



Advances in Robotics (AIR 2021)

5th International Conference of The Robotics Society
June 30 - July 3, 2021, Indian Institute of Technology Kanpur, Kanpur, India



Advances in Robotics (AIR) is a series of biennial conference organized by [The Robotics Society](#) (earlier referred to as 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 has plenary talks, oral and poster presentations, workshops and special industry oriented sessions. The previous editions of AIR's were held at R&DE, DRDO Pune ([AIR 2013](#)), BITS Pilani Goa Campus, Goa ([AIR 2015](#)), IIT Delhi ([AIR 2017](#)) and IIT Madras ([AIR 2019](#)).

AIR 2021, the 5th conference of the series, was conducted in "Fully Online Mode" by IIT Kanpur, Kanpur, Uttar Pradesh, India during June 30-July 3, 2021.

Technical Sessions

AIR 2021 conference received around 115 papers and at least two double-blind review process was conducted on all the papers. Based on the reviewers' comments and the technical committee recommendations, a total of 56 papers were accepted as

- 38 Full Paper Presentation (14 minutes presentation)
- 18 Short Presentation (7 minutes) followed by Posters

Workshop

The Robotics Society of Japan (RSJ) and The Robotics Society (TRS, India) **Workshop** – "Robotics in Japan and India" is on June 30, 2021. The following are the speakers in the Workshop

RSJ (Japan)

Prof. Hiroki Murakami
 Prof. Tomohiro Shibata
 Prof. Kanako Harada
 Prof. Kimitoshi Yamazaki
 Prof. Gentiane Venture

TRS (India)

Prof. Santanu Chaudhury
 Prof. Subir Kumar Saha
 Prof. Asokan T.
 Prof. Ekta Singla
 Prof. Ashish Dutta

Tutorials

- Tutorial 1: "**Machine Learning Applications in Robotics using MATLAB**" by Dr. Dhruv Chandel, MathWorks India
- Tutorial 2: "**Design and Control of Rehabilitation Robots**" by Prof. Sunil Agarwal, Columbia University, USA

Industry Session

Systemantics India

Plenary and Keynote Speakers

AIR Conferences invite highly reputed researchers from robotics domain to deliver plenary and keynote lectures. For AIR2021, these were delivered by

Prof. M. Asada

Osaka University, Japan

"Autonomy in humans and machines: Robot sense of agency: self, pain, and ethics"



Prof. Paolo Fiorini

University of Verona, Italy

"Dreams in medical and surgical robotics: intelligence and affordability"

Prof. Seul Jung

Chungnam National University, Korea

"Balancing mechanism and control in research and life"



Prof. Prathyush P. Menon

University of Exeter, UK

"Autonomous Oceanographic Sampling"

Patron

Prof. Abhay Karandikar

Director, IIT Kanpur

General Co-Chair

Prof. Santanu Chaudhury

IIT Jodhpur (President, TRS)

Programme Co-Chairs

Prof. Ashish Dutta

IIT Kanpur

Prof. Tomohiro Shibata

Kyushu Inst. of Tech., Japan

Publication Chair

Prof. Asokan T

IIT Madras (Secretary, TRS)

Publicity & Sponsorship Chairs

Prof. Subir K. Saha

IIT Delhi (Vice President-Acad., TRS)

Mr. Alok Mukherjee

DRDO (R&DE), Pune

Organizing Committee

Prof. Laxmidhar Behera, IIT Kanpur

Prof. G. C. Nandi, IIIT Allahabad

Prof. Mangal Kothari, IIT Kanpur

Prof. S. R. Sahoo, IIT Kanpur

Prof. K. S. Venkatesh, IIT Kanpur

Prof. Anjali Kulkarni, IIT Kanpur

Prof. Indranil Saha, IIT Kanpur

Mr. Rajeevlochana G. Chittawadigi

Amrita Vishwa Vidyapeetham, Bengaluru

Proceedings



Technical



Day 1: The Robotics Society of Japan (RSJ) and The Robotics Society (TRS, India) Workshop – “Robotics in Japan and India”

The screenshot shows a Zoom meeting interface with the following details:

- Meeting Title:** Advances in Robotics (AIR 2021)
- Event:** 5th International Conference of The Robotics Society
- Status:** LIVE, 46 participants
- Participants:** Ashish Dutta, Asokan, Director, IIT Jod..., Hiroki MURAKAMI, Kimitoshi Yama..., Minoru Asada, SK Saha, Tomohiro Shibata, kanako HARADA
- Bottom Bar:** Includes a timer at 00:15:20, a 'Stop' button, and controls for Present On, Cam Off, Mic Off, Share, Lobby, and More.

