

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

Biomechanical Energy Harvesting Devices: Finding Alternatives for Rural Applications

Biomechanical energy harvesting from human motion presents a promising clean alternative to electrical power supplied by batteries for portable electronic devices and for computerized and motorized prosthetics.

Power availability certainly has been a constraint in Indian development story. In rural India many villages are either not connected to the electric grid or connected to unreliable grids. India is not going to eliminate this problem in near future through national grids. India needs certain electricity generating alternatives to this problem so that in rural India people can get sufficient power for charging their mobile phones and running the portable electronic devices. If power can be generated at this scale then it will surely pave the way for efficient innovative devices, which can improve the living standards of people in remote areas, where power availability has been a constraint. These can be weather forecasting devices or any other communication devices. For portable devices we use batteries but the convenience of all above applications would be enhanced by a technology that would provide energy for an extended time, without the need to recharge batteries.

A promising clean alternative way of meeting the above-described need is to exploit the heat and motions generated by the human body to generate electrical energy, which has been popular since inception of human development history. B. Tech students of MNIT propose to develop a knee mounted energy harvesting device as an alternative low cost, highly efficient, fast to install, pervasive and locally available resource oriented alternative to solve this problem. See the article inside.

Dr. Himanshu Chaudhary, Editor-in-Chief

1st International & 16th National Conference on Machines and Mechanisms (iNaCoMM-2013)

Indian Institute of Technology (IIT), Roorkee

18-20 December, 2013

Department of Mechanical & Industrial Engineering, IIT Roorkee under the aegis of Association for Machines and Mechanisms (AMM), and the International Federation for the Promotion of Mechanism and Machine Science (IFTToMM) will be organising iNaCoMM-2013 at IIT Roorkee. This is the first time the conference has been declared international in order to easily embrace researchers from other countries. The conference aims at bringing together researchers, industry experts and students interested in various aspects of design and analysis of machines and mechanisms. The conference will also have keynote lectures and a students' mechanism design contest.

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Development of Knee Mounted Energy Harvester as a Portable Power Generation Device

by

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Human body is an attractive source of energy. Muscles consume chemical energy to produce mechanical work with a peak efficiency of approximately 25%, comparable to that of the internal combustion engines. Compared with the methods of harvesting human energy using piezoelectric, electro-active polymer and electro-magnetic generators, a light-weight electromagnetic generator is capable of efficiently converting mechanical power into electrical power in a form suitable for charging a battery. Heel strike, and knee or ankle motions seem to be good candidates for energy harvesting devices, since a relatively large part of their total energy can be recovered. Furthermore, these motions are almost all single-degree of-freedom movements, which simplify the device design. Although the input speed and torque requirements for magnetic generators are not ideal for direct coupling to knee motion, we found them superior to the other alternatives because of the feasibility of designing efficient transmissions to convert the knee joint power into a suitable form. The device developed by us uses a one-way clutch to transmit only knee extensor motions, a spur gear transmission to amplify the angular velocity, an electromagnetic generator to convert mechanical energy to electrical energy and a customized orthopedic knee brace to support the hardware and distributing the device reaction torque over a large leg surface area.

Our knee-mounted energy harvester device can generate about 10 W of power. It is a good source of portable power, thanks to the physiology of walking. It is one of the most efficient biomechanical energy harvesters and it can possibly be used as a device for charging or powering mobile electronics which consumes power less than 10 W. One of the applications which we suggest is of mobile charging because mobile gets charged with a power requirement of 5.6 W and remaining power can be utilised in lighting DC 3W bulbs if required through energy storage in battery.



Knee Mounted Energy Harvester

(Continued from Page 1)

A Special Session on Multibody Dynamics: A set of relevant papers will be presented in this session. Short tutorial is also planned.
Organizer: Prof. S. K. Saha, IIT Delhi, and Prof. Javier Cuadrado, Spain (Chair of IFToMM TC for Multibody Dynamics)

Other topics of iNaCoMM-2013 include: Analysis and Synthesis of Mechanisms; Compliant Mechanisms; Design and Analysis of Biomedical Devices; Dynamics and Vibration Analysis in Machines; Fault Diagnosis and Health Monitoring; History of Machines and Mechanisms; Mechanisms and Machines for Rural, Agricultural and Industrial Applications; Mechatronic Systems; Micro-, Nano-Machines and Mechanisms; Modeling and Simulation; Robotics; Theoretical and Computational Kinematics; Tribology; Vehicle Dynamics.

