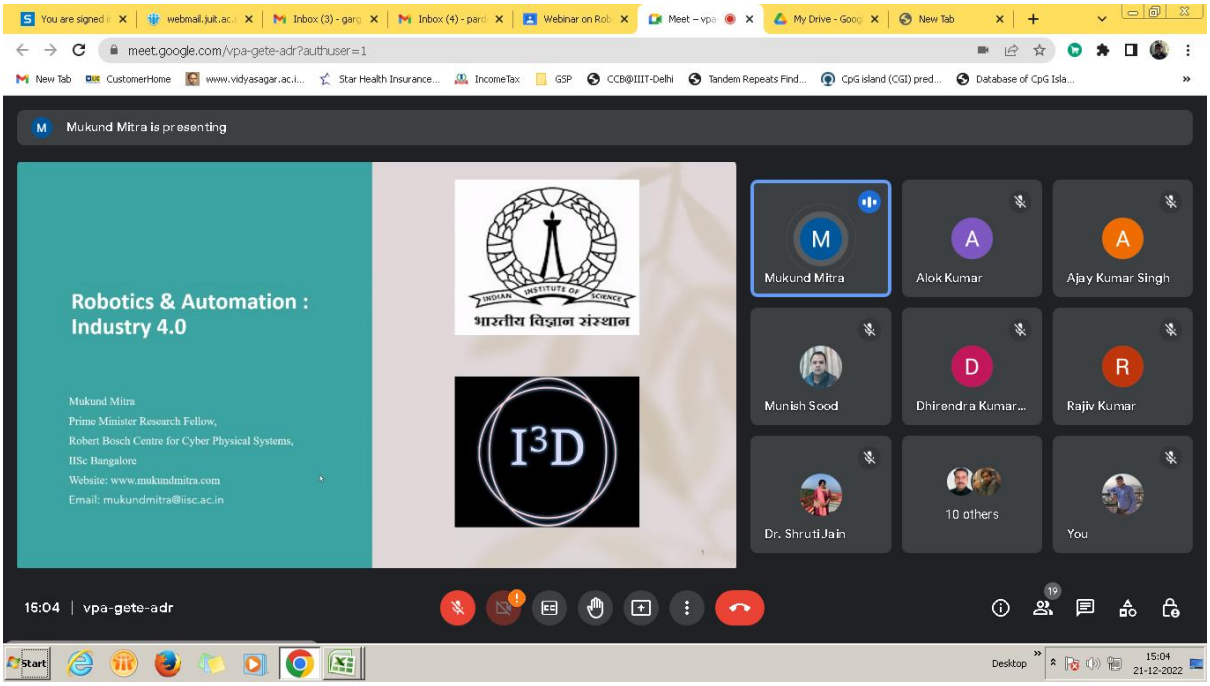
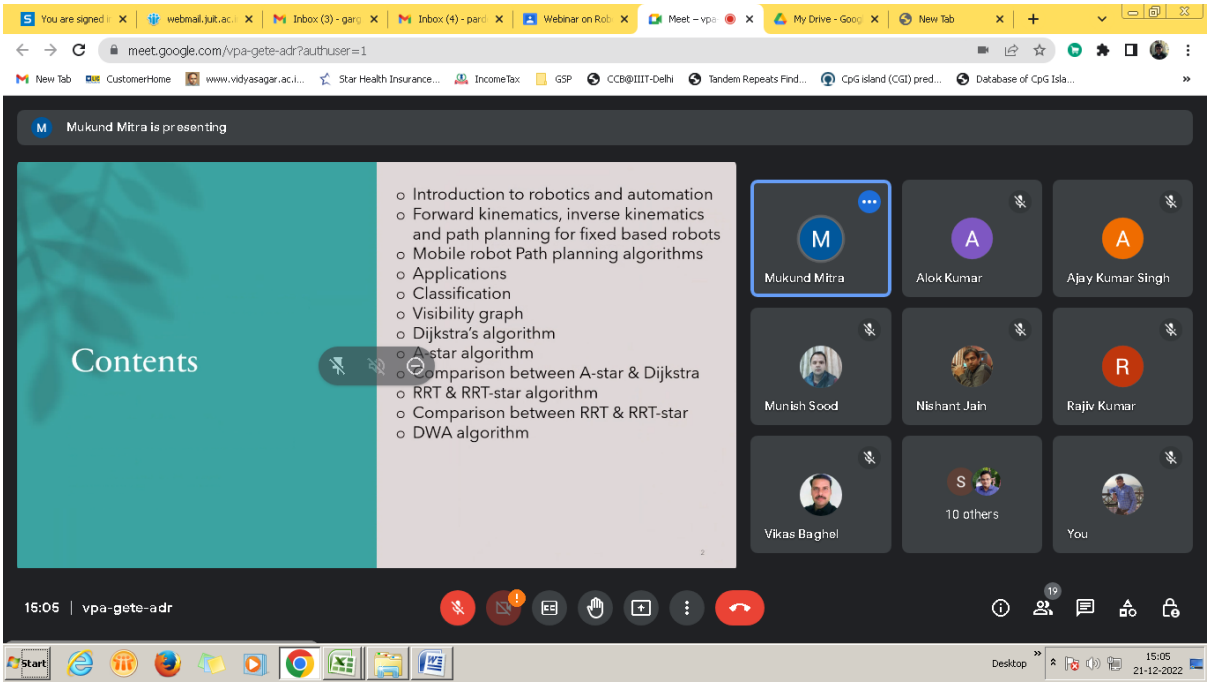
Report of Webinar held on 21-12-2022

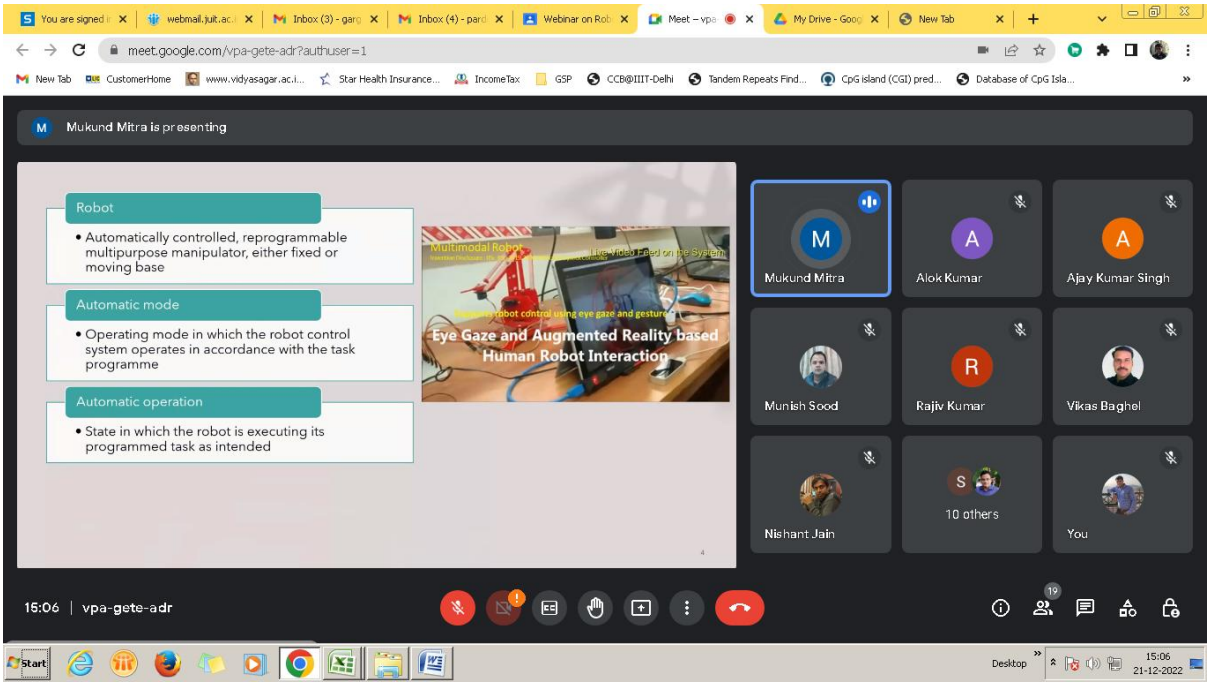
The department of Electronics & Communication Engineering, JUIT organized a webinar in online mode on **21-12-2022 at 3 PM**. The topic of the webinar was, '**Robotics & Automation: Industry 4.0**'. The resource person for the webinar was Mr. Mukund Mitra.

