

Association for Machines and Mechanisms News Bulletin

Volume 9, No. 1

January 2017

Message from the Editor-in-Chief



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 International & National Conference on Machines and Mechanisms, iNaCoMM, and the workshops on Industrial Problems on Machines and Mechanisms, IPRoMM regularly.

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Due to some unavoidable circumstances, publication of the January 2017 issue of the Bulletin of the Association for Machines and Mechanisms (AMM) is somewhat delayed.

In this New Year, Bulletin of the AMM **Volume 9, No. 1, January 2017** issue is now ready for publication. Dr. Shankar Sehgal, Zonal Vice President (North), initiated to bring out this issue.

Dr. Shital S. Chiddarwar (Zonal Vice President- West) has contributed effectively to send an article and a report of XII IPRoMM National Workshop 2016. Dr. G. Saravana Kumar, Secretary AMM, and other office bearers of the AMM have extended background support as usual.

Report on the proceedings of the 12th IPRoMM National Workshop 2016 on Industrial Problems on Machines and Mechanisms held at VNIT, Nagpur is included in this issue. Thanks to the Organizing Team from VNIT Nagpur for compiling the report. The Award Winning article on "**Solar Panel Cleaning Robot**" authored by Vijay Kulwant and S.S. Chiddarwar is also placed in this bulletin.

AMM members and other interested persons are requested to contribute articles and send the same to the editorial team for April 2017 issue. Constructive suggestions, comments for improvement of the Bulletin of the AMM are requested.

On behalf of the Editorial Team of the Bulletin of AMM, I thank all concerned for their support, good wishes and suggestions for bringing out of this Bulletin.

Hope you all have a wonderful New Year 2017!

Prof. Santanu Das
Editor-in-Chief

About the Association of Machines and Mechanisms (AMM)

AMM headquarters are currently located at the Department of Engineering Design, IIT Madras. A new set of office bearers have taken charge of the affairs of AMM. AMM invites both individual and corporate membership from Indian academia, research organizations and industry. Membership benefits and other information about AMM are available at www.ammindia.org. The body of Zonal Vice Presidents (ZVPs) is active over the past several years with representations from the four corners of the country. They are playing the role of nodal agencies so as to decentralise the AMM official activities and to organise workshops under the aegis of AMM to popularise the mechanism science in their respective regions. They also form the editorial team of this news bulletin. AMM invites contributory articles from its members and others working in the various fields of mechanisms science for this quarterly news bulletin. Interested people can contact the editorial team.

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**An ordinary teacher can express,
A common teacher can explain,
A good teacher can experiment,
A great teacher can inspire (the
inner sprit of the student).**

--- Anonymous

Brief Report on XII IPRoMM-2016 Organized by the Department of Mechanical Engineering, Visvesvaraya National Institute of Technology Nagpur

National Workshop on Industrial Problems on Machines and Mechanisms (IPRoMM 2016) was organized under the aegis of the Association for Machines and Mechanisms by Department of Mechanical Engineering of Visvesvaraya National Institute of Technology Nagpur. The main theme of the workshop is “Challenges in Manufacturing”. IPRoMM 2016 was organized with the aim to provide a platform to bring together academicians, researchers, designers, practicing engineers and other users of industrial machines to share the problems, solutions, new developments & ideas and relevant issues. It was a two days’ event, 22-23 December 2016. IPRoMM 2016 has been successful in attracting about 89 research papers for final publication in the proceedings. An open competition – “Designing Challenges”, based on live industrial problems is being arranged as part of IPRoMM 2016 to promote research on industrial issues and this is the first time that such a competition is included in IPRoMM workshops. In addition to this, a workshop on Solid Modelling is also being arranged for students as part of this event.



Release of XII IPRoMM Proceedings on 22.12.2016

The inauguration function of XII – IPRoMM was graced by Mr. M.S. Unnikrishnan, MD and CEO of Themax Ltd. Pune and Prof. Narendra S. Chaudhari, Director VNIT Nagpur. He addressed the gathering with his views on current trend in Manufacturing Industries i.e. Industry 4.0. Eminent personalities from various industries like Ashok Leyland Bhandra, Thermax Ltd. Pune, IOCL Nagpur were present along with eminent professors from various academic institutes. Dr. G. Saravana Kumar, Secretary AMM also briefed about activities of AMM during inaugural function.

IPRoMM 2016 included a special session on “Human Powered Machines”, in the honour of Prof. Jayant Modak, who has been recently awarded D. Sc. in Engineering Sciences by Rashtrasant Tukdoji Maharaj Nagpur University for his contribution in the field of “Human

powered machines”. The key note addresses by eminent personalities like Dr. C. Amarnath, former Professor, IIT Bombay and President AMM, Prof. Kshitij Gupta, Professor, IIT Delhi, Prof. J. P. Modak, Prof. Emeritus PCE Nagpur and Dr. G. Saravana Kumar, Associate Professor, IIT Madras were also scheduled during this two days’ event.

Overall, 100+ papers were submitted for IPRoMM-2016 through EasyChair. Out of them 89 papers were accepted for oral presentation and publication in the proceedings. 103 delegates registered for the IPRoMM, 15 for designing challenges and 21 for solid modelling competition. The 80 research papers were presented on both days of workshop. From the accepted papers, following papers were awarded with prizes based on recommendations of the reviewers.

First Prize (Rs. 5000/-): Design of a universal test setup for testing motors at ambient and thermovac, by Mahesh Ch, Dheerank R, Gaurav V Kotecha, Abhinandan Kapoor, Abhishek Kumar and Keshava Murthy Ka, ISRO Bangalore.

Second Prize (Rs. 3000/-): Design of pedal operated behda cracking machine using flywheel motor, by Vipul Satone, Nimesh Chahare and Pramod Padole of VNIT Nagpur.

Third Prize (Rs. 2000/-):

- a. Modeling of a magneto-rheological (MR) damper using genetic programming, by Pravin Singru, Ayush Raizada, Vishnuvardhan Krishnakumar and Akhil Garg, BITS Pilani Goa Campus
- b. Multi-sensor tool condition monitoring in end milling of Ti-6Al-4V, by Neelesh Kumar Sahu, Makrand Channe and Atul Andhare, VNIT Nagpur

Consolation:

- a. Dynamic analyses of four-bar mechanism in MechAnalyzer software, by Rohit Kumar, Sripad D Vantmuri, Rajeevlochana G. Chittawadigi and Subir Kumar Saha, Amrita University and IIT Delhi
- b. HuMotor: A humane way to utilize human efforts at a workplace, by Sivakumar A, Sandipan Bandyopadhyay, Gurunathan Saravana Kumar and Palaniappan Ramu, IIT Madras
- c. Numerical analysis of tandem airfoils for sub-sonic axial flow compressor blades, by Arunendra Kumar Tiwari, Sanjay K Sharma, Rohan Pande and Vilas R Kalamkar, VNIT Nagpur

The event “Designing Challenges” was organized as a part of XII IPRoMM-2016. In this event, live problems from various prestigious industries nearby Nagpur were float on the website. Participants were asked to submit a report on probable solutions and present it on the first day of the XII IPRoMM-2016. The event was judged by industry and academia experts and two solutions were judged best in all categories and were awarded with cash prize of Rs. 10,000/- each.

