

Association for Machines and Mechanisms News Bulletin

Volume 1, No. 4

October 2009



Our Objectives and Activities

The main objective of AMM is to contribute to mechanical design at all levels starting from academic research to industrial initiatives, thereby enhancing the quality and reliability of indigenous machines. With this in view, AMM organises the National Conference on Machines and Mechanisms, NaCoMM, and the workshops on Industrial Problems on Machines and Mechanisms, IPRoMM.

Inside This Issue

1. Message from the Vice-President (AMM)
2. Textile Column
3. Recently Published Book
4. Forthcoming Events
5. Industry Watch

Contact Details

Dr. Sandipan Bandyopadhyay
Secretary, AMM
Tel: (044) 2257 4733 (O)
Fax: (044) 2257 4732
E-mail: secretary@ammindia.org
Web: <http://www.ammindia.org>

Message from Vice-President (AMM) and Patron of the News Bulletin

It is indeed a great pleasure during this festive month of October to write this message in the 4th and last issue of this year's news bulletin. Since the new office bearers of AMM took over in 2008, a plan was drawn to rejuvenate the AMM news bulletin with the help of four Zonal Vice-Presidents (ZVPs). Earlier the ZVPs were drawn from Indian Institute of Technologies (IITs)/Indian Institute of Science (IISc) only. However, the new team consciously decided to draw them from institutes other than IITs/IISc. This was simply to emphasize the importance of the involvement of faculty members from non-IIT/IISc institutes/colleges for the national level activities of AMM. In this regard, the AMM is indebted to the four ZVPs drawn from four different parts of the country, namely, National Institute of Technology (NIT), Hamirpur, Himachal Pradesh (North), Vellore Institute of Technology, Vellore, Tamil Nadu (South), Malavva National Institute of Technology, Jaipur, Rajasthan (West), and Bengal Engineering and Science University, Shibpur, West Bengal (East).

In the endeavour of bringing out the news bulletin in a new style, Dr. S.K. Pradhan from NIT Hamirpur along with his ZVP-North Dr. Rajesh Sharma have done a wonderful job in designing our news bulletin which was brought out in January 2009. Following this, the style was adopted by the editorial team for the whole year. In order to keep the work pressure of bringing out the news bulletins reasonable, every ZVP has kindly agreed to bring out one news bulletin in a year. This way, our cycle has become North (January issue), South (April issue), West (July issue), and East (October issue). Further to make the news bulletin self sustaining the sponsorship of Turning Point and Venlax, Bangalore for the four issues (April, July, October 2009 and January 2010) is truly appreciable.

Observing the enthusiasms with the news bulletin, two new initiatives were undertaken. They are: Introductions of a (i) Textile Column; and (ii) Industrial Column. While the former is coordinated by Dr. Apurba Das of IIT Delhi, the latter one by Dr. Prasad Bhangale of John Deere, Pune. Thanks are due to them for their prompt agreements to coordinate articles from their respective areas. It is expected that the special articles in the Textile Column will spark interests amongst the Indian researchers and students for the textile industry which uses machineries and mechanisms that are very complex in nature. On the other hand, Industry Column is introduced mainly to cater our industry members who can share their activities through this column.

The following initiatives by the former NaCoMM organizers are also noteworthy to mention:

- 1) Receipt of the funds from NaCoMM 2007 for AMM office setup with necessary infrastructure at IIT Madras.
- 2) Establishment of the best paper awards in NaCoMM conferences funded by NaCoMM 2007.
- 3) Establishment of the Student Mechanism Award based on mechanism building competition in NaCoMM conferences funded by NaCoMM 2003 (See NaCoMM 09 announcement).

Finally, it is hoped that AMM will be able to serve its members through this news bulletin in the coming years too. For that, let us plan contributing articles. For 2010 New Year issue, please send news/articles to ZVP North.