Day 1: Tutorial 1: Machine Learning Applications in Robotics using MATLAB by Dr. Dhruv Chandel, MathWorks (India)



LIVE

45

Advances in Robotics (AIR 2021)

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Speakers



Ashish Dutta



Dhruv Chandel

MathWorks

There are two ways to get a computer to do what you want

Machine Learning

```
graph LR; Data[Data] --> Computer[COMPUTER]; Output[Output] --> Computer; Computer --> Model[Model]; subgraph AI [Artificial Intelligence]; subgraph ML [Machine Learning]; subgraph DL [Deep Learning]; end; end; end;
```

10



Dhruv Chandel screen



00:09:23

Stop



Present On



Cam Off



Mic Off



Share



Lobby



More

Day 1: **Tutorial 2:** Design and Control of Rehabilitation Robots by **Prof. Sunil Agrawal**, Columbia University, USA



LIVE
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Advances in Robotics (AIR 2021)
5th International Conference of The Robotics Society

Speakers



Ashish Dutta



Sunil K. Agrawal

Robotics to improve Balance, Posture, and Mobility in Children

Sunil K. Agrawal, Ph.D.

Professor of Mechanical Engineering and Rehabilitation Medicine

Director of ROAR Laboratories

Columbia University, New York, NY 10027

Email: Sunil.Agrawal@columbia.edu

Web: <https://roar.me.columbia.edu>



RObotics
And
Rehabilitation
Laboratory



COLUMBIA UNIVERSITY
MEDICAL CENTER

NewYork-Presbyterian
The University Hospital of Columbia and Cornell



COLUMBIA ENGINEERING
The Fu Foundation School of Engineering and Applied Science



Sunil K. Agrawal screen



00:03:25

Stop



Present On



Cam Off



Mic Off



Share



Lobby



More

Day 2: Inaugural Program of AIR 2021

Upper Row: Prof. Ashish Dutta, Prof. Mangal Kothari, Prof. M. Asada

Lower Row: Prof. Samir Khandekar, Prof. Santanu Chadhury, Prof. Abhay Karandikar)



Day 2: Plenary Talk 1: Prof M. Asada, Osaka University, Osaka, Japan
“Autonomy in humans and machines: Robot sense of agency: self, pain, and ethics”

Self Introduction

大阪国際工科専門職大学

• Vice president of International Professional University of Technology in Osaka, JAPAN

大阪大学
OSAKA UNIVERSITY

• Former President of Robotics Society of Japan

RSJ

• Vice President of Japanese Society of Baby Science

RoboCup

• One of the founders of **RoboCup**



Day 2: Technical Session 1: Kinematics, Dynamics, Control and Simulation

Session Chair: Prof. Asokan T



LIVE

48

Advances in Robotics (AIR 2021)

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Aishwarya Rao

Asokan

Ranjan Dasgupta



Ritesh kumar

Unmute

SARFARAJ AH...

Shubhi Katiyar

Day 2: Technical Session 2: Kinematics, Dynamics, Control and Simulation

Session Chair: Prof. Ashish Singla



LIVE
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Advances in Robotics (AIR 2021)
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00:09:43

Stop



Day 2: Technical Session 3: Design of Robotic Mechanisms

Session Chair: Prof. Ekta Singla

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LIVE 32

Ashish Dutta

Ashish Majithiya

DIPNARAYAN ...

Ekta

Rajashekhar V S

Saurabh

Unmute

02:10:13 Stop

Present On Cam Off Mic Off Share Lobby More

Day 3: Technical Session 4: Humanoid Robotics, Active Sensory Perception

Session Chair: Prof. Vineet Vashista

The image shows a Zoom meeting interface for the event "Advances in Robotics (AIR 2021)", which is the 5th International Conference of The Robotics Society. The meeting is currently live, with 14 participants. Five video thumbnails are visible, each with a name label at the bottom: Ashish Dutta (top left), Jitendra Kumar (top middle), Navaneeth M G (top right), Sunil Gora (bottom left), and Vineet Vashista (bottom right). The interface includes a top navigation bar with a menu icon, a profile icon, and the event title. At the bottom, there is a control bar with icons for help, a timer showing 00:11:32, a "Stop" button, and various meeting controls like mute, video, and chat.

Day 3: **Technical Session 5:** Humanoid Robotics, Active Sensory Perception

Session Chair: Unmanned Vehicles and Virtual Reality



LIVE
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Advances in Robotics (AIR 2021)
5th International Conference of The Robotics Society



Rajeevlochana ...



