolkata, India;
School of Languages and Linguistics, Jadavpur University, Kolkata, India

Uddalok Sarkar Department of Electrical Engineering, Jadavpur University, Kolkata, India

Ranjan Sengupta Sir C.V. Raman Centre for Physics and Music, Jadavpur University, Kolkata, India

Rashika Sharma Speech Language Pathologist, Jawahar Lal Nehru Medical College and Hospital, Ajmer, Rajasthan, India

Mahavir Singh A & V Metrology, PMM Division, CSIR-National Physical Laboratory, New Delhi, India

Shashank Shekhar Singh Department of Mechanical Engineering, JECRC, Jaipur, Rajasthan, India

P. M. Singru BITS Pilani K K Birla Goa Campus, Goa, India

Kirti Soni A & V Metrology, PMM Division, CSIR-National Physical Laboratory, New Delhi, India

Neetu Srivastava Department of Mathematics, Amrita School of Engineering, Amrita Vishwa Vidyapeetham, Bengaluru, India

S. Suryakumar Indian Institute of Technology Hyderabad, Telangana, India

Ch. Suryanarayana Scientist 'E', Naval Science and Technological Laboratory, Visakhapatnam, India

N. Tandon Centre for Automotive Research & Tribology (formerly ITMMEC), Indian Institute of Technology Delhi, New Delhi, India

Prithivi Thanikaierasu All India Institute of Speech and Hearing, Mysore, Karnataka, India

Rajeev Kumar Upadhyay Department of Physics, V. A. Government Degree College, Atrauly District Aligarh, India

M. Vasupradaa All India Institute of Speech and Hearing, Mysore, Karnataka, India

Radhika Vathsan BITS Pilani K K Birla Goa Campus, Goa, India

B. Venkatesham Indian Institute of Technology Hyderabad, Telangana, India

Mohd Wajid Department of Electronics Engineering, ZHCET, Aligarh Muslim University, Aligarh, India;
Centre for Applied Research in Electronics, Indian Institute of Technology Delhi, New Delhi, India

Yudhisther K. Yadav A & V Metrology, PMM Division, CSIR-National Physical Laboratory, New Delhi, India

K. Yeshoda All India Institute of Speech and Hearing, Mysore, Karnataka, India