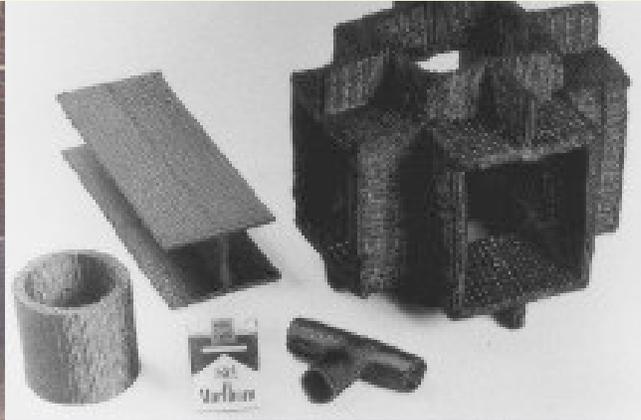
Prof. S.K. Saha, IIT Delhi

3D Textile Preforms for Advanced Composites[#]

Textile technology is of particular importance in the context of improving certain properties of composites like inter-laminar shear and damage tolerance apart from reducing the cost of manufacturing. Depending upon textile preforming method the range of fiber orientation and fiber volume fraction of preform will vary, subsequently affecting matrix infiltration and consolidation. As a route to mass production of textile composites, the production speed, material handling and material design flexibility are major factors responsible for selection of textile reinforcement production.



Prototype of 3D braiding machine (3Tex Inc., USA)



3D preforms of different shapes

3D textile preforming in particular provides option of placing the reinforcing filament yarns in all three directions with or without interlacements between the participating yarns. This technology also provides option for producing net shaped preforms. Over the years, a number of methods have been evolved in the manufacture of 3D preforms. The properties of the 3D preforms differ according to the method of producing them. Thus each method produces preforms suitable for specific applications.

3D preforms could be produced as non interlaced or interlaced types and they can be produced through one of the textile fabric manufacturing techniques like weaving, knitting, braiding and nonwoven means. Braiding was the first textile process used to manufacture a 3D fiber preform for a composite. 3D braiding is an extension of 2D braiding in which fabric constructed by intertwining or orthogonal interlacing of yarns to form an integrated structure through position displacement, which provides through-the-thickness reinforcement and ready acceptability to the fabrication of wide range of complex shapes. Three dimensional braids feature comparatively high level of fiber content and at the same time less than 1% voids by interlocking continuous layers of braid. There are basically two types of braiding machines: one is rectangular and other is circular to produce I or T beams and thick wall tubular structures respectively. In case of weaving, the earliest method has been noobing technique and the fabric so produced by the method is considered to be a non-woven fabric, even though produced on a loom. A number of methods have been developed which do not strictly conform to the 3D weaving principle and fabric properties differ accordingly. Preforms could accordingly be categorized as 3D woven 3D fabric and 2D woven 3D preforms. 3D preforms are also produced with knitting and nonwoven methods with interesting properties. Due to the flexibility in design and improved mechanical properties associated with the composites produced with these 3D textile preforms, they have tremendous potential for development in the field of composite manufacturing.

[#]Contributed by R Alagirusamy, Department of Textile Technology, Indian Institute of Technology, Delhi

Recently Published Book

Dynamics and Balancing of Multibody Systems

Himanshu Chaudhary and S K Saha

Series: Lecture Notes in Applied and Computational Mechanics, Vol. 37, 2009

Publisher: Springer Verlag Germany

This monograph develops a unified methodology for dynamic analysis and minimization of the inertia-induced forces occurring in high speed multiloop planar as well as spatial mechanisms based on the multibody system modeling approach. Dynamic analysis is prerequisite for the dynamic balancing of mechanisms. The balancing of mechanisms is one of the crucial steps in design of high speed machinery and is a difficult one due to trade-off amongst various dynamic quantities, e.g., shaking force, shaking moment, bearing reactions, and driving torques/forces. Hence, it is essentially an optimization problem where various dynamic quantities are computed repeatedly..... *more on <http://springer.com/978-3-540-78178-3>*



Salient Feature of the Book

The contents of this book are well grounded in the current research trends of multibody dynamics and mechanisms synthesis. A modern and advanced methodology for dynamic modeling of open-loop and closed-loop systems is developed systematically. The underlying problems associated with the minimization of inertia forces are important to reduce noise, vibration, and wear of machines, etc., and to improve their fatigue life, etc. The salient features of the book are outlined below.

