

# Association for Machines and Mechanisms News Bulletin

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## 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 regularly.

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## Message from the Editor-in-Chief

### ROBOTICS RESEARCH: Fascination Vs Feasibility

In the immediate aftermath of the release of the Rajinikanth-starrer *Enthiran* (meaning *machine-man* or, equally meaningfully, *my prowess*) and the Hindi version *Robot*, I had a tough time facing friends and acquaintances whose pleasantries were invariably followed by comments and queries on the movie: "*Is that possible, and how about this one, too?*"

The field of robotics has fascinated mankind for many decades, with expectations and imaginations of the common man fuelled by innumerable many films and fictions. A large number of universities and research laboratories around the world have very strong research groups. Yet, there remains a gulf of difference between the creative imaginations and the actual state of the art in robotics.

The presumed negative impact of industrial robots taking away jobs from the humans are less talked of now. It was rather the much expected *Honda Humanoid*—its name *ASIMO* (Advance Step in Innovative *MO*bility) was a GK question in *Kaun Banega Crorepati*—that failed to make its market presence felt and got withdrawn, during one of the economic melt-downs, from the few places where it was deployed.

Industrial robots have indeed been employed in large numbers in a number of sectors even in India that witnessed a belated growth. Despite the prevailing unemployment, there were no qualms raised with the automotive industry employing in their assembly lines several dozens to over a hundred robot manipulators. However, there is a noticeable trend in these installations that the flexibility, automation, and the possible sensory intelligence that a robot could be endowed with, are hardly put to benefit. One might even wonder whether, in consideration of the current practice, the elegantly tool-changing computer-numerically controlled machines with much the same, if not fewer, number of axes as robots are rather more flexible in their operation! On the other hand, automatic end-effector change is seldom resorted in industrial robot installations. The multiple articulated-configuration robots each performing its specified task in programmed coordination are probably productive enough to require a tool change.

Nevertheless, much headway is imperative in a number of areas of robotics. The world is facing disasters on a larger scale and frequency these days, and robots of the current days are not autonomous enough to work in highly unpredictable and unstructured environments of a disaster-struck zone. While part of the problem may be solved in providing visual information, autonomous field robots are likely to become too bulky due to the poor power-to-weight ratio of on-board power sources, which themselves eat significantly into the payload!

Dexterity in mobility and manipulation is also still found wanting. The poor accuracy and resolution of humans and most living species is compensated by the dexterity of handling and mobility, as well as their ability to swiftly deal with enormous amount of sensory information they are bestowed with.

Exoskeletons and assistive devices for the disabled, some of which may even be required to have a means of capturing the user intentions, are areas where robotics is urgently required to provide usable and affordable products.

Unsolved problems in robotics have the potential for providing career challenges and opportunities in multiple fields for technologists of the next generation or even further into the future.

P. Vivekananda Shanmuganathan  
Editor-in-Chief

# Forthcoming Events



**NaCoMM 2011**  
15<sup>th</sup> National Conference on Machines and Mechanisms  
Indian Institute of Technology Madras, Chennai, India  
November 30 - December 02, 2011



Conference details and updates:  
<http://www.nacommm2011.org>  
Email:  
[nacommm2011@iitm.ac.in](mailto:nacommm2011@iitm.ac.in)



## CALL FOR PAPER

Authors are invited to submit a two-page extended abstract by **31<sup>st</sup> May, 2011**. For the submission procedure and the topics of interest, please visit the conference home page: [www.nacommm2011.org](http://www.nacommm2011.org). Based on the reviewers' reports, some papers would be selected for oral, and some others for poster presentations. Selected papers would be published in the IFToMM journal, Mechanism and Machine Theory. The best two papers (one in the general, and the other in the students' category) would receive AMM Best Paper awards.

## WORKSHOP

The conference opens with a one-day workshop on kinematics, conducted by the following experts:

**Prof. A. K. Mallik**, Honorary Distinguished Professor, BESU, Shibpur, India, and  
**Univ.-Prof. Dr. Manfred L. Husty**, Professor of Geometry and CAD, University of Innsbruck, Austria.

Workshop would focus upon the motion analysis and design of planar and spatial mechanisms. No additional registration formality/fee is required to attend the workshop. For more details, visit:

[www.nacommm2011.org/workshop.html](http://www.nacommm2011.org/workshop.html).

