

# THE ROBOTICS SOCIETY



## AT A GLANCE..



Report on Advances in  
Robotics - 2019



Report on GBM of The  
Robotics Society



Development of Radiation  
Tolerant Adaptive Gripper  
BARC Mumbai



Development of Spherical  
Robots - IITB



Pipe Inspection Robot- IIT  
Hyderabad



TRS-Student Chapter  
Activities

## EDITOR SPEAKS...

- The name 'Robotics Society of India' has been changed to 'The Robotics Society'.
- This newsletter dedicates additional two pages for the AIR 2019 conference which was held at IITM.
- If you are interested in publishing robotics activities of your institution in TRS newsletter, kindly mail us to 'apsudheer@nitc.ac.in'.

## REPORT ON AIR 2019 AT IIT MADRAS

The 4th International Conference of The Robotics Society, Advances in Robotics 2019, was held from 2nd July to 6th July IIT Madras, Chennai, India. Over five days, over 200 participants saw a plethora of talks, discussions, seminars and technical sessions, with representation from all parts of India, as well as people from around the world. The conference attracted researchers from robotics and related areas and served as a confluence for ideation and innovation. The venue for the conference was at the IC&SR Building, in the main auditorium for the talks and technical sessions. The first day of the conference included two tutorial sessions for the benefit of young researchers. The first tutorial session was on "Brain Machine Interfacing for Robotics" by Prof. Girijesh Prasad, from Ulster University, Ireland. Later in the afternoon, Prof. Davide Scaramuzza delivered a tutorial lecture on "Visual Inertial Odometry and SLAM with both standard and event cameras". More than 80 students attended the tutorials.

The next day, the formal inauguration of the conference was done by Dr. Tessy Thomas, (DG, DRDO) as the Chief Guest and Prof. Bhaskar Ramamurthy (Director, IIT Madras) presiding over the session. Prof. Ashish Dutta (IIT Kanpur) was the representative from The Robotics Society. Prof. N. J. Vasa, Prof. Asokan T and Prof. Sandipan Bandyopadhyay represented the organizing committee. The inauguration was followed by a plenary talk from Dr. Eduardo Nebot, who talked about Autonomous systems in industrial applications and urban environments. Prof. Davide Scaramuzza delivered a keynote talk on "Autonomous, Agile, Vision-controlled Drones: from Frame-based to Event-based Vision".

On 4th July, the 3rd day of the conference, after short presentations for the poster sessions, Prof. Blake Hannaford from the University of Washington, Seattle, USA, gave his plenary talk on "Model-Driven Medical Robot & Procedure Design", followed by a keynote lecture by Prof. Taewon Seo in the afternoon on "Underwater Robotics Platform for Hovering and operations".

The general body meeting of The Robotics Society was held as the last session on the same day, open to all delegates of the conference, where the functioning and activities of the TRS were discussed. A banquet dinner was organised at The Westin, Chennai for all the participants, where they were treated to a classical music performance on the veena. All delegates had a sumptuous dinner over light conversation, meeting new people and building their network.

On the next day, Prof. Jan Peters from TU Darmstadt, Germany in his plenary talk talked about “Motor Skill Learning”. Prof. Nobuto Matsuhira from the Shibaura Institute of Technology, Tokyo, Japan gave a keynote lecture on “Community Service Robot”. Throughout the conference, 8 technical sessions were organised where authors presented 41 papers spread across the fields of Artificial Intelligence & Motion Planning, Design & Analysis, Dynamics & Control, R & D, Service Robots, Sensors & Navigation and finally, Humanoid & Exoskeleton. The technical sessions witnessed productive discussions happening after each presentation, giving valuable feedback to the speaker. Poster presentations saw the participation of 29 scholars presenting their work, and they also presented their work in the form of short presentations in the main auditorium. During the conference, MathWorks and R&DE (Engineers) Pune, DRDO gave invited talks during the technical sessions. The 4th day of the conference concluded with the valedictory function, presided by Prof. N.J. Vasa, Prof. Asokan T, Prof. Blake Hannaford, Prof. Nobuto and Prof. S K Saha. Prof. Vasa announced three awards, the Best poster presentation, Best oral presentation, and the Japan-India Friendship for Human Community Award.