- 1) A critical review of methods for modeling and simulation of multibody systems, as well as the balancing of mechanisms, is provided.
- 2) The decoupled natural orthogonal complement (DeNOC) matrices are introduced for serial and tree-type mechanical systems for the purpose of dynamic modeling.
- 3) Concise forms of the dynamic equations of motion are derived using DeNOC matrices.
- 4) Recursive dynamic formulations of constraint wrench for both open- and closed-loop systems are developed.
- 5) A number of nontrivial examples are solved to illustrate effectiveness of the dynamic analyses using the proposed formulations.
- 6) Using the equimomental system of point-masses, the dynamic equations are appropriately reformulated.
- 7) A general mathematical optimization problem is formulated for the balancing of inertia-induced forces, both for planar and spatial mechanisms.
- 8) Considerable reductions in shaking force, shaking moment, and driving torque is shown for practical mechanisms.

Review Report:

There are many great books being available in the area of multibody system dynamics of which this is just one. To the best of reviewer's knowledge, yet there are few books to deal with balancing using multibody dynamics, which makes this book exceptional.

The book covers the two main methodologies of multibody systems dynamics, i.e., DAE and ODE formulations, and compares them first. Then, it successfully presents one of the ODE formulations, meaning the Decoupled Natural Orthogonal Complement (DeNOC) Matrices since they are one of the authors' contributions. Using the DeNOC matrices, speeds up computational process in planar and spatial multibody systems as being a recursive formulation.

The second part of the book focuses on balancing of the foresaid systems and offers a unified and original methodology for minimization of the inertia-induced forces occurring in high speed serial and tree multi-loop planar and spatial mechanisms based on the multibody system modeling approach discussed in the last part.

The book incorporated comprehensible text, intelligible figures, and superior exercises, which make it recommendable for graduate students as well as researchers in multibody system dynamics area.

Rahmani-Hanzaki Ali

Assistant Professor and Dean of Students

Mechanical Engineering Department, Shahid Rajaei University, Tehran-Iran

Forthcoming Events (2009-2010)



NATIONAL SYMPOSIUM AND WORKSHOP
ON
PLANAR PARALLEL ROBOTS AND MECHANISMS
(In Memory of famous Researcher in Mechanisms and Machines, Late Prof. A. C. Rao)
January 7th - 10th, 2010

Organised by:
Department of Mechanical Engineering
Rungta College of Engineering & Technology
Bhilai, Chhatisgarh, India

Sponsored by:



Association for Machines and Mechanisms, India



Indian Society for Technical Education (ISTE)

Topics: Generation and Rating of Planar mechanisms, Synthesis and Analysis of Planar Mechanisms, Articulated Planar Robots, Application of MEMS to Planar Robots, Analysis and Design Medical Planar Robots, Design- Rating and Selection procedure for Planar Robots, Optimization of Planar mechanisms for an application (any one application may be chosen), Multi Degree of Freedom Closed Planar Linkages, Applications of Multi D.O.F. Closed Planar Chains, Any other relevant topics as felt suitable by the author(s).

About the Workshop: The workshop shall be having invited lectures by eminent Professors and Researchers in the relevant fields from IITs, IISc, NITs and Central Universities and also from Foreign Universities like Michigan State University and Cincinnati University, USA. Apart from the lectures the workshop shall demonstrate the usage of software like KINEMATIK, Altair Hyperworks Motion Solve and MBD, ANSYS etc for various processes involved from generation to fabrication of Planar mechanisms.

Participation Criterion in Symposium: Faculty for IITs, NITs, IISc, Universities and AICTE Approved colleges across India, Research Scholars of M.E/ M.Tech/ Ph.D and Post Doc Fellows, Scientists and Researchers of Govt Labs / Govt. approved and certified Laboratory.

Participation for Workshop: Same as above, also any B.E/ B.Tech Final Year students may attend.

Important Dates: Last date for sending Abstracts - 15th November 2009, Date of intimation for acceptance of Abstracts - 25th November 2009, Submission of camera ready full length papers - 25th December 2009, Registration for presentation / delegates - 29th December 2009, Intimation for Accommodations - 2nd January 2010, Symposium - 7th January 2009, Workshop - 8th and 9th January 2009, Concluding session - 10th January 2009.