## MECHANISM DESIGN CONTEST REGISTRATION FOR STUDENTS

The objective of the competition is to encourage the students to apply their theoretical knowledge in the domain of mechanisms and machines to solve problems relevant to the society. Participation is restricted to individuals or groups of students (up to three members), registered as full-time students or research scholars or project assistants in recognised institutes.

The design problem may be chosen from a wide range of application domains - from agricultural and rural technology to automobile and aerospace engineering. A few examples are:

- Tree climbing mechanism,
- Assistive devices for vertical transport of materials at construction sites,
- Walking mechanism (with two or more legs), for rough or even terrains,
- Assistive devices for people with physical impairments.

The above are only representative and the participants can choose any relevant problem. Participants are required to submit a two-page proposal by **15<sup>th</sup> August, 2011** outlining the design challenge and innovation of the proposed design. For more detailed information about the competition, please visit: [www.nacommm2011.org/studentcontest.html](http://www.nacommm2011.org/studentcontest.html).

At least one author of each accepted paper is required to register for the conference by **15<sup>th</sup> October**. Registration categories and fees, etc. are available at the site: [www.nacommm2011.org/register.html](http://www.nacommm2011.org/register.html).

Further instructions would be posted on this site as appropriate. AMM Life/Corporate members are entitled to a concession in the registration fee upon quoting their membership numbers during the registration process.

## KEYNOTE LECTURES

**K. Lakshminarayana Memorial Lecture**, by **Prof. Ashitava Ghosal**, Department of Mechanical Engineering & CPDM, Indian Institute of Science, Bangalore, India.

**B. M. Belgaumkar Memorial Lecture**, by **Prof. Dr.-Ing. Andrés Kecskeméthy**, Chair of Mechanics and Robotics, University of Duisburg-Essen, Germany.

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## Other Forthcoming Events

**International Conference on Microactuators and Micromechanisms**  
**CSIR-CMERI, Durgapur, India**  
January 19-20, 2012  
<http://www.cmeri.res.in/mamm2012>

**2011 ASME Student Mechanism & Robot Design Competition**  
**Washington, DC, USA**  
August 28-31, 2011  
<http://sites.google.com/site/asmesmrdc/>

# AMM General Body Approves Financial Assistance to Students

The Association for Machines and Mechanisms has earmarked Rs. 25,000 every year to provide financial assistance to students attending AMM-sponsored events. Up to five students will be supported every year with Rs. 5,000 each.

The proposal was approved on February 25, 2011 in the General Body Meeting of the association at K.L. University, Vijayawada, on the sidelines of the *International Conference of Multibody Dynamics*. Professor S.K. Saha, Vice President, chaired the meeting. A dozen members, including Prof. B.V.A. Rao, Prof. J.S. Rao, and Prof. T.S. Mruthyunjaya, attended the meeting.

The other issues deliberated upon in the meeting include:

- IIT Roorkee to host NaCoMM 2013, following IIT Madras that won the privilege in 2009 of hosting the NaCoMM 2011 amidst stiff competition.
- AMM to start the National Leg of the Mechanism Olympiad in order to motivate Indian students further and help them become competitive internationally in mechanism design.
- Request to past office-bearers of AMM to transmit member database and other AMM-related documents to the present secretary to maintain integrity of the databases.
- Initiation of faculty development programmes in order to improve the teaching in the field of mechanisms and machines.
- Approving a refundable seed-fund of Rs. 25,000 for AMM-sponsored events.
- Contribution of 40% of excess funds from AMM-sponsored events to AMM in order to help the latter enhance its role in motivating students with financial support for participation in AMM-sponsored events.

### Novel Fibres and Fabrics for Extreme Cold-Weather Clothing Applications

Human body generates and dissipates the thermal energy continuously. The rate of dissipation depends on various factors such as metabolic heat production, external work done, environmental variables, namely, temperature, relative humidity and air velocity, etc. If the weather is extremely cold, the rate of dissipation is higher than the rate of production, causing the reduction in the core temperature of the body, which leads to hypothermia. To overcome this situation, heat loss from the body has to be minimized by means of proper selection of the clothing. Since olden days, animal fur has been used to protect the body from extreme cold environments.

Synthetic fibres such as polyester, acrylic, micro denier fibre, hollow fibres and fabrics with different structures are possible alternatives in the development of such clothing. Dr. Apurba Das and Dr. K. Shabaridharan, researchers with the Department of Textile Technology, IIT Delhi, report here some of the studies on the thermal and moisture vapour transmission behaviour using such fibres and fabrics.