The 5th and final day of the conference was reserved for the Doctoral Symposium, where current Ph.D. Scholars presented their work to a panel of eminent roboticists to obtain valuable feedback and guidance on how they should proceed with their research. Prof. S K Saha from IIT Delhi gave a talk on how to go about doing research, and some tips in general for those interested in delving into robotics. A Workshop by Mathworks on Robotics and Autonomous Systems was held in parallel with the doctoral symposium.



### **ROBOTS IN INDUSTRY**

Across the world, the automotive industry is the biggest customer of industrial robots with a 41% share of the total supply in 2018, according to the International Federation of Robotics. In India too, car industry majors are moving towards robotization. Maruti Suzuki's production line in Haryana utilizes 7,000 labourers and 1,100 robots. Car-maker Ford's Gujarat plant has automated 90% of its work with 453 robots. Hyundai motors Chennai station is swarming with modern bots, and similar is the case with Volkswagen India and Tata Motors' Pune shop floors.





**PHOTO GALLERY**

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**Dr. Tessy Thomas**



**Prof. Blake Hannaford**



**Prof. Davide Scaramuzza**



**Prof. Eduardo Nebot**



**Prof. Girijesh Prasad**



**Prof. Taewon Seo**



**Prof. Jan Peters**



**Prof. Nobuto Matsuhira**







# MINUTES OF GENERAL BODY MEETING(GBM) OF THE ROBOTICS SOCIETY (TRS)

## 4TH JULY 2019 (5.30-6:30 PM): IC&SR AUDITORIUM, IIT MADRAS

The general body meeting of The Robotics Society was held at IIT Madras campus on 4th July 2019 during the international conference on “Advances in Robotics (AIR 2019)”. Prof. Santanu Chaudhury (President) welcomed the members and the invitees through Skype and Prof. T. Asokan, Prof. Ashish Dutta and Prof. Mohammed Suhaib were seated on the dais.

### Points Discussed

1. Prof. T. Asokan (Secretary) mentioned about the earlier GBMs The minutes of earlier GBM were circulated over email and the members approved the minutes of previous GBM.
2. Prof. T. Asokan (Secretary) presented a report on the activities of the society in the last one year and provided the current status of the membership. The report is enclosed as Annexure 1.
3. Prof. Mohd Suhaib (Treasurer) presented the statement of last one year accounts and the general body has approved the same.
4. TRS Newsletter for 2019 was released in April 2019 (Vol. 7, No 1). One more is planned in October. Few volunteers agreed to help with the articles. These are:
  - a. Dr. Abhishek Sarkar from IIIT Hyderabad
  - b. Dr. Ekta Singla from IIT Ropar
  - c. Mr. Ranjith Pillai. R from SRM University, Chennai
  - d. Prof. Vilas B. Shinde from AVCOE, Sangamner
  - e. Prof. Vinay Patel from BVM, Gujarat
5. Suggestion on using Payment Gateway for processing of New Membership fees and also generation on invoice (with GST details) was made. Action => Mr. Rajeevlochana has to prepare a brief feasibility and comparative study.
6. Suggestion to conduct summer internship for TRS members discussed. Prof. Asokan agreed to look into this suggestion. He requested faculty from IITS and NITs to offer internships for TRS members. Action: Prof. Asokan to work out the details.
7. Suggestion on hosting MOOCs on topics related to Robotics by members of TRS. The links can be put on the TRS website.
8. A provision to obtain TRS membership number is required on the website, where email id can be used to fetch membership ID (similar to IEEE PIN). Action => Mr. Rajeevlochana.
9. Suggestion for holding Workshop/FDP by TRS for the TRS members was made. However, it was decided that such workshops/FDPs should be made public so that anyone can participate.
10. Several TRS members approached TRS for technical co-sponsorship for conducting Conference/Workshop/FDP activity during the next 1 year. A formal request has to be made to the Secretary, TRS for approval.
  - a. NIT Calicut, Kozhikode to conduct a workshop in December 2019/January 2020.
  - b. Birla Vishwakarma Mahavidyalaya, Vidyanagar. Gujarat
11. IIT Ropar (Dr. Ekta Singla) has agreed to host the next TRS Biennial Workshop in 2020. Tentative theme is on “Exoskeletons”
12. IIT Kanpur (Prof. Ashish Dutta) was unanimously selected to be the next organizer for AIR (AIR2021), tentatively in the first week of July 2021.
13. It was also discussed that anyone bidding for AIR conference should have conducted TRS Biennial Workshop.
14. TRS has agreed to be the technical co-sponsor for the 6th International Conference on Multibody System Dynamics (IMSD) and 10th Asian Conference on Multibody Dynamics (ACMD) at IIT Delhi during November 1-5, 2020 (Prof. S. K. Saha).