1. Shubham Dongarwar, Solar panel cleaning mechanism, VNIT Nagpur
2. Pranjal Sharma, Design and development of closed loop electrical feedback system for engine preservation unit

Another event “Solid Modelling Competition” was held in collaboration with Shri Ramdeobaba College of Engineering and Management Nagpur. The first round of this event was held at collaborating institute and final round at VNIT Nagpur. This event was judged by Dr. Gaurav Tiwari of VNIT Nagpur. This competition was successfully conducted by Dr. Vishal Shukla of collaborating institute. For first round, 21 candidates participated in the

competition and 10 out of them qualified for the final round. Out of 10 qualifiers, two participants were awarded with prizes.

1. First Prize (Rs. 3000/-) Vinay Badewale of J.D. College of Engineering and Management, Nagpur
2. Second Prize (Rs. 1000/-) Surendra Das of Indo German Tool Room, Aurangabad

The prize distribution was done at the hands of Dr. C. Amarnath, President AMM in the valedictory function.



Prof. C. Amarnath gracing the valedictory function of XII IPRoMM-2016

XII IPRoMM was successfully accomplished by Prof. P. M. Padole (XII IPRoMM Organizing Chair) and Dr. A. B. Andhare along with Dr. Shital Chiddarwar (XII IPRoMM Organizers) and their team.

Solar Panel Cleaning Robot

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INTRODUCTION

Pollution, dust and birds dropping causes in preventing sunlight from reaching the solar cells in solar panels and more the dirt lesser the amount of energy they produce. This loss may be as high as 30 percent of the capacity of that panel. So there has to be proper periodic inspection and cleaning of solar panels to avert this loss. Cleaning of solar panel involves huge investment and labour if it is done manually. So the solution has to be economical, efficient and should not affect the surroundings.

CONCEPT

Considering all the above mentioned issues the robot was designed which is easy to handle and adjustable to any length of solar panel and type of installation. It is easy to manufacture, repair and will consume less amount of energy.

SCIENCE AND TECHNOLOGY INVOLVED

For cleaning of solar panels the robot has to cover whole area of the panel according to the installation of panels. In this robot the brush is made to reciprocate all over the panel length. Sufficient passes are made to clean the panel. For reciprocation of brush scissor's mechanism is used which is actuated by the DC motor placed at the base of scissor mechanism. And flat rope drive is used to move the scissor's mechanism assembly vertically. The overall weight of the assembly is kept lower for easy handling and to make actuations easily by DC motors.

DRAWINGS

Scissors mechanism as shown in figure 1 will be moved horizontally and vertically to clean solar panels. There are total four DC motors used in a robot. One high torque DC motor is used for actuation of scissor's mechanism, second DC motor is used to move whole mechanism horizontally on panel, third DC motor is used to move the scissors mechanism vertically which is attached to flat belt winch and fourth DC motor is used to move pawl on the ratchet which is fixed on the axle of trolley timing pulley wheel.

Two C sections are used to fix the whole robot to the solar panel installation one at the top as shown in figure 1 and other at the bottom. Which removes the additional support required to fix the robot to the panels and can be fixed to any type of panel installation. To move the mechanism assembly vertically the trolley is designed which will transverse on the circular and rectangular tubes whose ends are supported by two C sections. Pulley wheel is attached beneath the trolley to move on circular tube and timing pulley wheel is attached to move on timing belt fixed on rectangular tube which facilitates the ratchet and pawl mechanism used to stop trolley at required position. Scissor's mechanism is attached to C section guide rod as shown in figure 1 and rollers are provided at every joint so that mechanism will remain in

plane and move freely. Every joint is made using bolt and lock nut so that it will not get loose because of vibration produced by continuous reciprocating motion.

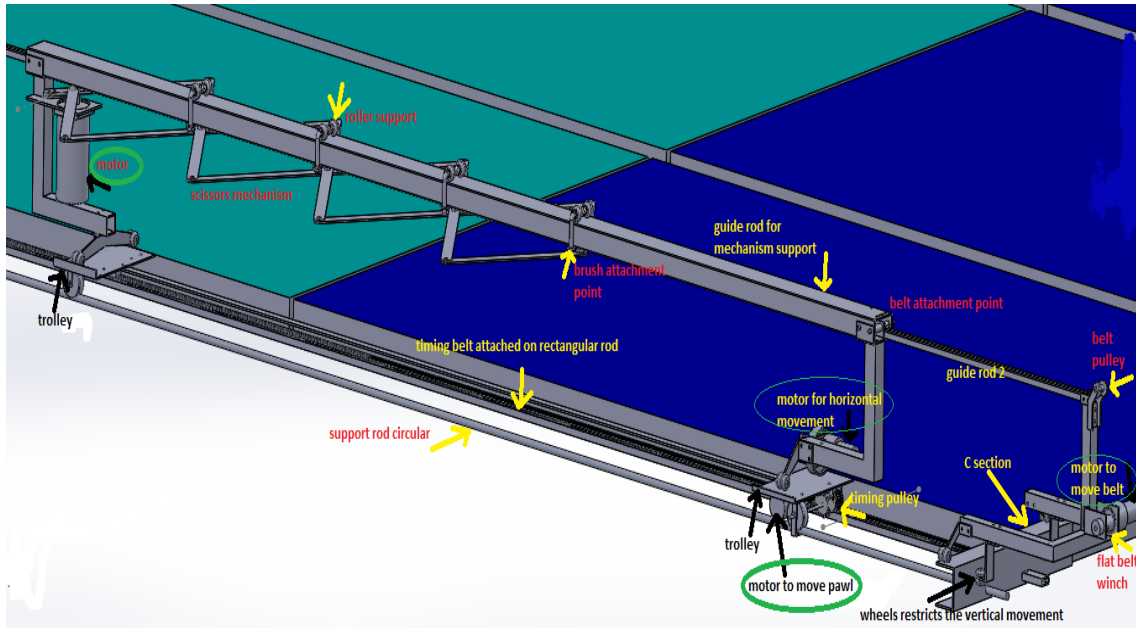


Figure 1 Whole robot fixed by C section attachment to panel

METHODOLOGY USED

For easy operation of mechanism and robot the capacity of motor should be of sufficient to take all loads for its operation.

