Editorial

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Biographical notes: R. Ganesh Narayanan is presently an Assistant Professor at the Department of Mechanical Engineering, Indian Institute of Technology Guwahati. His areas of research include sheet metal forming, forging, joining and forming, tailor welded blanks, formability and forming limit, and computational applications in joining and metal forming. He has contributed several papers in journals of international repute, authored several book chapters and has edited a book. He completed his PhD degree from the Department of Metallurgical Engineering and Materials Science, IIT Bombay, India.

Uday S. Dixit received his PhD degree from IIT Kanpur and is currently a Professor in the Department of Mechanical Engineering at the Indian Institute of Technology Guwahati. He has about five years of experience in the industry and 15 years of experience in the academia and has contributed several papers to journals of international repute. He has authored three books and edited one book. His research interests include design and manufacturing, FEM, neural networks, fuzzy sets and mechatronics.

This special issue contains six papers dealing with 'Advances in computational methods in manufacturing'. An International Conference on Computational Methods in Manufacturing (ICCMM2011) was held at Indian Institute of Technology Guwahati, India during December 15–16, 2011. There were 79 papers presented during this conference in different fields of manufacturing highlighting the importance of computational methods. The authors of some selected papers were invited to submit a modified and improved or a new paper to the special issue of the journal. The submitted papers were then meticulously reviewed by experts in those research fields. Finally, six papers having extensive originality were accepted.

The first paper deals with the characterisation of different theoretical periodic profiles using non-contact capacitive sensor. The developed capacitive response model has been used to accurately predict the equivalent theoretical capacitive displacement profile. The same has been related accurately to a measured surface finish of the profile. The response of capacitive sensors was related to dimensional and non-dimensional parameters of the theoretical profile, and later was validated with results from a measurement setup. This work provides a method to assess the surface quality in the field of automotive manufacturing. A similar methodology can be adopted in the case of non-periodic profile measurement.

The second paper is about finite element modelling of micro laser welding process, focussing on the heat transfer and fluid flow aspects. The numerical model incorporates the temperature dependent material properties and latent heat of melting and solidification. The efficiency of the numerical model is improved by including a harmony search based meta-heuristic optimisation algorithm, aimed to make out most suitable unknown input parameters. The validation of numerical results with experimental results is encouraging. This work will be useful in understanding the laser micro welding process, wherein gathering experimental data will be highly resource intensive and time consuming. This process has got tremendous potential in the fields of medical devices, micro-electro-mechanical system, optoelectronics, etc. supporting the usefulness of the present work.

The third paper has got applications in standardising the sampling strategies for adequate measurement of freeform surfaces using coordinate measuring machines. The sampling strategy involves scanning of number of isoparametric lines, and locating them on the freeform surface. In this work, the authors have proposed a new sampling strategy using dominant isoparametric lines. The present method assumes that the number of isoparametric scan lines to be measured is known. The actual task is to locate them such that they adequately represent the given freeform surface. The results of proposed method are compared with results from existing sampling methods like curvature-based sampling and uniform parametric spacing. The suitability of the proposed sampling method has been demonstrated for sampling of freeform surfaces.

In the fourth paper, the finite element analysis of laser assisted bending of a magnesium alloy sheet with moving mechanical load has been studied. A sequential thermo-mechanical analysis is conducted by considering Gaussian distribution of moving heat flux and moving point mechanical load. The analyses on the effect of moving mechanical load shows that the process efficiency can be improved to have larger bend angles without spending additional energy in multipass laser bending process. The laser parameters and mechanical load can be optimised to align sheets that are used in ship building and aerospace industries.

The fifth paper deals with the finite element modelling and analysis of orthogonal cutting aiming to identify the minimum uncut chip thickness at a given tool edge radius. The studied focuses on tungsten carbide tool and Al2024-T3 work-piece at a tool edge radius of 4 μm. The Johnson-Cook Fracture model has been used to evaluate the minimum uncut chip thickness. It has been concluded that the minimum uncut chip thickness is of the order of 12% to 18% of the edge radius. The findings are useful for mechanical micro-machining fabrication technique to manufacture miniature devices and components with features ranging from tens of micrometers to a few millimetres in size.

In the last paper, finite element analysis based approach has been presented to estimate the temperature in the roll and the strip. The finite element analysis of steady state heat transfer analysis of plane strain rolling is carried out, with the aim of reducing the computational time of any software package. The method proposed took less than 10 minutes of the screen time in ABAQUS, which normally takes a few hours.

The papers published in the special issue provide a glimpse of advances in computational methods for simulating various manufacturing processes like machining, laser welding, laser bending, strip rolling, surface characterisation and measurement. The methods used model the manufacturing processes accurately and consume lesser computational time. We are thankful to all the authors and reviewers for helping us to

deliver this special issue within stipulated time. We are grateful to Professor T. Ozel, Editor-in-Chief of *International Journal of Mechatronics and Manufacturing Systems* (*IJMMS*) for inviting us as the guest editors of this issue. We also thank the editorial staff of *IJMMS*.