With no other points to discuss, the GBM ended with a vote of thanks.

### Agenda

1. Welcome Address
2. Approval of minutes of previous GBM
3. Presentation on report of activities by Secretary (Annexure 1)
4. Ratification of decisions taken by General Council
5. Presentation of statement of accounts by Treasurer
6. Discussion on
  - a. TRS news letter
  - b. Accounting issues
  - c. Membership and data base
  - d. TRS activities for 2019-20
  - e. AIR 2021
7. Any other matter with the approval of the chair.

## REPORT ON TRS ACTIVITIES FOR THE PERIOD 2017-2019

- PRESENTED BY THE SECRETARY, TRS DURING THE GBM AT AIR 2019

This report presents the current status on the membership of the society and the activities carried out in the last two years. The total number of members (student as well as lifetime members) as on 15th June is 1106.

For the last two years we were engaging proactively with the robotic community and our sustained publicity efforts could bring a sudden jump in the membership. We have added 388 members in the last two years, which is almost a 40% of the total members.

Another major initiative during the last two years was the formation of student chapters. I thank the committee which worked on the guidelines for student chapters and with their efforts we have a well-defined procedure for chapter formation. Currently we have 5 student chapters. They are:

### 1. COLLEGE OF ENGG, PUNE

Mechanical Engineering Department, College of Engineering, Pune - 411 005 Maharashtra, INDIA.

Prof. Dr. Shantipal S. Ohol

### 2. N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

Dept. of Mechanical Engineering,

Vidyanagar, Nellur Dist, Andra Pradesh -524 413

Prof. CHR. Vikram Kumar-9247714280

### 3. RCC INSTITUTE OF INFORMATION

Dept. of Applied Electronics & Instrumentation Engineering, RCC Institute of Information Technology, Beliaghata, Kolkata- 700015.

Dr. Srijan Bhattacharya- 9432326434

### 4. AMRUTHAVANI COLLEGE OF ENGG.,

Amrut Nagar, Sangamner 422 608 (MS)

Prof. Vilas. B. Shinde - 9420198988.

### 5. JSPM'S RAJARSHI SHAHU COLLEGE OF ENGINEERING,

Tathawade, Pune 411 033, Mob - 9552221600.

Few more are in the pipeline.

We made a good show in the News Letter front also. Thanks to Prof. Sudheer and team; we could bring three issues of newsletter in the last two years. The next issue is due in October 2019. Request the members to contribute articles for the News Letter.

Due to the changes in the society name and registration of the society, a new account was opened at SBI, IIT Delhi for TRS. Also, PAN and GST has been approved for TRS. We are



working on the IT exemption currently. Prof. Suhaib will give more details.

TRS website has been moved to an Indian server. Thanks to web coordinator Prof. Rajeev Lochan for his tremendous efforts in getting this done.

TRS in association with other institutes organised many workshops and conferences. Technical sponsorship was provided for the following conferences:

1. RoSMa 2018, 19-21 July 2018 at IIITD&M Kanchipuram.
2. Second International Conference on Advancements in Automation, Robotics & Sensing (ICAARS2018) PSG College of Technology, Coimbatore, India
3. IEEE Ro-MAN 2019 conference to be held at Delhi in October 2019.

TRS co-organised the following workshops:

1. National Workshop on Human-Centered Robotics (NWHCR) at IIT Jodhpur during March 17-18, 2018
2. Winter School on 'Robotics and Autonomous Systems' at IIT Kanpur, during April 2-5, 2019.
3. Brain-Storming Workshop on Robotics for Improved Livelihood in Indian Context, Innovation-cum-Incubation Centre, CSIR-CEERI, Jaipur (Malviya Nagar), India

Overall, we could make a good impact in the last two years and hope to continue the momentum. Request the support from all the members to make TRS an active society.