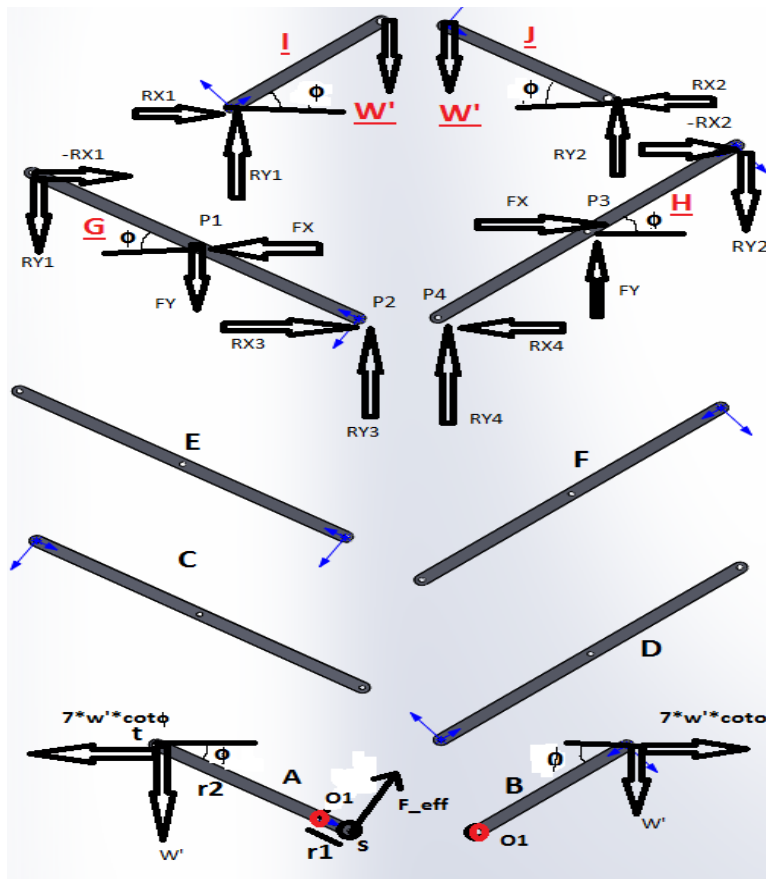


Figure 2 Free body diagram of scissors mechanism

W' = Load considered to be applied due to cleaning process between brush and panel = 1 kg-f (assumed)

L = Length of larger link (C,D,E,F,G and H) = 2 * link of smaller link (I,J,B and tO1) = 25 cm

By considering the free body diagram of I and J links balancing vertical load and moment we get

$R_{Y1} = W'$ and $R_{Y2} = W'$ (By vertical load equation)

$R_{X1} = \frac{W' L \cos \theta}{\tan \theta} = R_{X2}$ (By moment equation)

By considering the free body diagram of G and H links balancing vertical load and moment we get

$R_{Y1} + F_Y = R_{Y3}$ and $R_{Y2} + F_Y + R_{Y4}$ (By vertical load equation)

$R_{X3} = F_X + R_{X1}$ and $R_{X4} = F_X - R_{X2}$ (By horizontal load equation)

$F_Y = 0$ (By moment equation about P1 and P3)

Therefore, $R_{Y3} = R_{Y4} = R_{Y1} = W'$

$R_{Y1} * \frac{L \cos \theta}{2} + R_{X3} * \frac{L \cos \theta}{2} + R_{Y3} * \frac{L \sin \theta}{2} + R_{X1} * \frac{L \sin \theta}{2} = 0$ (By moment about P1)

Hence $R_{X3} = \frac{2W' L \sin \theta}{\tan \theta}$

So on adding an extra link the horizontal reaction at the base given by

$R_X = (2 * N + 1) * \frac{W' L \sin \theta}{\tan \theta}$ (Where N = no of cross links present)

In given design there are three cross linkages, therefore N=3

By above equation $R_X = \frac{8W' L \sin \theta}{\tan \theta}$

Motor fixed at O1 has to apply the moment equal to the moment transferred by applied load to point O1

Moment about O1 = $M_1 = \left(\frac{8W' L \sin \theta}{\tan \theta} * \sin \theta + W' * \cos \theta \right) * \frac{L}{2} = 4 * W' * \cos \theta * L$

Required moment = $2 * M_1 = 8 * W' * \cos \theta * L = 8 * 1 * 50 * \cos \theta$

Maximum value of M = 400 kg-cm (for $\theta = 0 \text{ deg}$)

Torque capacity of motor should be 400 kg-cm to operate the mechanism. As rpm requirement is not high so for same watt motor, more torque can be applied. By mechanical advantage at the link attached to motor.

$F_{\text{eff}} * r_1 = M$ (equating moment on both the sides)

For same torque if F_{eff} is optimized the hub size can be reduced and space at motor axle can be optimized.

Total weight of robot = 12 kg (By design)

So for different angle of solar panel installation the maximum torque required is when solar panel is perfectly vertical. So for 12 kg of robot taking average radius of 4 cm of belt pulley maximum torque rating required is 48 kg-cm. And for horizontal movement motor capacity will be much less than 48 kg-cm as solar panel will be at some angle so normal reaction will be less than 12 kg so DC motor with 120 kg cm torque capacity will be sufficient for both of the above mention cases.

IMPLEMENTATION OF SOLUTION

To fix the mechanism at motor axle a hub and hub support is attached by bolt and hub is attached to the one of the base link of mechanism which is extended backward as shown in figure 3. Which help in mechanical advantage as lever arm is reduced by keeping same moment to be transferred. Second base link will come between the link attached to the hub and hub support having collar which will not allow link to come out.

To stop the trolley in between at any point the trolley is having ratchet and pawl mechanism as shown in figure 4 which is attached to the axle having timing pulley at one end. The motor fixed to pawl is moved clockwise or anticlockwise according to motion of robot in either direction moving upward or downward. Figure 5 shows the motor attached to flat rope winch and flat pulley which can be manufactured using the nylon tubes of required diameter or by 3D printing. Flat rope will be attached to winch at one end and other end will be attached to the slot on mechanism assembly guide rod. Rope will pass over the pulley fixed in between for safe and efficient operation.