Gao et al. (2007) have carried out a detailed investigation on the properties of goose down fibres and compared with the properties of other fibres such as wool and cotton. They have reported that the down fibre has 3 to 5 times higher bulkiness, higher compression and good recovery by agitation, than other fibres due to the nodes that are projecting from the surface of the fibres. It was also reported that the thermal conductivity of the down fibre is lesser compared to other fibres.

Das et al. (2009) studied the thermal transmission behaviour of needle punched fabrics produced using shrinkable and non-shrinkable acrylic fibres. The thermal conductivity was found to increase with the increase in the proportion of shrinkable acrylic fibres up to 40% after which it decreased. This was attributed to the creation of air spaces within the structure due to the shrinkage of acrylic fibres.

An attempt has been made by Debnath and Madhusoothanan (2010) to investigate the effect of the cross sectional shape of fibre on the thermal properties of needle punched non-woven fabrics. It is reported that the thermal insulation of the fabric produced from trilobal polyester fibre is higher, followed by hollow fibre, which is attributed to the higher thickness of the fabric produced from trilobal fibre. It is also reported that the punch density and mass per unit area, which have the direct effect on consolidation of fibrous assemblies, thickness and porosity of the fabric, have the significant effect on the thermal insulation properties

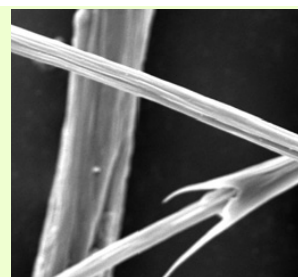
Mao and Russell (2007) have made an attempt to analyse the thermal transmission properties of two different spacer fabrics which are relatively thicker and thinner, mechanically bonded with wool fibre. Hydro-entanglement system is used to make the mechanical bonding. It has been reported that the alignment of fibre with respect to the direction of heat flux and the aperture size of the spacer fabric plays a significant role in determining the thermal resistance of the spacer fabric. In the past few decades, such attempts made by researchers have given significant improvement in the thermal comfort properties of clothing meant for extreme cold climatic conditions.

Gao, J., Yu, W., and Pan, N. (2007) STRUCTURE AND PROPERTIES OF THE GOOSE DOWN AS A MATERIAL FOR THERMAL INSULATION', *TEXT. RES. J.*, 77 (8), 617 – 626.

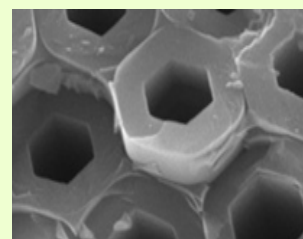
Das, A., Alagirusamy, R., and Banerjee, B. (2009) STUDY ON NEEDLE-PUNCHED NON-WOVEN FABRICS MADE FROM SHRINKABLE AND NON-SHRINKABLE ACRYLIC BLENDS. PART II: TRANSMISSION BEHAVIOUR, *J. TEXT. INST.*, 100 (4), 350 – 357.

Debnath, S. and Madhusoothanan M. (2010) THERMAL INSULATION, COMPRESSION AND AIR PERMEABILITY OF POLYESTER NEEDLE PUNCHED NON-WOVEN, *INDIAN J. FIB. TEXT. RES.*, 35 (1), 38 – 44.

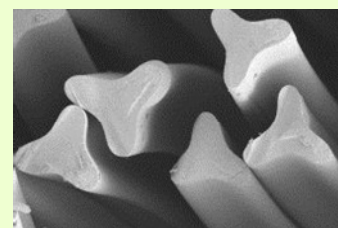
Mao, N., and Russell, S.J. (2007) THE THERMAL INSULATION PROPERTIES OF SPACER FABRICS WITH A MECHANICALLY INTEGRATED WOOL FIBER', *TEXT. RES. J.*, 77(12), 914 – 922.



Nodes projecting from the surface of the downfibres



Cross sectional view of hollow fibres



Cross sectional view of trilobal fibres



Spacer fibres



## INDUSTRY WATCH

Why are Indian manufacturing industries, in large, characteristically lagging behind, with low productivity and operating at sub-optimal profits; and consequently not having a desirable share in the national growth and GDP? Dr. Ashish Mohan ponders over this pertinent issue.