(Asokan T)  
Secretary, TRS

# DESIGN & DEVELOPMENT OF RADIATION TOLERANT ADAPTIVE GRIPPER FOR HOT-CELL APPLICATIONS

Surendra Singh Saini, Debasish Datta Ray

Division of Remote Handling & Robotics, Bhabha Atomic Research Centre, Mumbai 400085

## ABSTRACT:

Hot-cells are used to keep radioactive materials safe from humans at nuclear installations. Special purpose Manipulators, Servo manipulators, Advanced servo manipulators (ASMs) and Force reflecting Tele-robots are used inside the hot-cells to remotely handle the hazardous substances. The Telerobot developed earlier for this purpose had a parallel jaw gripper for holding the hot-cell objects. However, as demand grew, the hot cell tasks have become more complex and various object geometries have since been introduced to the Hot-cell. Gripping these with a parallel jaw gripper is not very effective. This provided an impetus for the development of a compliant gripper for effectively gripping moderately complex hot-cell objects. The most significant consideration in designing the gripper is its radiation tolerance since it is closest to the radiation source.

**KEYWORDS:** Adaptive gripper, Tele-robot, Hot-Cell, Remote handling, Compliant gripping, Remote manipulation of radioactive substances.

## ARTICLE:

The Telerobot developed earlier [1] had a parallel jaw gripper. The compliant adaptive gripper so developed is shown in Fig.1 below. The gripper is controllable remotely via two wire connection to a brushed dc motor which was used as an actuator. The current of the motor is controlled to achieve force control and assist the compliance control of the robot [2]. The kinematic chain is designed for the desired opening of 100 mm and a payload of 2kg. The prototype gripper was manufactured us-

ing various engineering materials viz. Carbon Fiber Composite (Phalanges, Interlinks), Al (Cover), Steel/SS (Springs / Fasteners, Spacers, Bearings) etc.

The various operating modes of the gripper as shown in figures 2, 3 and 4.

Extensive trials were taken with the gripper with various load geometries and the efficacy of the design was ascertained. A higher payload capacity version of the gripper is under development.

## CONCLUSION:

This development will further assist in safely manipulating hazardous and radioactive substances remotely and effectively. The design of the gripper avoids use of any material or electronics that may be damaged due to very high radiation that the gripper will be exposed to without compromising any essential functionality.

## REFERENCES:

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2. "Compliance Control of Tele - Robot", Teja Swaroop Tumapala, Surendra Singh Saini, Ushnish Sarkar, Debashish Datta Ray, Proceedings of Conference on Advances In Robotics (AIR '13). ACM, New York, NY, USA, Article 33,7 pages. DOI=10.1145/2506095.2506114 <http://doi.acm.org/10.1145/2506095.2506114>, July 4-6, [2013]

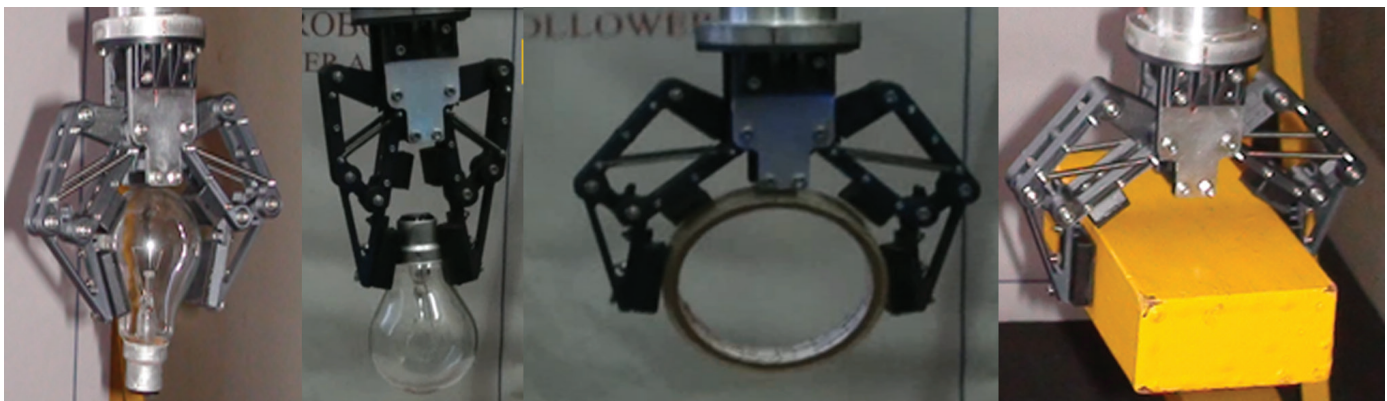


Figure 1

Figure 2

Figure 3

Figure 4

Figure 1: Adaptive gripper for Hot-Cell applications; Figure 2: Pinch mode; Figure 3: Holding a circular ring of 90 mm O.D. in encompassing mode; Figure 4: Holding a rectangular block;