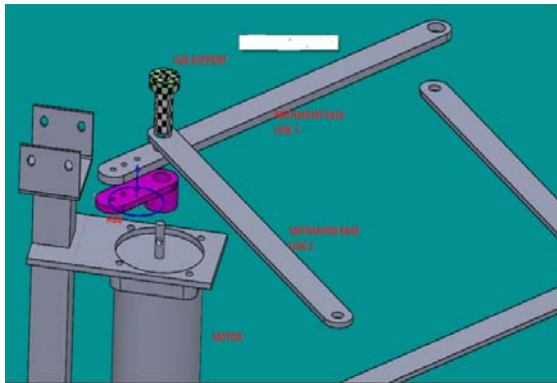


Figure 3 Hub assembly to fix mechanism to Motor

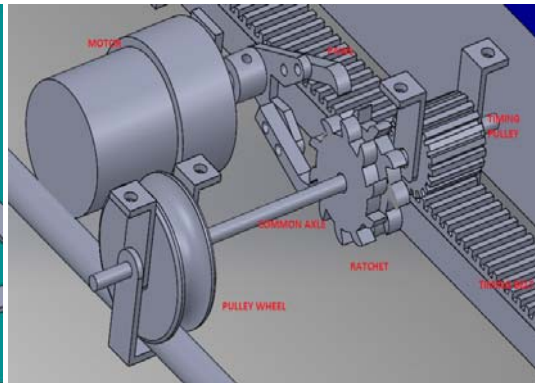


Figure 4 Assembly of ratchet and pawl with timing pulley

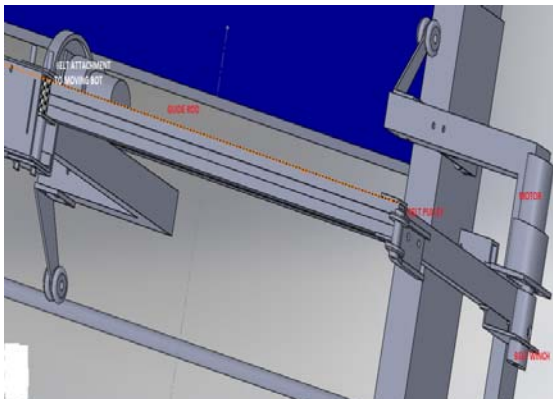


Figure 5 Winch and pulley for flat belt assembly

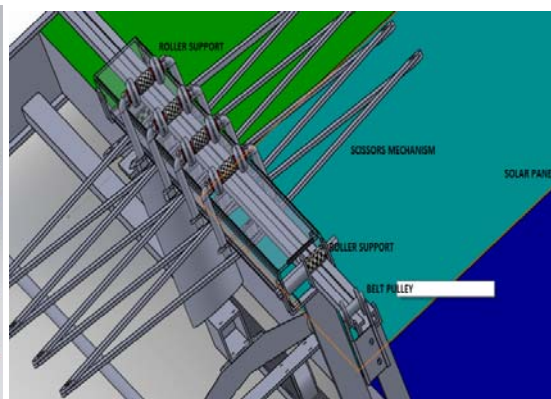


Figure 6 Guide rod passing through mechanism assembly

To move mechanism assembly upward with the trolley and to hold the mechanism assembly at required position the guide rod is passed through the mechanism assembly as shown figure 6 the guide rod is passed below the roller which will not allow mechanism to move in any direction with respect to guide rod and the length of guide rod depends on the panel installation height.

SPECIAL FEATURES OF THE SOLUTION

This robot can be used to clean any size of solar panel of less than the stroke length of scissor's mechanism and solar panel installation of length less than guide rod length passing through mechanism assembly. This robot is designed to access any point on flat rectangular

surface as trolley can be stopped at any position on the supporting tubes to access any area to facilitate cleaning process.

OTHER SPECIFIC DETAILS

To reduce the consumption of water for cleaning solar panels the solution is suggested in which each solar panel is monitored for its output on periodic basis by some feedback system. If the output of particular solar panel is reduced by some threshold value, which is not acceptable then there is possibility of dirty solar panel and is not working at required efficiency. So the feedback is given to robot and water will be used to clean that particular solar panel column or solar panel depending on the installation. So in place of cleaning all the panels using water first panels are cleaned without water and then according to the feedback from monitoring system the panels are cleaned using water. If after cleaning using water, the efficiency is still below the threshold level then physical inspection will be required to know the actual problem.

IMPLEMENTATION ISSUE

As belt drive is used to pull mechanism assembly up and to hold it at required position, belt drive should be placed on top side of solar installation otherwise it will slack and will not work.

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- 2) Georgy Olenin, Thesis 2016, Design of hydraulic scissors lifting platform, Saimaa University of Applied Sciences, Faculty of Technology Lappeenranta Degree Programme in Mechanical Engineering and Production Technology.

Forthcoming Events



7th IFToMM International Workshop on Computational Kinematics (CK2017) Futuroscope-Poitiers, France, May 22-24, 2017

CALL FOR PAPERS

CK2017 aims to bring together researchers from the broad range of disciplines related to Computational Kinematics in an intimate, collegial and stimulating environment, where they can present and exchange their newest scientific results. The CK2017 Workshop is one of the activities of the IFToMM Technical Committee for Computational Kinematics. The previous sites of this Workshop series were Schloss Dagstuhl (1993), Sophia Antipolis (1995), Seoul (2001), Casino (2005), Duisburg-Essen (2009) and Barcelona (2013).

Topics : Papers are solicited on topics related with Computational Kinematics, including but not limited to:

- Kinematic design and synthesis
- Computational geometry in kinematics
- Motion analysis and synthesis
- Theory of mechanisms
- Mechanism design
- Kinematical analysis of serial and parallel robots
- Kinematical issues in biomechanics
- Molecular kinematics
- Kinematical motion analysis and simulation
- Geometric constraint solvers
- Deployable and tensegrity structures
- Robot motion planning
- Applications of computational kinematics
- Education in computational kinematics
- Theoretical foundations of kinematics

Contributed Papers: Original papers must be submitted in PDF format. Manuscript templates are available on the conference website. Only papers for which at least one author has registered for CK2017 prior to final submission will be accepted for the conference and be included in the proceedings. Accepted papers will be published after the workshop by Springer in an edited book.