Despite of all the synergy in the political system, potential strategy, values and maturity of the industry, automation and mechanization in Indian industry, especially in the non-automobile sectors such manufacturing, mining, and textiles, are still to be exploited to the fullest potential. Macroeconomic stability and the availability of a large set of cheap, albeit unskilled, labour force are India's strengths and advantages in manufacturing. However, the country still lacks dynamic participation by the private sector, skilled knowledge-workers capable of creating valuable knowledge linkages, and extension of institutions of a free market economy into these sectors. Consequently, the automation in a number of industrial sectors has not been significant enough.

In order to achieve India's vision of becoming a developed economy by 2020, manufacturing sector must have a greater share in GDP. To be competitive in the modern economic scenario, the Indian firms must present before the world a real differentiating value proposition system in its manufacturing industries. Noticeably, there are not many success stories of Indian firms in the core industries of the manufacturing sector.

In order to revive its sluggish manufacturing sector, Indian industries must incorporate automation in the technology. The automation in the industries is amateur, and there is a complete absence of technology management in it. An appropriate application of the latest technology and mechanization in the Indian industries can alleviate the shortcomings. A three pronged approach is suggested here for the revitalization of Indian manufacturing industries:

### ***Absorption and Adaptation of Knowledge in Technology (through collaborations)***

India's competence in the conventional methodologies must lend synergy to the excellence of the global players in research and automation. Thus, for a sustainable growth and prosperous manufacturing base in the industry, Indian firms must enter into collaborations with major global giants. The automobile sector of Indian industries is one such sector which presents showcase examples of successful and sustainable growth and productivity through technical collaborations with foreign companies. For example, Honda, the Japanese auto major, has a successful JV with Hero group and the combined Hero-Honda has more than 50% share in Indian two-wheeler market. Honda is further planning to expand its production capacity to 160,000 units. Maruti Suzuki India Ltd (MSIL) has more than 55% share in the passenger car market of India.

### ***Creation of Knowledge in Technology - Emphasis on R&D based Automation and Mechanization of Industry***

Indian companies must identify the importance associated with the self generated technology in the industry. As a user of technology developed by other countries, Indian industries are generally applying outdated technology, and hence, are operating at low levels of efficiency. They are also prone to economic fluctuations in these countries and sanctions against technology in these countries.

For a sustainable model, Indian industries must invest in R&D and create their own technology for modernization of machinery. A showcase example is again presented by the automobile sector of Indian industries: Tata Motors, the market leader in commercial vehicles in India, has a formal infrastructure for research in technology and its development. It maintains its market leadership through investment in research and innovations. A pioneer in innovations, it has introduced indigenously developed products in market at regular intervals, namely Tata Sumo in 1994, Indica in 1998-99 and Tata Nano in 2008-09. MSIL also plans to invest US\$ 2.25 billion, mostly in R&D, warehousing, marketing, logistics and design. The direct correlation between the market share of a firm and its investment in research in automation and technology is not merely coincidental.

### ***Management of Technology and Automation in Indian Industries***

The firms must evolve a framework of adaptation, utilization and diffusion of technology at the various levels of applications. There are also issues at the policy level, both at the company and the national level, which need to be addressed. These include: (i) Replacement of the sluggishness in the decision-making/implementation process by predictability and reliability; (ii) Providing end-to-end automation solutions rather than modular solutions; (iii) Improving upon the present poor state of infrastructure as compared to facilities available in other countries.

One could cite in this connection, specifically, the Delhi metro project and the Haldia petrochemical programmes, which present examples of adaptation, utilization and diffusion of technology across the organizations through state of the art project management and technology handling.

It becomes imperative here to further analyze the present trends in the industry with respect to technology management. There is discrimination by global companies against Indian companies when it comes to the matter of hi-tech transfers and high value automation projects, primarily because of an apparent lack of vendor trust-worthiness for Indian firms. There are apprehensions related to confidentiality of technology and intellectual property rights. Indian firms must re-build upon their image, and create a conducive atmosphere for technology transfers.

It is envisaged that by implementing the series of changes at various levels as highlighted above Indian manufacturing sector should be able to carve out a strategically advantageous environment for itself.



The first *International Conference on Multibody Dynamics* was held at KL University during February 24-26, 2011. Dr. Avinash Chander, Distinguished Scientist of DRDO, was the chief guest of the inaugural session of the conference, which was held at the Peacock Hall of KL University.

The conference was organized under the aegis of *International Federation for The Promotion of Mechanism and Machine Science* (IFTToMM), *Association for Machines and Mechanisms* (AMM), and *The Vibrations Institute* (TVI) of India. The presidents of these three bodies, Prof. Marco Ceccarelli, Prof. C. Amarnath, and Prof. J.S. Rao, respectively, were present during the Conference. Dr. Chander expressed the desire for joint research projects with organizations such as TVI and academic institutes such as KL University.