Advisory Committee: Prof. J. S. Rao, Prof. C. Amarnath, Prof. S. Bandyopadhyay, Prof. S. K. Saha, Prof. V. P. Agarwal, Prof. T. S. Mruthyunjaya, Prof. Amitabha Ghosh, Prof. A. K. Khan, Prof. D. S. Bal, Prof. M. Choubey, Prof. A. K. Khare, Prof. S. B. L. Beohar, Prof. A. Jagadeesh

For details contact:

Dr.A.Srinath, Professor, R.C.E.T-Bhilai, Mobile: 09229355532, 09000364455

Email: srinath.79@rediffmail.com, srinath@rungta.org

Visit our website for Details and Information: www.rungta.org/nswpprm

Forthcoming Events (2009-2010)

The First Joint International Conference on Multibody System Dynamics (IMSD)

Lappeenranta, Finland May 25 - 27, 2010



Important Dates

- One-page abstract submission deadline: November 30, 2009
- Notification of acceptance/rejection: January 15, 2010
- Final paper submission deadline: March 31, 2010
<http://developmentcentre.lut.fi/muut/imsd/>



International Conference on Advances in Mechanical and Building Sciences in the 3rd Millennium

ICAMB-2009

December 14-15, 2009

In associated with
US University Partners
www.vit.ac.in/icamb2009



The National Conference on Machines and Mechanisms (NaCoMM) is a series of conferences organized by Association for Machines and Mechanisms (AMM), an affiliate of the International Federation for Promotion of Mechanism and Machine Science (IFToMM) on different themes of interest of Machines and Mechanisms once in every two years. In this year, 14th NaCoMM (NaCoMM-09) is being organized by the Department of Mechanical Engineering, National Institute of Technology Durgapur, India.

This year, a student mechanism competition will be held (Theme: Increase in the Usage of Pneumatics in place of Conventional System) during the conference. Final year / Pre-final year UG students from all branches of engineering can participate in this competition.

Website: <http://nacomm.nitdgp.ac.in/>



PDMA India IV Annual International Conference

NPDC 2009

NEW PRODUCT DEVELOPMENT: CHALLENGES IN MELTDOWN TIMES

December 17-19, 2009 at IIT MADRAS, INDIA



NPDC – International Conference on Product Development

Website: www.npdc.iitm.ac.in.



ROBOTic CONtest (ROBOCON) is the largest annual student (for undergraduate students) robotic competition in the Asia-Pacific region organized by the Asia-Pacific Broadcasting Union (ABU). India's national television broadcaster Doordarshan (DD) is an ABU member, and organizes Robocon in India too. Every year, the national champion represents India in the ABU competition. For example, in 2009, IIT Madras was the champion amongst 55 teams participated in the national competition held in Pune. It is an excellent way to get exposure of making robots by integrating mechanical, electrical, electronic and IT components as per the specifications provided the ABU organizer, and compete against a set of competent to be engineers, and make friendship. For 2010 competition, the game plan is available from <http://www.roboconegypt2010.com>. The ABU competition will be held in Egypt. The national competition is planned in the first weekend of March 2010. There are several awards in the national Robocon competition including the one "only for the first timers" to encourage the teams to take part in this competition.

For more details on the national competition, visit <http://www.roboconindia.com>.

Contributed by Prof. S.K. Saha, IIT Delhi (saha@mech.iitd.ac.in)

Reporting on IPRoMM 2009 Conference



Indian Institute of Information Technology Design and Manufacturing (IIITD&M) Kancheepuram and IIT Madras in association with AMM jointly organized a National Conference IPRoMM2009 during 10-11 July 2009 at IIT Madras campus, Chennai. This is a series of IPRoMM (Industrial Problems in Machines and Mechanisms) conference and the theme of the present edition was "Design and Manufacturing Issues in Automotive and Allied Industries".

Shri P Kaniappan, Director, M/s. WABCO-TVS (India) Ltd. presided the function and delivered the keynote lecture. Prof C Amarnath (President, AMM) released the conference proceedings. Prof S K Saha (IITD), Prof Satish V Kailas (IISc), Dr M Satya Prasad (M/s. Ashok Leyland), Dr T Venugopal (M/s. Tata Steel), Dr Balachandran (M/s. Ashok Leyland), and Dr Sreedharan (M/s. Rane) delivered invited lectures. Sixty contributory papers were presented orally by students, scholars and researchers from various academic institutions and scientists from industrial and research organizations. The presentations were divided into twelve sessions and grouped in two parallel sessions in the areas of Mechanisms and Mechatronics, Mechanical Design, Manufacturing Technologies, Materials and Design, and Modeling & Simulation. The major sponsors of the event were BRNS, DST and CSIR besides a few engineering industries from private sector.