Registration fees

Registration fees include admission to technical sessions, coffee breaks, welcome drink, banquet, and conference proceedings. The registration fees are:

	Before April 1st, 2017	Standard Rate
Regular (IFToMM MO)	400€	450€
Regular (non MO)	450€	500€
Student (IFToMM MO)	300€	350€
Student (non MO)	325€	375€



<http://iftomm-ck2017.sciencesconf.org/>

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Important Dates:

Paper submission :
December 31st, 2016
Notification of acceptance :
February 6th, 2017
Final version submission :
February 15th, 2017



**AzC IFToMM INTERNATIONAL SYMPOSIUM ON
MECHANISM AND MACHINE SCIENCE (ISMMS – 2017)
Baku, Azerbaijan, September 11-14, 2017**



CALL FOR PAPERS

Organized by

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Azerbaijan Technical University (Department of Theory Mechanism and Machine, Mechanical Engineering Science Center),
İzmir Institute of Technology – Department of Mechanical Engineering

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Aim

The aim of the **ISMMS 2017** is to attract scholars, researchers, teachers, students, professionals and other groups interested in the promotion of science of mechanisms and machines, to submit their scientific work in our Symposium. The number of scientific works in the field of MMS grows in the world every year. Potential speakers are invited to submit papers for oral, poster or the video-presentations about new research and theoretical contributions in mechanism and machine science area.

Topics

Computational kinematics
Synthesis of mechanisms
Gear drives and transmissions
Dynamics of machinery
Reliability of machines
Tribology
Mechatronics
Manipulators and robots
Oil-field machines and mechanisms
Technological machines
Transport vehicles

Submission, presentation and publication

Authors are invited to submit a full paper of max. 8 pages through the submission system at the symposium website. The official languages of the Symposium are English, Azerbaijani and Russian. Each paper will be reviewed by the members of the Scientific Committee. All accepted articles will be published in the scientific journal Machine Science (ISSN 2227 – 6912), and also in scientific proceeding of the Symposium with ISBN, and also with the modified version the selected papers will be published in scientific journals of IFTToMM.

Deadlines

Full Paper Submission – 01.02.2017
Acceptance of notification – 30.04.2017
Final paper submission – 31.05.2017

Registration

The registration fee includes the complete program of the symposium and the proceedings. Registration fees before 31.08.2017:
IFTToMM Members – 200\$
Non IFTToMM Members – 250\$
Students/Accompanying – 150\$

Venue

The Symposium will be held in the Azerbaijan Technical University, Baku.

Accommodation

The Capital of Azerbaijan, Baku has several hotels of different categories. A list of hotels will be posted on the symposium website.

Young Delegates Program (YDP)

4-6 young participants will be supported by IFTToMM. For details of YDP: <http://iftommm.net/>

Correspondence Address

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Prof. Dr. Gokhan Kiper, Department of Mechanical Engineering, İzmir Institute of Technology, İzmir, Turkey

E-mail: gokhankiper@iyte.edu.tr

E-mail addresses for the symposium

For papers in Azerbaijani to elnur_huseynzade@hotmail.com

For papers in Russian to firengiz_haciveva@hotmail.com

For papers in English to alizada_rasim@hotmail.com

gokhankiper@iyte.edu.tr

For obtaining any necessary information it is also possible to call by phone:

+994125389403 – Haciveva Firengiz

+994508560009 – Huseynzade Elnur

Symposium Website:

<http://ismms2017.aztu.edu.az/ismms2017/>

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Sunil K. Agrawal	Columbia University, New York
Y. Nakamura	University of Tokyo

REGISTRATION FEE

	Delegates from	India (INR)	Others (USD)
1. Students & Full time Research Scholars		1500	100
2. Academic & Research Organizations		3500	250
3. AMM or IFToMM Members		3000	200
4. Others		5000	300

IMPORTANT DATES

Authors are invited to submit a two-page extended abstract as per the schedule given below and the guidelines available in the conference website.

Submission of Abstract	May 15 th , 2017
Acceptance of Abstract	May 31 st , 2017
Submission of Full Paper	July 15 th , 2017
Notification of provisional decision & Reviewer comments	Oct. 2 nd , 2017
Final submission of Camera-Ready Paper after addressing reviewer comments	Nov. 15 th , 2017
Registration	Nov. 15 th , 2017

VENUE

DAE Convention Centre
Anushaktinagar,
Mumbai-94

3rd International and 18th National Conference on Machines & Mechanisms

iNaCoMM 2017

December 13-15, 2017

Organized by
Division of Remote Handling & Robotics
Bhabha Atomic Research Centre
Mumbai

STUDENT MECHANISM DESIGN CONTEST

One of the key objectives of the Association for Machines and Mechanisms (AMM) is to promote innovation among the students. A mechanism design contest has been made as an integral part of iNaCoMM, since 2009. The purpose 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.

Details available in the conference web portal: www.inacomm2017.org

CONTACT

Dr. D. N. Badodkar, Chairman & Convener
Dr. T. A. Dwarakanath, Co-Convener

Ph: +91 22 2559 2545
Email: inacomm2017@barc.gov.in

DRHR, BARC, Trombay
Mumbai- 400085, India

FIRST CALL FOR PAPERS

www.inacomm2017.org

INVITATION

The Division of Remote Handling & Robotics, BARC is organising 3rd International and 18th National Conferences on Machines and Mechanisms during December 13-15, 2017 (iNaCoMM 2017) at Anushakti Nagar, Bhabha Atomic Research Centre, Mumbai, India.

iNaCoMM 2017 is the 18th National and 3rd International conferences on Machines and Mechanisms organized under the aegis of AMM and IFToMM. The conference aims at bringing together researchers, industry experts and students, working on various aspects of design and analysis of machines, mechanisms and robotics, to deliberate through oral, poster and design contest presentations on recent, novel advances.

iNaCoMM 2017 will feature eminent researchers from India and overseas, as plenary speakers. Each day there will be plenary talk by an eminent scientist followed by interesting morning and afternoon presentation/poster sessions on the topics of the conference. The iNaCoMM 2017 will also host Mechanism Design Contest for Students. There will be recreational performances, music and dance nights are also planned from troops of Art & Culture Associations.

Mumbai and its surroundings are famous for world heritage monuments, art and cultural museums, beautiful hill stations, beaches and islands. Mumbai is a financial capital of India and the famous Bollywood, the Indian Film Industry dwell here. The city offers a cosmopolitan and diverse lifestyle with variety of food and entertainment. During December the climate in Mumbai is generally pleasant. The city is well connected to the various parts of the country by roadways, by railways and by airways. The important tourist places like Ajanta, Ellora, Goa and many west coast beaches, are easily reachable with multiple transport options. The international airport offers direct flight to the various destinations of the world. We hope that besides the enriched scientific flavour of the Conference, you will also enjoy the verdant campus of Anushakti Nagar during your stay.

The Organizing Committee of the Conference extends its invitation to researchers working on the topics of the conference.

www.inacomm2017.org

SCOPE OF THE CONFERENCE

The scope of iNaCoMM 2017 are, but not limited to, the following topics:

Theoretical and Computational Kinematics:
Analysis, Synthesis, Design, Modeling and Simulation of Mechanisms or Machines.