## DEVELOPMENT OF SPHERICAL ROBOTS AT IIT BOMBAY

-Leena Vachhani, Abhishek Gupta, IIT Bombay

Surveillance and monitoring is a crucial part of the internal security infrastructure. The advent of robotics development, surveillance has become facile with the use of aerial and ground robots. However, aerial robots have its limitations for surveillance of indoor premises and specific applications where ground robots seem favourable. Embedded Control lab is working on the project 'Search and Reconnaissance using Spherical Robots' funded by NCETIS, IIT Bombay with the objective of developing spherical robots for surveillance and monitoring for internal security along with interaction with various defense forces in India.

In some specific defense purposes, prior monitoring is important, when its dangerous for defense personnel to take in charge of the situation, spherical robots become favourable due to its agility and scaled downsize with visual feedback and teleoperation which helps them to understand the scenario and take decisions. Spherical robots have been in development since a long time, various techniques have been used such as I. D. U. (Internal Driving Unit), Pendulum actuated propulsion, Flywheel based spherical robots etc. Here the research is carried out based on the yoke and double-pendulum based bots. The novel design of the double pendulum system has its advantages in steering the robot. Alongside methods for heading correction using double pendulum are developed. It has a gear-less design with its scalability from 20 cm to 80 cm spherical robots seem promising for various applications.

Spherical robots used for internal security and surveillance require a hull to be throwable, as the robots are deployed by throwing in any situation. Primarily spherical robot hull was investigated using acrylic material, due to the robot's weight the acrylic cannot withstand the load. So further research on the hull was carried using the poly-carbonate material, it has its advantages over acrylic as it was able to withstand a fall from 3ft where acrylic did not stand. Some investigations for the hull are also done using PDMS material which is soft and transparent, which solved both issues occlusion and throwability, however getting perfect sphere was difficult using PDMS.

A major element for any robot to be used in surveillance activities is the vision system of the robot. Present vision system being developed for the project consists of a single wide-angle camera and software that generates real-time pan 360 view. The software also provides a clear GUI which helps the operator to maneuver smoothly and simultaneously get the pan 360 view. Along with real-time 360 viewings, another software is being developed to reconstruct a 3D map of the environment, in which the robot is being manoeuvred. Presently concepts of LSD-SLAM (Large Scale Direct monocular Simultaneous Localization and Mapping) are being used to perform the 3D reconstruction by using simply the camera frames acquired by the robot. Dense 3D maps help the operator to understand the unexplored area in a better way since it gives more detailed information about the environment as well as pose of the robot.





# PIPE INSPECTION ROBOT FOR WATER SUPPLY AND SEWER PIPELINES

## ABHISHEK SARKAR, IIIT HYDERABAD

In cities most of the households are connected to pipeline systems. Pipeline networks support our everyday life through the transportation of water, crude oil and other products consumed on daily basis. However, the existing network is often in poor condition, endangering the environment, due to its poor maintenance and lack of access. In general, most of the pipes and fittings are susceptible to both internal and external corrosion unless appropriate protective measures are adopted. Problems can be of leaking joints, root intrusion, sedimentation, misalignments, cracks (structural failure), and collapse of pipes. These will lead to blocked supply, water ingress, pollution of the underground, flooding, and road collapse. So, rehabilitation of pipelines has become an absolute necessity. Most of these pipe-lines are placed under the roads. Replacing of pipelines has not only become more costly but it has also got more difficult with growing traffic intensity. No-dig techniques to restore performance by renovating pipelines are economically and environmentally desirable. To facilitate these tasks in pipelines inaccessible to humans, such as oil and gas pipes buried under the sea, power plants, boilers, etc., we thought of developing a pipe climbing robot – for inspection of the condition of a pipe without disrupting public life, which in turn reduce the inspection time as well as cost. Other usage of pipe climbing robot for small diameter pipes includes – profiling of underwater or buried pipes, jetting (cleaning) of household sewer lines etc. The locomotion mechanism of in-pipe climbing robot is broadly categorized as wheeled, wall-press, legged, inchworm and Screw robots [1].