The proceedings were brought out in collaboration with TVI. A few select papers of the conference are likely to be published in the TVI Journal, *Advances in Vibrations Engineering*. The Conference Proceedings will also get the ISSN numbering from TVI.

There were twelve keynote lectures delivered by eminent speakers, seven from within the country and five from abroad. Forty-five research papers were submitted and three different software demonstrations had been arranged for the benefit of the research community. The papers presented in the conference were categorized into different sessions on *Vibrations*, *Mechanisms*, *Robotics*, and *Multibody Systems*. The presentations were chaired by eminent researchers from renowned institutes such as IITs, IISc, and NITs, assisted by a Co-Chair from the host university.

The Conference dinner was hosted on the evening of February 24, 2011 at Vijayawada Club. The dinner was preceded by excellent cultural programs that depicted Indian classical and folk culture.

Prof. J.S. Rao, Prof. Marco Ceccarelli, and Prof. B.V.A. Rao were honoured with *Life-time Felicitations* for their contributions in Rotor Dynamics, Mechanisms, and Bearings/Vibrations, respectively. Er. K. Sataynarayana, Chancellor, K L University, and Prof. G.L. Datta, Vice Chancellor, KL University, presented them with floral bouquets, citations and mementos.

*(With inputs from Dr A. Srinath, KL University)*



The game arena for Robocon India 2011 (on the left) is seen glittering and colourful at the Balewadi Stadium, Pune. This very stadium hosted the Asian Youth Games 2008 for which it was originally built. The picture on the right shows one of the robots built by the Team Robocon of NIT Durgapur.

Debal Saha, Student of the 3<sup>rd</sup> Year B. Tech. Mechanical Engineering Programme of National Institute of Technology, Durgapur, writes on the ABU Robocon 2011 and the Robocon India 2011. The author may be contacted at debalsaha@yahoo.com.

**ABU Robocon** is a popular robotics event where autonomous and manually-operated robots made by college students compete in different categories. This event was conceived in the year 2000 by the Asia-Pacific Broadcasting Union, of which India is a member. The member countries of ABU jointly agreed in the year 2000 to organize an annual handmade robot contest to be participated in by the students of colleges, universities and polytechnics in the Asia-Pacific region, with the objective of developing knowledge, creativity and innovation among the youth in the region, in addition to promoting relationship and cultural exchange among countries in the region. The event is hosted every year by one of the member countries with the theme of the event also reflecting the culture of the host country. The *ABU Robocon* was launched in 2002 for the first time in Tokyo, Japan. The next five contests were held in Thailand, Korea, China, Malaysia, and Vietnam. India hosted the event in 2008. Japan is the only country to have got the second opportunity (in 2009). *ABU Robocon 2010* was held in Egypt last year.

Thailand is hosting this year's *Robocon* in Bangkok in August 2011. The theme of the contest is based on the traditional Thai ceremony, called *Loy Krathong*, which is to honour the Goddess of the river. The competing teams shall build one manual, and one or two autonomous-robots to pick up joss-stick pots and place them in a specific pole-top. Further, a candle-base needs to be picked up and placed on an elevated platform, called the *sala*. The autonomous robot(s) shall collect the *Krathong* petal-and-flower pot, and then assemble them on the candle-base atop the *sala*, followed by the manual robot picking up the joss-sticks from the joss-stick pot and placing them in the assembly to complete the *Krathong*. Then, the autonomous robot should place the completed *Krathong* on a wooden platform called the *River Surface* that sets into slow oscillations as the *Krathong* is dropped on it.

Doordarshan-MAE organized *Robocon India 2011* on March 5, 2011 at the Balewadi Sports Complex, Pune, to select the robot team that will represent India in the International event in Bangkok. Fifty-nine teams from colleges from all over India participated. The highly competitive selection process consisted of matches at various levels. In the *league matches*, the contest was between three teams. The team with the best score would be declared the winner. Winners of each of the eighteen league matches graduated to *Super 18*, the winners out of which competed in *quarter finals* and then *semi-finals*.

In the *finals*, Institute of Technology, Nirma University, beat IIT Mumbai Team A. Following this victory at the national level, Nirma University will represent India in *ABU Robocon 2011* in Bangkok.