Robotics:
Robot Kinematics and Robot Dynamics, Serial and Parallel manipulators, Master-Slave Manipulators, Telerobotics, Industrial Robots, Service robots, Autonomous robots, Collaborative and Cooperative Robotics, Distributed and Cloud Robotics, Internet of Robotics, Walking Robots and Humanoids, Wheeled Mobile Robots, Autonomous Vehicles, Swarm and Flying Robots, Under-Water Robotics, Space Robotics, Application of Robotics in Nuclear Industry, Hazardous material handling, Decommissioning, Robot applications in Agriculture, Defense, Medical & Surgical Robotics, Wearable Robotics.

Machine and Mechanism Intelligence:
Mechatronic Systems, Automation for Machine Tools, Manufacturing Automation, Process Automation, Machine Learning and Artificial Intelligence, Virtual Reality, Haptics, Telepresence, Human-Machine Interfaces and Interactions, assistive, and rehabilitative technologies.

Mechanisms & Devices:
Compliant Mechanisms, Micro-Nano Machines and Mechanisms, Biologically inspired mechanisms, Bio-medical devices, Mechanisms and Machines for Rural Applications and Agriculture.

Design & Manufacture:
Origami-based Engineering Design, Image and 3D-Print based Modeling and Manufacturing.

Dynamics of Machinery:
Dynamics and Vibration Analysis in Machines, Fault Diagnosis and Health Monitoring, Dynamics and Control of Multi-body Systems.

History and Future trends: in Machines, Mechanisms and Robotics.

BEST PAPER AWARDS

Two Best Paper Awards, one in general category and other in student category will be handed over by the Association for Machines and Mechanisms. Both awards carry a cash prize along with a citation.

ORGANIZING COMMITTEE

Patron: Director, BARC

Chairman & Convener:
Dr. D. N. Badodkar, Associate Director, DM&AG, BARC

Co-Convener:
Dr. T. A. Dwarakanath, BARC

Joint Organizing Secretaries:
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Shri Kamal Sharma, DRHR, BARC
Shri Jagadish Kota, DRHR, BARC
Smt. Bimmi Bharadwaj, DRHR, BARC

www.inacomm2017.org

iNaCoMM 2017

December 13-15, 2017

www.inacomm2017.org



SMDC

Student Mechanism Design Contest

Objective:

One of the key objectives of the Association for Machines and Mechanisms (AMM) is to promote innovation among the students. A mechanism design contest has been integral part of iNaCoMM since 2009. The purpose 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.

Eligibility:

Participation is restricted to individuals/groups of students (up to three members), who should be registered as full-time students/research scholars/project staff in recognized institutes.

Participation:

Participants are invited to submit proposals for design, construction and operation of mechanisms which are innovative and capable of solving a challenging design problem.

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



Guidelines:

- Participants must submit a 2-page proposal outlining the design challenge and novelty/innovation of the proposed design. The proposals have to be submitted through email, with the subject line **“Proposal for the Student Mechanism Design Contest”** to the email address: inacomm2017@barc.gov.in
- The winner will be decided based on the extent of innovation, difficulty of the design challenge, effectiveness of the proposed solution towards solving the actual problem etc.
- In any matter related to the contest, the decision of the judges and/or the organisers will be final and binding.
- Finished prototypes are to be demonstrated during iNaCoMM 2017 (December 13 - December 15, 2017) before a panel of judges.
- The finalists will be provided with TA/DA.

Important Dates

- | | | |
|---|---|---|
| • 1st Prize: ₹ 10,000 | • Submission of Proposal | - 25 th September, 2017 |
| • 2nd Prize: ₹ 6,000 | • Result of 1st Round Elimination | - 10 th October, 2017 |
| • 3rd Prize: ₹ 4,000 | • Submission of Detailed Design | - 10 th November, 2017 |
| | • Result of 2nd Round Elimination | - 20 th November, 2017 |
| | • Demonstration by Finalist | - 13 th -15 th December, 2017 |
- All participants will be awarded with Certificates from AMM

**3rd International and 18th National Conference
on
Machines & Mechanisms**

Organized by

Division of Remote Handling & Robotics

**Bhabha Atomic Research Centre
Mumbai**



Advances in Robotics (AIR 2017)

3rd International Conference of Robotics Society of India
June 28-July 2, 2017
Indian Institute of Technology Delhi, New Delhi, India



SECOND CALL FOR PAPERS

Advances in Robotics (AIR) is a series of biennial conference organized by the Robotics Society of India. The conference aims to create a forum to present and exchange new ideas by researchers and developers from India and abroad working in the fields of robotics and its applications. The conference would have plenary talks, oral and poster presentations, and special industry oriented sessions.

AIR 2017, will be held at IIT Delhi, New Delhi, during June 28-July 2, 2017. The previous two editions of AIR were held at R&DE, DRDO Pune (AIR 2013) and BITS Pilani Goa Campus, Goa (AIR 2015). The conference website is <http://www.advancesinrobotics.com>

Contributed Papers

The organizers of the conference invite unpublished research work in the following fields of Robotics (representative and non-exhaustive):

- Kinematics, dynamics, control and simulation of autonomous intelligent systems
- Design of robotic mechanisms
- Man-machine interface and integration
- Robotics-related computer hardware, software, and architectures
- Navigation of Unmanned vehicles – ground, aerial, underwater
- Machine learning and artificial intelligence for robotics
- Bio-mimetic and Bio-inspired Robotic Systems
- Vision and other non-contact sensory systems
- Tactile and other contact sensory technology
- Active sensory processing and control
- Medical and Assistive Robotics
- Swarm Robotics
- Humanoid Robots
- Safe Robots
- Robotic Hand
- Virtual Reality & Haptics
- Tele-robotics

Plenary Talks

The following plenary/keynote speakers will be giving a talk:

- Prof. Peter Corke, QUT, Australia
- Prof. Nancy Amato, Texas A&M Univ, US
- Prof. Burkhard Corves, Aachen Univ, Germany

Workshop and Tutorials

A full day workshop and/or tutorials will be held during the conference. The details on the workshop would be made available on the conference website.

Doctoral Symposium

A symposium will be held for the PhD students working in all areas relevant to robotics. It would provide an opportunity to showcase their ongoing research work and interact with experts in the field. More details on the conference website.

Submission Instructions

Research papers have to be submitted in double column ACM format. There is a maximum page limit of 6. The submitted papers will undergo peer-review process. The template and instructions are available on the conference website.

Proceedings

All the accepted papers, after incorporation of the reviewers comments, will be published by ACM.