Micro-mechanism – A New Area of Research

Miniaturization of the macro-size engineering world is not the only fascinating aspect of micro system technology which integrates one or more elements that sense, actuate and control. High performance machines already played an important role in the precision engineering commonly employed by modern industry, and will be increasingly important as precision engineering develops in the future. Fundamental research on micro-mechanism technology is in progress towards producing durable and practical micro-machines which have economical advantages. Work is going on related to the investigations into the production and properties of micromechanisms, development of machine and design technology, and the realization of the concept of "Microfactory". There are many examples of micro-mechanism, e.g. Barrier Climbing Micro Mechanism, Sumo (Wrestling) Micro Mechanism, Dice Operating Micro Mechanism, and Boastful Micro Mechanism, which even attract students for its further development. Generally, the size of a micro-mechanism is of the order of 10mm x 10mm x 10mm or less. For the development of such mechanisms, it will be necessary to develop a compact actuator, which can load itself and actuate, energy sources, a means for energy transmission, error insensitive mechanisms, a new effective mechanism unique to micro-mechanics, and a location/configuration sensor. It includes excellent elemental technologies, comprehensive manufacturing technology to fuse each elemental technology, and control/manipulation technology in order to realize such excellent micro systems. Another example of micro-mechanism is a micro gripper which includes a microactuator member and a microgripper member. The microactuator member includes an actuating portion adapted to output a driving force to the microgripper member. In a micro-machine, inertial forces are usually small compared to surface forces such as friction. The tribological characteristics of small contact surfaces under low normal load are to be studied in order to develop lubrication methods suitable for micro-machines. Materials generally behave differently in micro-machines than they do in machines where the components are of normal size. Special mechanical test methods for the materials used in micro-machines are therefore need to be developed. The effects of micro-structure, micro-defects, and surface layers on mechanical properties also need to be studied. A planar micro parallel-link mechanism also provides fine planar motion to a platform using comb-drive actuators. The kinematic and dynamic analyses need to be integrated with closed-loop control system to monitor and supervise the position and velocity of the micro mechanism. And, mechanical contrivance considering the scale effect is necessary. It is expected that the micro-mechanisms will contribute to the development of new machines with practical applicable use for business and society.

Dr. Subhasis Bhaumik, ZVP (East)

The next step of new industrial revolution

Indian industries have evolved over decades some time after independence starting in 60s and continuing in 70s. Industry got another boost when economic liberalization helped to open the gates of closed Indian economy for outsider companies in the 90s. By then, engineers of India were mostly busy at the shop floor slogging with the operators, foremen and supervisors. This helped them to gain hands-on experience and laid sound foundation for things to come.

Gradually, computer monitors took place of drawing boards and drawing sheets, while drafters and T-squares made way for AutoCAD and ProE, etc. Industries were getting increasingly automated and high speed complex manufacturing machineries with highly advanced capabilities started calling shots. These increasingly complex machineries needed even highly trained engineers to operate. Eventually, the Indian education system shifted gears to churn out more and more highly skilled and computer friendly engineers. Everything in the industry involved use of a computer, be it email communication, meetings, appointments, design, development, analysis and decisions. Computers offered seamless connectivity across the organization even if it is spread over few continents. Communication on various levels in different ways became the backbone of industrial evolution.

Already the engineers from India working in foreign countries have created positive impression with their hard work and technical knowledge. As the doors of Indian economy thrown open for foreign industries, they realized the availability of enormous engineering talent pool. Initially, mechanical component design & analysis was entrusted to Indian engineers by their foreign-based employer. Apart from this, turnkey projects design, installation and commissioning got Indian hands involved. The highly trained graduate and post-graduate engineers got hired to do very complex analytical tasks. After gaining sufficient confidence, finite element analysis (FEA) work has been delegated on Indian engineers and many MNCs opened their offices in India to tap this talent. Initial stress of these

technology and research centers was on analysis of various mechanical components and systems. Slowly focus on FEA has been shared by Computational Fluid Dynamics (CFD) and Multi-Body Dynamics (MBD) activities. These activities are high-end of engineering analysis and offshore engineers have reached a notch higher to grab this type of work and doing it successfully.