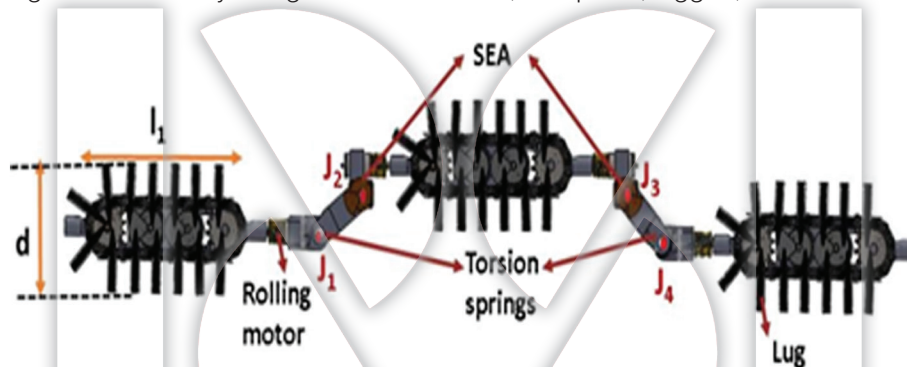


Figure 1: Side view of the CAD model.

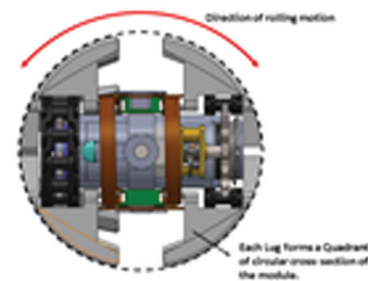
Taking into consideration all of the above facts and limitations of different designs we have designed a prototype of robot with a serial kinematic chain of 3 OmniCrawler (Fig. 1) modules interconnected by links via compliant joints [2]. The design of the OmniCrawler module (Fig. 2), inspired by [3], is of cylindrical shape with hemisphere at both ends. It has two tracks with a series of lugs, results in a significant increase in the contact area and traction. The arc shape of the lugs helps to form the circular cross-section (Fig. 1(c)) of the modules. The holonomic motion of the module is characterized by the circular cross-section of the lugs. Also, the circular cross-section avoids a problem of sinking of modules in a marshy surface, which makes it robust enough to crawl inside pipes with low friction coefficient values. The size of the modules is determined by design constraints posed by the actuators' size as well as pipe diameter.



Figure 2: (a) OmniCrawler module,



(b) Bending capability of robot



(c) circular cross-section

Starting from the design of every components of the pipe climber robots, then fabrication of 3D printed parts and assembly, and finally experimentation are done at Robotics Research Center, IIT Hyderabad. During this process, we have also simulated kinematic and dynamic model of the modules for finalizing many design parameters i.e. shape, size and strength of the parts, spring stiffness for compliant joints etc.

To further extend the capability of the robot to overcome smooth turns and comply with friction coefficient variations, springs at joints J2 and J3 are replaced by an arrangement of geared motor in series with a linear spring, called series elastic actuator (SEA). Here, SEA has been designed with an assembly of dual circular shaft with linear extension springs, where the pair of springs are embedded in between these 2 shafts (Fig. 3).

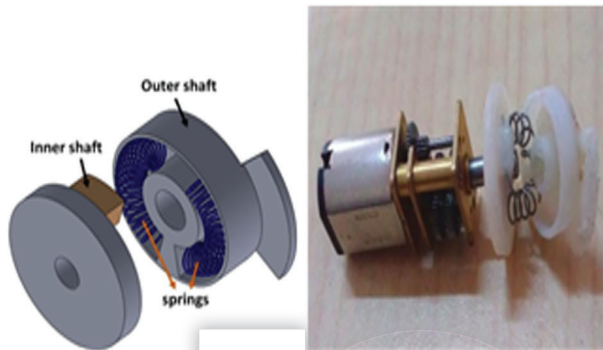


Figure 3: Design of a SEA joint  
(a) CAD model, (b) prototype.



Figure 4: Pipe climbing robot passing through a 90° bend pipe.