Aditya Rathi



Akshay Darekar



Ashish Dutta



Karthikeyan M



Mangal Kothari



SIVASANKAR



Suraj Borate

Day 3: Plenary Talk 2: Prof. Paolo Fiorini, University of Verona, Verona, Italy

“Dreams in medical and surgical robotics: intelligence and affordability”

Speakers



Ashish Dutta



Paolo Fiorini



Advances in Robotics (AIR 2021)

Dreams in Medical and Surgical Robotics: Intelligence and Affordability

Paolo Fiorini
Department of Computer Science
University of Verona

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Paolo Fiorini screen

Day 3: Technical Session 6: Poster Presentation

Session Chair: Prof. Ashish Dutta



LIVE
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Advances in Robotics (AIR 2021)
5th International Conference of The Robotics Society



Day 3: Technical Session 6: Poster Presentation

Session Chair: Prof. Ashish Dutta



LIVE
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Advances in Robotics (AIR 2021)
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Day 4: Plenary Talk 3: Prof. Seul Jung, Chungnam National Univ., Korea “Balancing mechanism and control in research and life”



LIVE

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Advances in Robotics (AIR 2021)

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Speakers



Ashish Dutta



Seul Jung



Balancing Control in Research and Life

Prof. Seul Jung
(jungs@cnu.ac.kr)

I.S.E.E
(**I**ntelligent **S**ystems and **E**motional **E**ngineering Laboratory)
Department of Mechatronics Engineering
Chungnam National University, Daejeon, Korea
Daejeon, Korea 34134
(<http://isee.cnu.ac.kr>)

for

The 5th AIR(Advances in Robotics)
9AM(12:30) – 10AM(13:30), July 3, Saturday 2021



Seul Jung screen



00:04:29

Stop



Day 4: **Technical Session 7**: Poster Presentation and Industry Talk
Session Chair: Prof. Subir K. Saha



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Day 4: July 3, 2021 (Saturday)

Timings mentioned are Indian Standard Time (IST) which is GMT + 5:30 hours

Technical Session 7: Poster Presentation 2 and Industry Talk

Time	Paper ID	Presenter	Paper Title
10:00 – 10:10	52	Aakarsh Goel	Adaptive Look-ahead distance for Pure Pursuit Controller with Deep Reinforcement Learning Techniques
10:10 – 10:20	22	Lalit N Patil	Enhancing Safety of Electric Vehicle Drivers through Vision Oriented Monitoring System
10:20 – 10:30	69	<u>Nayan M. Kakoty</u>	Development of A Technology Education Programme based on Self-Driven, Self-Learning and Self-Evaluating Approach
10:30 – 11:00		Industry Talk	Industry Talk from <u>Systemantics</u> (Bengaluru, India) By <u>Dr. Jagannath Raju</u> (CTO, <u>Systemantics</u>)



Day 4: **Technical Session 8:** Bio-mimetic and Computer Vision
Session Chair: Prof. Sudheer A. P.



Day 4: Technical Session 9: Machine Learning, Man Machine Systems

Session Chair: Prof. Nayan M. Kakoty

Navigation icons: Home, Profile, Search, etc.

LIVE Advances in Robotics (AIR 2021)
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Rajeevlochana ...

Ashish Dutta

Nayan M Kakoty

Prashant Nag

Siddhant Saoji **Unmute**

00:08:21 Stop

Microphone, Video, Chat, Participants, More options

Day 4: Keynote Talk: Prof. Prathyush P. Menon, Univ. of Exeter, UK

“Autonomous Oceanographic Sampling”



LIVE

25

Advances in Robotics (AIR 2021)

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Speakers



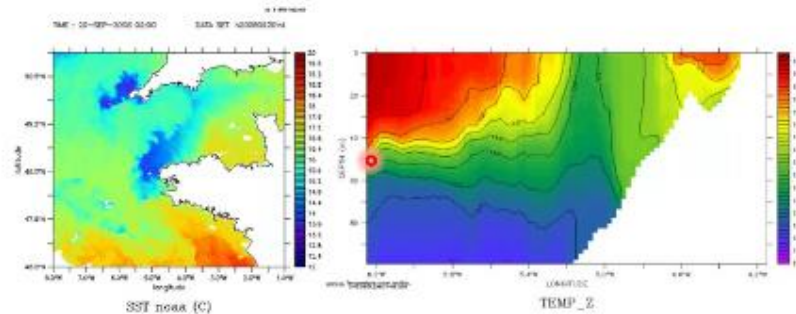
Prathyush



Ashish Dutta

Oceanography Applications

- Tidal fronts separate the stratified deeper waters from the mixed/homogeneous shallower waters



Prathyush screen



00:09:56

Stop



Day 4: Closing Ceremony

Navigation icons: Home, Profile, Search, etc.

LIVE Ending in: **53:50** 34

Advances in Robotics (AIR 2021)

5th International Conference of The Robotics Society



Rajeevlochana ...



Ashish Dutta



Mangal Kothari



Navaneeth M G



Prathyush



Rajashekhar V S



Vilas B. Shinde



Aamir Hayat

01:37:05 Stop

Navigation icons: Stop, Mute, Video, Chat, etc.