Recently, there is rapid rise in the simulation activities in every domain with all the advanced softwares coming to serve the analysis engineers. Right now, the complete prototype can be built in simulation softwares and various concepts can be proven without spending enormous amount of time, money and resources to create a physical one. This helps to reduce the time-to-market for the product significantly improving the chances of market realization and gaining lead over the competitors. Once enough confidence in the simulation model is confirmed, most of the physical tests can be done away and lot of efforts and energy can be saved. With technology developing by leaps and bounds, the day is not far away when the designer will dream of the product and it will be available for the consumer in the market within lightening time without a single physical prototype testing.

Prasad Bhangale, Ph.D.,
John Deere Technology Center – India
Email: prasadbhangale@gmail.com

SKF Knowledge @ Campus & Industries (A Partnership program from SKF India Limited)

HIGH LIGHTS :

1. Tie up with Industries & engineering colleges to impart knowledge in the field of equipment reliability & maintenance.
2. SKF shall provide the partnered industry or college with a set of Self learning tools (SLT) for training and support for knowledge building.
3. Certification from SKF - Reliability Maintenance Institute.
4. MoU with selected Industries & colleges.
5. Minimise the training cost ,improve equipment reliability, improve production.
6. Students become more employable by practical training.



For more details contact :
K.V.Suresh
SKF India Limited
28/3 Montieth Road
Egmore
Chennai 600 008
Phone : 044-30280137
Mobile : 09176691013

The SKF logo, consisting of the letters "SKF" in a bold, blue, sans-serif font.

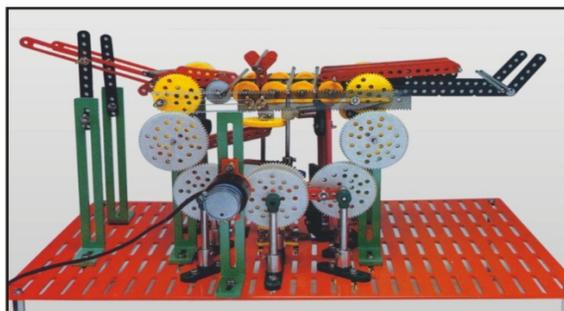
CONCEPT TO CREATION ... WATCH YOUR IDEAS IN ACTION

MAKIT®

• Patent Pending

The Creative Engineers Kit

A COLLECTION OF CAREFULLY DESIGNED, FLEXIBLE,
EASY TO ASSEMBLE, PRECISION MECHANICAL & CONTROL ELEMENTS.



* **MAKIT®** is available in 2 models.

* **MAKIT® - Master** : Contains all Machine elements

* **MAKIT® - Hitech** : Contains all Control elements

Now you can

- ... build your dream machine on your table !
- ... use the kit as an excellent teaching & training aid !
- ... use the kit components for the project works !
- ... use the kit components for Robotic competitions !

Ideal for :

- * **R & D Centres**
- * **Educational Institutions**
- * **Creativity Centres**

- * **Robotics Labs**
- * **Mechatronics Labs**
- * **SPM Manufactures**

Designed & Manufactured by :

TURNING POINT 

No. 47/1, 3rd Main Road,
Bapuji layout, Near Chandra Layout,
Vijayanagar, Bangalore - 560 040. INDIA
Ph. No. 080-23391257, Mob: 09845293360
E-mail : turningpoint_bangalore@yahoo.com
www.makit.co.in

Marketed by :

venlax  **MARKETING PVT. LTD.**

No. FF2, Garment Complex,
1st Floor, KSSIDC Indl. Estate,
Rajajinagar, Bangalore - 560 010. INDIA
Ph. No. 080-23102016, Mob: 09972502016
E-mail : sales@venlax.in
www.venlax.in

Editorial Board

Patron: Prof. S. K. Saha, IIT Delhi **Editor-in-Chief :** Dr. Subhasis Bhaumik, BESU Shibpur [ZVP East]

Editorial Members: Dr. Himanshu Chaudhary, MNIT Jaipur [ZVP West]; Dr. Rajesh Sharma, NIT Hamirpur [ZVP North]; Dr. P. Vivekananda Shanmuganathan, VIT University, Vellore [ZVP South].