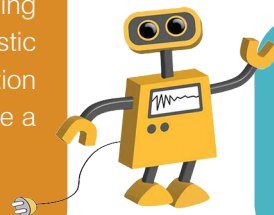
These in-pipe climbing robots are capable of handling various networks of pipes and bends (Fig. 40, and inspection requirements, i.e. drainage pipes, air conditioner ducts, water line pipes etc. But, for different situations, the design and control need to be updated according to a pipe diameter.

## REFERENCES

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2. A. Singh, E. Sachdeva, A. Sarkar and K. Madhava Krishna, "COCrIP: Compliant OmniCrawler in-pipeline robot", 2017 IEEE/RSJ Int. Conference on Intelligent Robots and Systems (IROS) , 24-28 Sept. 2017.
3. Tadakuma, Kenjiro, et al., "Crawler mechanism with circular section to realize a sideling motion." Proceeding of IEEE/RSJ International Conference on Intelligent Robots and Systems, Acropolis Convention Center. Nice, 2008.

## RASHMI

"Rashmi" is an indigenously developed humanoid robot commonly known as the Indian version of Sophia robot. Rashmi robot has got the title of being the first RJ robot as it started RJ'ing for Red FM. The robot hosts an "Ask Rashmi" show where it listens to the user's queries and replies to them. The developers claim that this robot is India's first lip-syncing robot that uses Artificial Intelligence (AI), Linguistic Interpretation (LI), visual data and face recognition systems enabling it to act and answer queries like a human being.



## UPCOMING EVENTS

Faculty Development program on Robotics, Artificial Intelligence and Control (RAIAC 2020) to be held at NIT Calicut from 3rd to 8th Feb 2020 (Sponsored by TEQIP NIT Calicut, Indo-Korea Joint Network Center on Robotics (IKJNCR) & TRS

## "HOW TO BECOME A TRS MEMBER"

To become a TRS member kindly follow the instructions given in the website

<http://www.rs-india.org/membership/>



## TRS STUDENT CHAPTERS

### FIRST-EVER STUDENT CHAPTER FORMED AT THE COLLEGE OF ENGINEERING PUNE

The student chapter of The Robotics Society (TRS) India was inaugurated at the College of Engineering Pune on 18th January 2019 (Chapter Reg. No.: TRS-SC/18/001). Dr. B. B. Ahuja, Director COEP and Dr. S.S. Ohol are the Faculty Committee members of the student chapter at COEP. The chief guests for the inauguration ceremony were Mr. Alok Mukherjee (Scientist 'G' and Head, Robotics Division, R&DE Dighi, DRDO) and Dr. B. B. Ahuja (Director, College of Engineering, Pune). Mr. Alok Mukherjee is known for his instrumental work in the development of UAV Netra. The student chapter was inaugurated using an upper torso humanoid robot built at COEP's Robotics and Automation Lab by the Robot Study Circle members.

The Director of COEP, Dr. B.B. Ahuja elaborated on the need for Robotics and importance of IoT in industry. He termed IoT as an "Integration of Technology" which is leading to development for Industries. Mr. Alok Mukherjee gave a presentation on DRDO's recent projects in defense robotics. His keynote gave the audience a vision to explore how robotics can make it safer while handling and operating bombs. He provided a practical model presentation on the insights of Unexploded Ordnance Handling Robot (UXOR) which is capable of handling, diffusing and detecting unexploded ordinance. He also congratulated Dr. S. S. Ohol for taking the initiative and motivating three other institutes in and around Pune city to begin student chapter of The Robotics Society of India in their respective institutes. Dr. B. B. Ahuja expressed his thoughts on increasing applications of



robots in the real world. Dr. S. S. Ohol introduced the audience to the TRS and motivated students as well as faculty members to be a part of the chapter. He explained the importance and need of the TRS student chapter. TRS student chapter members were informed about the workshops that will be organised in the near future, some of which are based on Robot Operating System (ROS), brain-controlled robotics, ABB industrial robot training workshop, hands-on session on the ARM cortex microcontroller, collaborative robot and its demonstration workshop, advanced intelligent drone software workshop, etc. At the end of the ceremony, the robot study circle members who represented India at the International Robocon 2017 at Tokyo, Japan, were felicitated with a certificate of appreciation for their outstanding performance at International Robocon.