Important Dates

Full Paper Submission Deadline: **Feb 1, 2017**
Announcement of Results: April 10, 2017
Camera Ready Version: May 5, 2017
Doctoral Symp. Deadline: May 5, 2017
Doctoral Symp. Results: May 25, 2017
Conference: June 28- July 2, 2017

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IIT Delhi/CSIR CEERI
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IIT Delhi
- Prof. Mohammed Suhaib
Jamia Millia Islamia, Delhi

Organized by:

IIT Delhi



Proceedings:

Published by ACM



<http://www.advancesinrobotics.com>



The 12th IFTOMM International Symposium on Science of Mechanisms and Machines SYROM'2017

Iasi, Romania, November 02-03, 2017



Organized by:

Romanian Association for the Science of Mechanisms and Machines - ARoTMM and "Gheorghe Asachi" Technical University of Iasi, Mechanical Engineering Faculty

With the support of:

International Federation for the Promotion of Mechanism and Machine Science – IFTOMM



Conference Chairman

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Organizing Committee Chairman

Cezar OPRISAN (Romania)

Organizing Committee

Virgil ATANASIU (Romania)
Dumitru LEOHCHI (Romania)
Emil BUDESCU (Romania)
Florentin BUIUM (Romania)
Eugen MERTICARU (Romania)

Aim

The aim of the symposium is to bring together researchers, scientists, industry experts and PhD students to provide a general forum for researchers, engineers and PhD students involved in the general area of mechanisms and machines, and their applications, to disseminate their latest research results and exchange views on the future research directions of these fields.

Topics

We are looking for original, high-quality contributions on topics related to mechanisms within aspects of theory, design, practice and applications in engineering, including but not limited to:

- Theoretical kinematics
- Computational kinematics
- Mechanism design
- Experimental mechanics
- Mechanics of robots
- Dynamics of machinery
- Dynamics of multi-body systems
- Control issues of mechanical systems
- Mechanisms for biomechanics
- Novel designs
- Mechanical transmissions
- Linkages and manipulators
- Micro-mechanisms
- Teaching methods
- History of mechanism science
- Industrial and non-industrial applications

Submission, presentation and publication

The official language of the symposium is English. Each paper will be reviewed, and the papers selected by the Scientific Committee will be published in a book edited by Springer, Mechanisms and Machine Science series. Only papers with at least one author as registered participant will be included into the conference volume. All submitted papers must be strictly prepared following the publication guidelines. For detailed up-to-date information, please visit the SYROM'2017 conference website.

Deadlines

Full paper submission: April 15th, 2017
Prov. accept. notification: June 1st, 2017
Final paper submission: July 10th, 2017
Final accept. notification: July 20th, 2017

Registration

"Early Bird" Registration (before August 1st, 2017)

IFTOMM Members	250 €
Non IFTOMM Members	350 €

Regular Registration

IFTOMM Members	350 €
Non IFTOMM Members	450 €
Students/Accompanying Persons	150 €
Excursion, November 04 th , 2017	25 €

Venue

The conference will be held at "Gheorghe Asachi" Technical University of Iasi. Iasi is the largest city in eastern Romania, located in the historical region of Moldavia. Iasi has traditionally been one of the leading centres of Romanian social, cultural, academic and artistic life. Known as *The Cultural Capital of Romania*, Iasi is a symbol in Romanian history. It is easily accessible from countries by plane, train or car (see website).

Accommodation

Iasi provides accommodation in several hotels of different categories. A list of hotels will be available on the conference website.

Excursion

Directly after the conference there will be an Excursion day.

Further information

This is the first call for papers intended to inform about the aim, topics and important dates of the symposium. Detailed information about venue, accommodation, social program and other topics will be published on the website.

Correspondence Address:

Prof. Ioan DOROFTEI
Prof. Cezar OPRISAN
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"Gheorghe Asachi" Technical University of Iasi
B-dul D. Mangeron, 43
700050-Iasi, Romania
ldorofte@mail.tuiasi.ro
coprisan@mail.tuiasi.ro

Website

<http://www.mec.tuiasi.ro/syrom2017>

REGISTRATION FORM
 Department of Mechanical Engineering
 National Institute of Technology Karnataka, Surathkal
 TEQIP-II Sponsored two-day workshop on
**MACHINES AND MECHANISMS: KINEMATICS,
 DYNAMICS AND COMPUTATIONAL TOOLS**
 [Send PDF copy of this form by mail to
mechanisms@nitk.edu.in. Please do not send by post]

14th and 15th March, 2017
 Name (in Block letters):
 Degree (B. Tech/M. Tech/ Ph. D)
 with specialization:
 Year and Semester:
 Department:

Mobile: Email:

DECLARATION BY THE PARTICIPANT
 The information furnished above is true to the best of my knowledge. If selected, I shall attend the programme for the entire duration. I also undertake the responsibility to inform the Coordinator sufficiently in advance, in case I am unable to attend the programme.

Date: Signature of Applicant

Place: Signature (with seal)
 Date: Faculty in charge/Head of the Department

**Two day Workshop on
 MACHINES AND MECHANISMS: KINEMATICS,
 DYNAMICS AND COMPUTATIONAL TOOLS
 14th and 15th March, 2017**

Sponsored by TEQIP-II



Coordinator

Dr. SOMASEKHARA RAO TODETI



Organized by
 Department of Mechanical Engineering
 National Institute of Technology Karnataka
 Surathkal, Srinivasnagar P.O., Mangalore-575 025
www.nitk.ac.in

HOW TO REACH NITK

Being situated right on the NH-66, the Institute is very well connected by bus routes to the North and South. Mangalore is also connected by NH-48 to Bangalore and there are a number of luxury buses plying daily between Mangalore and Bangalore all through the day. Surathkal, on the Konkan Railway line (linking Mumbai to Kanyakumari), is the nearest railway station and is a stopover for most trains passing through Konkan Railway. While Surathkal and Kankanady (Mangalore Jn.) are the closest alighting points for visitors coming by train from north India. Mangalore Central is the terminus for many trains from South India. The Mangalore (Bajpe) airport is just 20 km from the campus.

IMPORTANT DATES:

Last date for receipt of application: 10th March, 2017
 Intimation about selection: 11th March, 2017
 (Only through e-mail)
 Last date for confirmation by participant: 12th March, 2017

CONTACT INFORMATION:

Please address all communications to the Coordinator

Dr. SOMASEKHARA RAO TODETI

Assistant Professor, Mechanical Engineering
 NITK Surathkal, Mangalore – 575025.
 Mobile: +91-9611057598
 Email: ssrao@nitk.edu.in

NITK SURATHKAL

Since its inception in 1960, National Institute of Technology Karnataka (NITK), Surathkal has established itself as a premier Institution, engaged in imparting high quality technical education and supporting and development activities. NITK has conferred the status of an Institution of National Importance vide NIT Act No.29 of 2007 by Govt. of India and is consistently ranked as one of the top ten technical institutions in India. Presently, NITK offers 9 Bachelors, 28 Master's and Doctoral Degree programmes.