## ABU Asia-Pacific Robot Contest: *ABU Robocon 2011* (Continued)

Team Robocon of NIT Durgapur participated in the Robocon India 2011 with one manual and two autonomous robots. Aluminium-L sections were used in the fabrication in order to reduce weight. The autonomous robots had LED sensors to detect the grids in the gaming arena. AVR microcontrollers were used to program the robots for path following and for other tasks anticipated in the contest. NIT Durgapur contested in League O with Sardar Vallabh National Institute of Technology, Surat, and Ambedkar Institute of Technology, Delhi. In the match against SVNIT Surat, NIT Durgapur scored 30 points with manual robot but the unfortunate malfunction of an autonomous robot attracted penalty to bring down the score to just two points in the first set. In the latter two sets, the manual robot of NIT Durgapur repeated its score of 30, beating SVNIT Surat with only 28. AIT Delhi could manage only 6 points while NIT Durgapur was consistent with 30 points in all the sets against AIT Delhi. NIT Durgapur had indeed won the league match, yet several other teams had won other league matches with better scores, so NIT Durgapur lost its chance to Super 18. Nevertheless, Team Robocon of NIT Durgapur is a proud participant of the coveted event.

One of the Robocon India judges, Prof. S.K. Saha of IIT Delhi, is available for live chat once in a month or two at the website [www.roboconhelp.com](http://www.roboconhelp.com). This website has been started in the general interest of the students who want to take part in Robocon or similar competitions. Any student can join the group and benefit from the experiences of the others.

## National Conference on Industrial Problems on Machines and Mechanisms (IPRoMM 2010)



The 10<sup>th</sup> National Conference on *Industrial Problems on Machines and Mechanisms* (IPRoMM 2010) was held at *Malaviya National Institute of Technology Jaipur* in association with *Association for Machines and Mechanisms* (AMM), India during December 17-18, 2010. With an objective to draw attention of the hitherto neglected area of handicraft sector in India, the conference focussed on ***Design and Development of Tools and Equipment for Handicrafts Sector***.

Fifty-five abstracts were received from researchers all over the country in response to the call for papers for the conference. These abstracts were examined to assess the fit with the scope of the conference. Out of these papers, 34 papers were accepted for oral presentation as well as publication in the conference proceeding and. These papers were published in the conference proceeding in six different sections, namely, *Dynamics, Mechanisms and Robotics, Design Improvement and Optimization, Use and Selection of Materials, Industrial Problems-I, and Industrial Problems-II*.

Prof. S.K. Saha of IIT Delhi presented a keynote lecture on “*Devices for Carpet and Other Sectors of Rural India: An Opportunity for New Research*”. Prof. S.K. Rathore of Rajasthan Technical University focussed his keynote address on “*NDT Techniques: An overview with focus on Laser based Ultrasound*”. There were two speakers from the industries. Mr. Nand Kishore Chaudhary, Chairman, Jaipur Rugs Company Private Limited, Jaipur (India) presented “*The Scenario of the Carpet Sector in India and its Challenges*”. Dr. Ramesh Mittal, Deputy Director, CCS National Institute of Agricultural Marketing, Jaipur, delivered a lecture on “*Handicrafts sector in India: Problems and Prospects*”.



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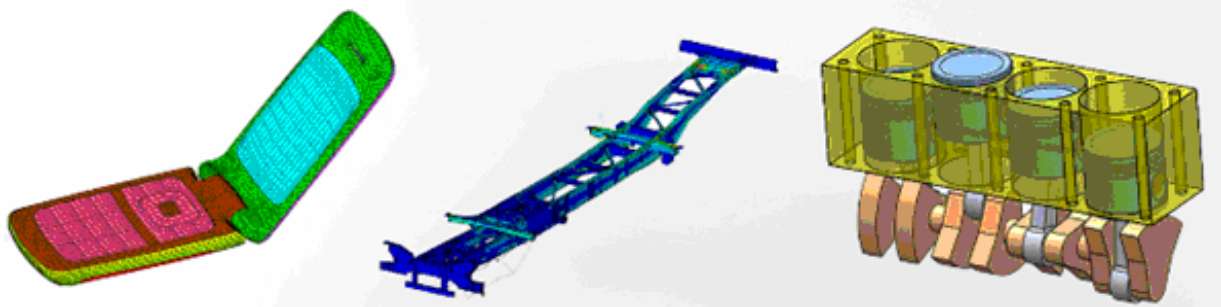
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