### STUDENT CHAPTER INAUGURATED AT THE JSPM RAJARSHI SHAHU COLLEGE OF ENGINEERING

TRS student chapter was established in JSPM'S Rajarshi Shahu College of Engineering, Tathawade Pune on 2nd August 2019. The chief guest Dr. S S Ohol and guest of honor Ms. Srujana Tripathi inaugurated the chapter. The meeting was graced by Dr. R K Jain, Principal of JSPM's RSCO, Dr. A M Badadhe, HOD of Mechanical Department, Prof. K M Nawasagare, chapter coordinator, and teachers of Mechanical Department. The program began by lightning the lamp after which guests were felicitated, and the inauguration of the chapter was carried out digitally. Dr. S S Ohol, student coordinator of TRS, India highlighted the importance of emerging technology and defined robotics, its extremities, and limitations. Ms. Srujana Tripathi currently working in TAL (Tata Automation Ltd.) shared her industry experience with students. Dr. A M Badadhe delivered the key-

note address on activities of the Mechanical Department. The inauguration program was concluded by the vote of thanks by Prof. K M Nawasagare. The program was a grand success and paved the way for Robotics activities within the college.



## TRS STUDENT CHAPTER AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER, MAHARASHTRA

The TRS student chapter at the Amrutvahini College of Engineering, Sangamner, Maharashtra, started on 22nd February 2019, with two faculty members and twenty students. Vilas B. Shinde, Assistant Professor, Production Engineering, is currently the Coordinator of the student chapter which organized several student and faculty workshops. A national workshop on manufacturing, automation, and robotics (NWMAR'19) was held at Amrutvahini COE in collaboration with TRS during 22nd & 23rd February 2019. The workshop had two plenary talks, six expert sessions in the area of industrial robotics by eminent Professors/Scientists/Researchers from Academia/R&D and organization/Industry. The workshop received a very encouraging response which was attended by more than seventy participants across the country. More specifically, it focused on basic fundamentals of robotics and application of robotics in manufacturing automation. Prof. Dr. B.R. Borkar, Head of the

Department of Production Engineering welcomed the participants and experts to the workshop. Inauguration and opening of the TRS students chapter were graced by eminent people like Dr. Arvind Tilak (CEO, Ascent Intellimation Pvt. Ltd, Pune), Prof. Dr. M.A. Venkatesh (Principal Amrutvahini COE) and Shri. Anil Shinde (CEO, Amrutvahini Institutes). Dr. Arvind Tilak (CEO, Ascent Intellimation Pvt. Ltd, Pune) and Prof. Dr B.K. Rout (BITS Pilani, Rajasthan) delivered plenary talks. This was followed by invited talks from Prof. Dr. S. Ohol (COEP, Pune), Dr. PJ Pawar (Professor and Head, PED, KKWIEE&R, Nashik), Mr. Sunil Chore (GM, India soft, Pune), and Mr. Narsimasing Gehrewar (Associative Robotics, Pune). The hands-on training was given to the participants on basic robot welding programming using ABB IRB1410 Industrial Arm. The workshop was concluded with vote of thanks by Prof. Vilas B. Shinde (coordinator of the workshop).



## TRS STUDENT CHAPTER RCCI INSTITUTE OF INFORMATION TECHNOLOGY (RCCIIT), KOLKATA

The Department of Applied Electronics & Instrumentation Engineering of RCCIIT organized the 2nd student workshop on Mechatronics & Robotics with the TRS student chapter, RCCIIT (Chapter Reg. No.: TRS-SC/19/003) on July 25th & 26th, 2019. Dr. Srijan Bhattacharya (LMTRS) and Prof. Ujjwal Mondal (LMTRS) were the conveners for this workshop. Mr. Avishek Paul (LMTRS) and Ms. Naiwrita Dey (LMTRS) were the joint conveners for the event. Fifty-eight students including Diploma, B. Tech, and M.Tech participated in this workshop.

The Keynote Lecture was given by Prof. Subhasis Bhaumik, founder of School of Mechatronics & Robotics, IEST, Shibpur. Mr. Pallab Acharya, of Siemens interacted with students, and he gave a lecture on the on-going activities of Siemens in vari-

ous engineering fields. Prof. Budhaditya Biswas, Assistant Professor in Electrical Engineering, RCCIIT demonstrated different models of IoT. Dr. Srijan Bhattacharya, RCCIIT gave a lecture on the applications of Mechatronics & Robotics in daily life.