NITK is committed to enhance capabilities and potential of our human resources with the objective of transforming them into leaders in their chosen areas of interest. Our vision is to strive for excellence, be globally competitive in technical education and focus on knowledge assimilation, generation and dissemination. The year-long activities during the occasion showcased the glorious contributions of NITK in various fields of its activities and projected new initiatives for the coming years. The institute is located 22 kilometres north of Mangalore City along the Kanyakumari-Mumbai

National Highway-66, amid 300 acres of sylvan surrounding with the picturesque Western Ghats on the east and sun-kissed sands of the Arabian Sea to the west.

DEPARTMENT OF MECHANICAL ENGINEERING

Department of Mechanical Engineering established in 1960, the oldest and largest department of NITK, has earned a good reputation as a center for academic, research and industrial consulting activities. Academic Programmes leading to B. Tech. degree in Mechanical Engineering, M. Tech. degree in Manufacturing, Mechatronics, Thermal & Design and Precision Engineering, and Ph.D degree in the broad areas of Design, Manufacturing, Mechatronics, and Thermal Engineering are currently offered by the department. Laboratories with state of the art equipments, highly qualified faculty and dedicated supporting staff provide an ideal environment for academic and research pursuits.

ABOUT THE WORKSHOP

Machines and Mechanisms have fascinated mankind throughout recorded history. In this two days' workshop on 'Machines and

Mechanisms: Kinematics, Dynamics, and Computational Tools', prominent scientists from IISc, IIT, and ISRO will present the recent advances, and applications/case studies in the field of Machines and Mechanisms. Apart from the above presentations, there will be demonstrations of computational tools by experts from the industry (MSC Software, Dassault Systems and Altair).

PRESENTATIONS BY THE SCIENTISTS

- Creative design of mechanical systems using 'Systematics of Linkages' technique
- Kinematics in Elastic Deformation of Compliant Mechanisms
- Mobility analysis of compliant mechanisms
- Lumped models of compliant mechanisms
- Design of real-life using concepts from mechanisms
- Machines and mechanisms in Spacecraft

TOPICS TO BE COVERED UNDER DEMONSTRATIONS OF COMPUTATIONAL TOOLS

- Kinematics and Dynamics of Machines and Mechanisms

- Multi-Body Dynamics & Virtual simulation tools
- Flexible Body Dynamics & Application Areas.
- Tutorial kit for students
- Modelling Automotive components with MBS Tools.
- Creating and analyzing multibody models from existing CAD and FEA models.
- Kinematics & Compliance Analysis of Automotive Suspensions

- Road Load Data Analysis & development of virtual roads in Automotive
- Optimization driven Multi body dynamics solutions
- Developing Component Stiffness models for vehicle dynamics Assessment
- Generation of MBS Driven Loads
- Application and use cases in industry

RESOURCE PERSONS

(ACADEMIA/ORGANISATION)

Dr. Mruthyunjaya T.S., Former Professor, IISc- Bangalore

Dr. G.K Ananthasuresh, Professor, IISc-Bangalore

Dr. Sudipto Mukherjee, Professor, IIT-Delhi

Dr. Sandipan Bandyopadhyay, Assistant Professor, IIT-Madras

Mr. H N Suresh Kumar, Deputy Project Director ,ISRO

The 4th Conference on Mechanisms, Transmissions and Applications (MeTrApp 2017) at Trabzon, Turkey on July 3-5, 2017

The 4th Conference on Mechanisms, Transmissions and Applications (MeTrApp 2017) will be organized by Karadeniz Technical University, Mechanical Engineering Department in Trabzon, Turkey on July 3-5. The call for papers and the detailed information are provided at the conference website:

<http://metrapp2017.ktu.edu.tr/>

MeTrApp 2017 is organized under the patronage of International Federation for the Promotion of Mechanism and Machine Science (IFTOMM). The researchers are welcome to submit their high quality and original research papers relevant to the conference topics:

* Mechanisms and Machine Design

- * Mechanical Transmission
- * Mechatronics
- * Computational and Experimental Methods
- * Dynamics of Mechanisms and Machines
- * Micromechanisms and Microactuators
- * Biomechanics and Medical Engineering
- * Industrial Applications

We are looking forward to your contributions to MeTrApp 2017 and hope to meet you in Trabzon, Turkey.

Contact:

Dr. Mehmet ITIK (Conference Chair)
Department of Mechanical Engineering
Karadeniz Technical University,
Trabzon, Turkey

Call for Papers for the 41st Mechanisms and Robotics Conference (MR)

@ ASME 2017 International Design Engineering Technical Conferences
<https://www.asme.org/events/idetccie>

**Abstract and Final Draft Paper Due:
February 10, 2017**

The 41st ASME Mechanisms and Robotics (MR) conference will be held as part of the 2017 ASME International Design Engineering Technical Conferences & Computers & Information in Engineering Conference (IDETC/CIE) in Cleveland, OH, August 6-9, 2017.

Since 1952, the ASME Mechanisms and Robotics (MR) conference has provided an international forum for the exchange of technical and scientific information on the theory and practice of mechanical and robotic systems. Topics span areas central to design and analysis of mechanical, mechatronic, and robotic systems, including kinematics, dynamics, novel mechanisms and robots, software systems, educational practices, and various applications. Papers are particularly encouraged from the areas in soft-, flexible- and human-safe robots, reconfigurable mechanisms and robots, origami-based systems, rehabilitation and medical robots, and exoskeleton/prosthesis design and development.

Submitted papers will be eligible for the Mechanisms and Robotics Best Paper, Freudenstein/ General Motors Young Investigator, A.T. Yang Memorial, and Compliant Mechanism awards. Authors of the strongest papers at the conference will also be invited to submit enhanced archival versions to an IDETC Special Issue of the Journal of Mechanisms and Robotics.

The MR conference will host the following symposia:

MR-1 Mechanism Synthesis & Analysis
MR-2 Theoretical & Computational Kinematics
MR-3 Compliant Mechanisms
MR-4 Origami-Based Engineering Design
MR/MNS-5 Micro/Nano-Scale Robotics & Manufacturing
MR/MSNDC-6 Motion Planning, Dynamics & Control
MR-7 Medical & Rehabilitation Robots
MR-8 Novel Mechanisms, Robots & Applications

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