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Experiences in the International Conferences on Multibody Dynamics

by

Subir Kumar Saha, Dept. of Mech. Eng., IIT Delhi

The second International Symposium on Multibody System Dynamics (IMSD 2012) was held at Univ. of Stuttgart during May 29-June 01, 2012. The first one was held in Lappeenranta, Finland. In Stuttgart, there were four registered participants from India, even though finally three participated and two papers were presented. China, Korea and Japan, on the other hand, had about 16-19 participants each. This showed the popularity of the topic in other leading Asian countries. In fact, this could be the reason that the Asian Conference on Multibody Dynamics (ACMD) is getting held in these three countries only. So far ACMD was held in Korea and Japan. This year it will be held first time in Shanghai, China during August 26-30, 2012. In fact, the subject is slowly gaining popularity in India as the auto and other companies like Tata Motors, John Deere, Time Tooth Technologies, JCB India and similar companies have started hiring graduates with multibody dynamics background. Hence, an attempt was made to hold a multibody conference in Vijayawada, India last year (Feb. 2011). Even though it had international participants, they were all invited speakers. In order to encourage the topic, which according to many of us in the academic institutes and industries is of great importance in the era of simulation, because almost any process, be it mechanical, electrical, textile or even biological, is attempted to be theoretically studied through simulation.

About 200 papers presented in IMSD 2012 were classified under Theoretical and Computational Methods (TCM), Algorithms, Integration Codes and Software (AICS), Robotics, Control and Mechatronics (RCM), Flexible System Dynamics, Optimizations, Contacts and Impacts, Efficient Methods, Rotating Structures, Vehicles, Biomechanics, and other topics. From India, two presentations were in the category of TCM and AICS. The third paper was in the area of RCM. As the topics listed above are not new to the Indian researchers we must make an effort to share our results with the international community. It is true that sometimes it is difficult to attend international conferences due to the associated difficulties, e.g., paying hefty registration fees, buying air-tickets, getting visas, etc., but it is worth attending these conferences if we consider placing India in the global scenario. Moreover, it is important that we attend one or two good conferences of our choices regularly so that the community slowly starts recognizing the Indian researchers. Just to share my experience over almost last one and half decades, I have attended six European, Asian and International conferences on Multibody Systems, whereas my students have attended some 4-6 more. Hence, this time (during IMSD 2012) I was approached by the Chairman of International Steering Committee of IMSD if I could join the committee. I feel this is the recognition of the Indian researcher community by the international key figures whom I have been meeting again and again. In fact, many of them like to attend the multibody dynamics conferences in India too. I hope I will be able to encourage Indian participants during IMSD 2014 and 2016 to be held in South Korea and Canada, respectively. Besides, we the community should be able to host IMSD or ACMD in future too.



Student participants of IMSD 2012 on the street of Stuttgart downtown



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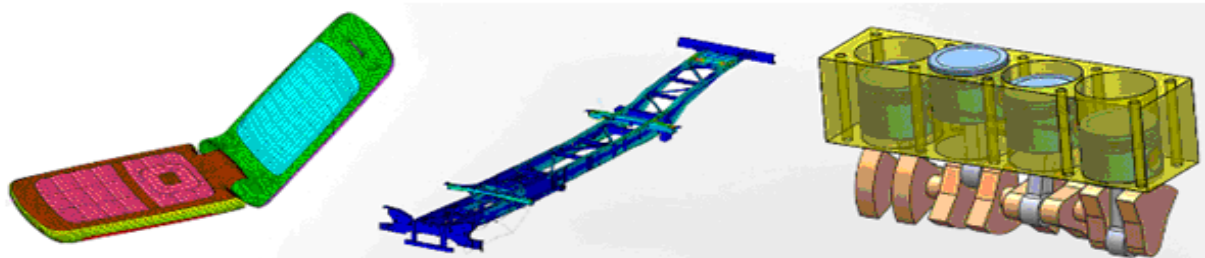
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