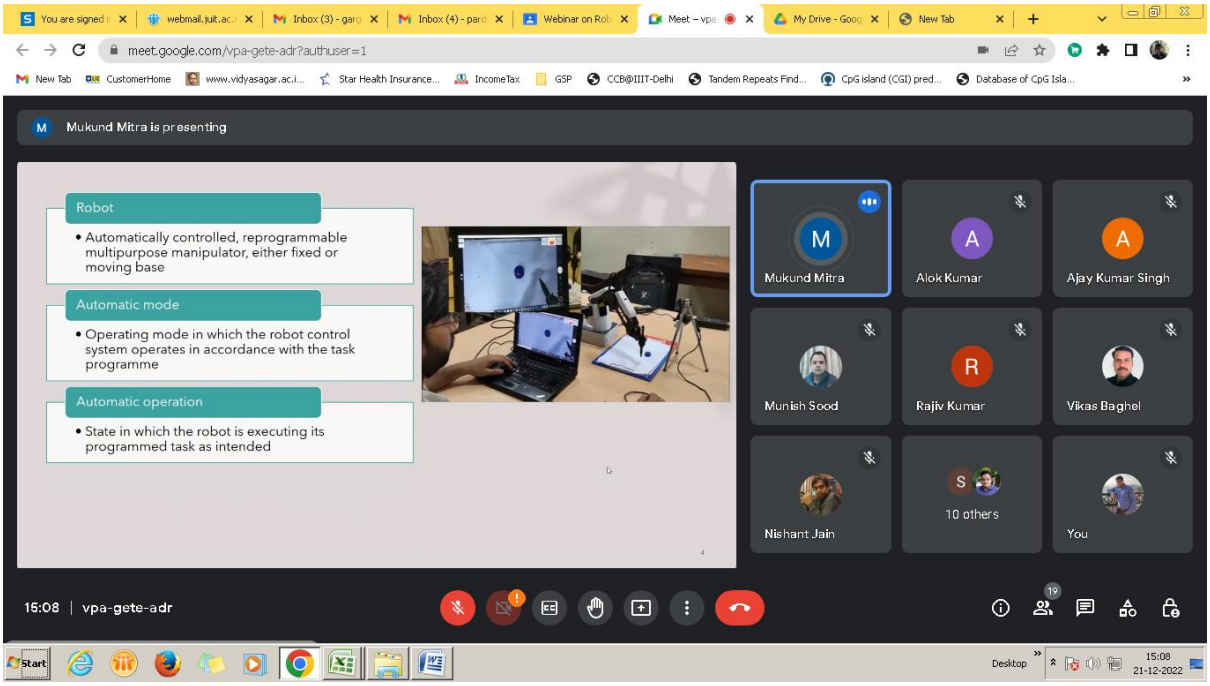
Mr. Mukund Mitra is a PhD scholar and Prime Minister Research Fellow at Robert Bosch Centre for Cyber Physical Systems (RBCCPS) in Indian Institute of Science Bangalore (IISc) Bangalore. He received his B.Tech. degree in Mechanical Engineering from National Institute of Technology (NIT) Raipur in 2020. He started his career in the field of robotics especially on mobile robots. His prime focus as a PhD student is on trajectory planning and optimization of mobile robots. He also works on control system, human-robot interaction and reinforcement learning for all kinds of robotic platform. He works in I3D lab and Nahar Centre for Robotics and Prototyping at IISc Bangalore under the supervision of Prof. Pradipta Biswas. He is the recipient of many awards and has given talks on Robotics earlier also. He has undertaken various projects in the field of Robotics.

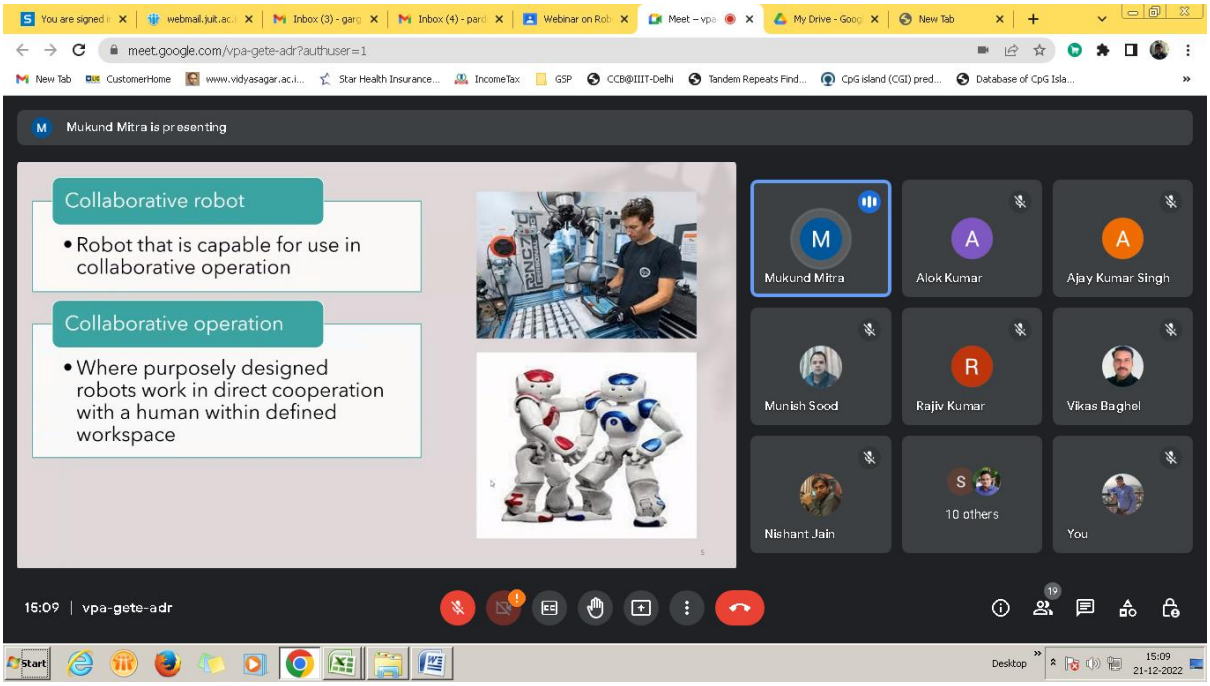
The webinar was attended by all faculty and lab staff members of the ECE department. Few glimpse of the webinar are as follows:




meet.google.com/vpa-gete-adr?authuser=1
Mukund Mitra is presenting
Contents
Introduction to robotics and automation
Forward kinematics, inverse kinematics and path planning for fixed based robots
Mobile robot Path planning algorithms
Applications
Classification
Visibility graph
Dijkstra's algorithm
A-star algorithm
Comparison between A-star & Dijkstra
RRT & RRT-star algorithm
Comparison between RRT & RRT-star
DWA algorithm
Mukund Mitra
Alok Kumar
Ajay Kumar Singh
Munish Sood
Nishant Jain
Rajiv Kumar
Vikas Baghel
10 others
You
15:05 | vpa-gete-adr


meet.google.com/vpa-gete-adr?authuser=1
Mukund Mitra is presenting
Robot
Automatically controlled, reprogrammable multipurpose manipulator, either fixed or moving base
Automatic mode
Operating mode in which the robot control system operates in accordance with the task programme
Automatic operation
State in which the robot is executing its programmed task as intended
Eye Gaze and Augmented Reality based Human Robot Interaction
Mukund Mitra
Alok Kumar
Ajay Kumar Singh
Munish Sood
Rajiv Kumar
Vikas Baghel
Nishant Jain
10 others
You
15:06 | vpa-gete-adr


meet.google.com/vpa-gete-adr?authuser=1
Mukund Mitra is presenting
Robot
• Automatically controlled, reprogrammable multipurpose manipulator, either fixed or moving base
Automatic mode
• Operating mode in which the robot control system operates in accordance with the task programme
Automatic operation
• State in which the robot is executing its programmed task as intended
Mukund Mitra
Alok Kumar
Ajay Kumar Singh
Munish Sood
Rajiv Kumar
Vikas Baghel
Nishant Jain
10 others
You
15:08 | vpa-gete-adr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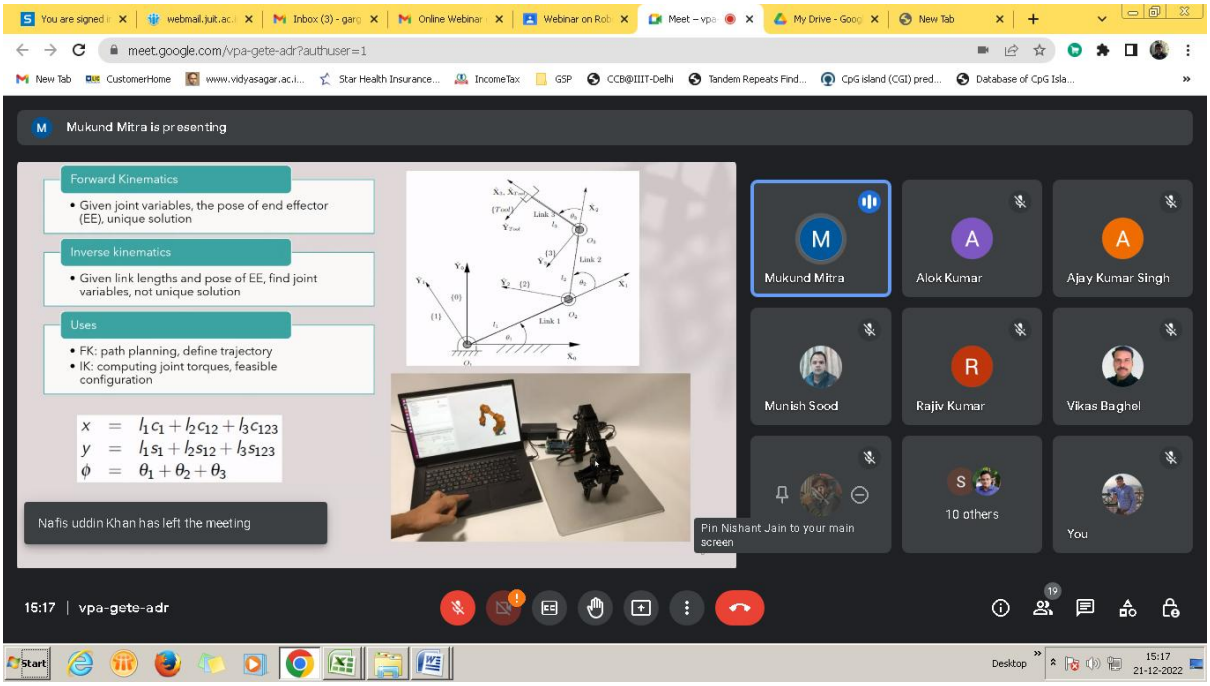
Mukund Mitra is presenting
Collaborative robot
• Robot that is capable for use in collaborative operation
Collaborative operation
• Where purposely designed robots work in direct cooperation with a human within defined workspace
Mukund Mitra
Alok Kumar
Ajay Kumar Singh
Munish Sood
Rajiv Kumar
Vikas Baghel
Nishant Jain
10 others
You
15:09 | vpa-gete-adr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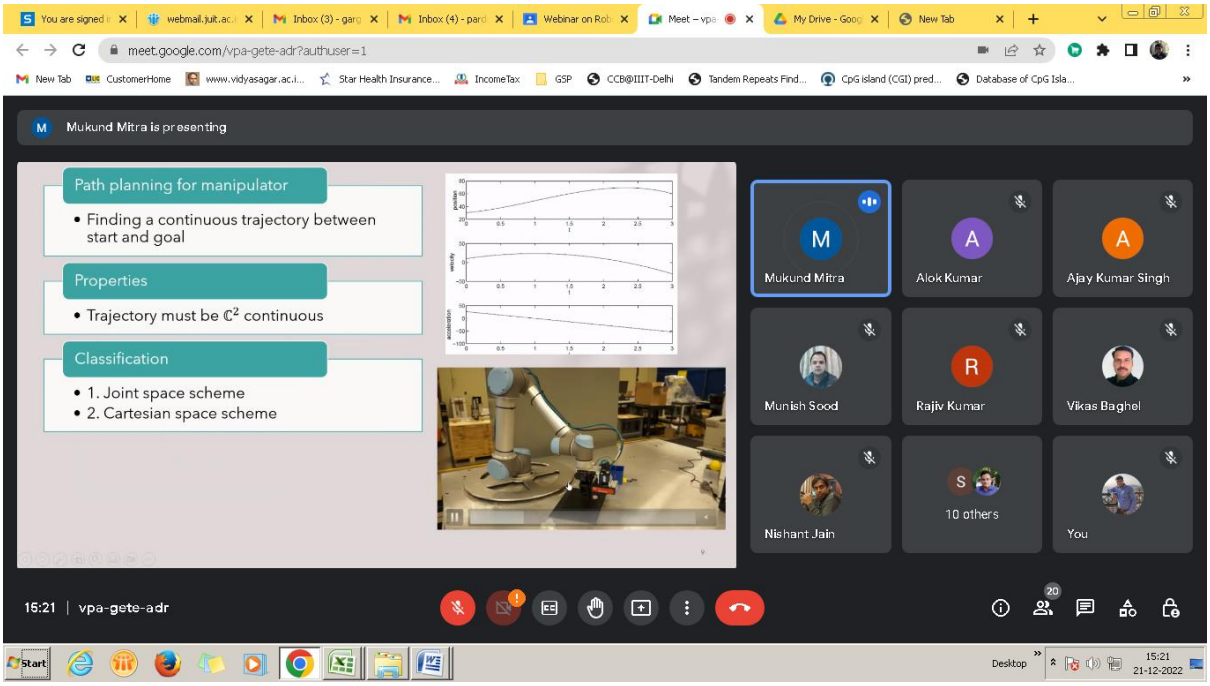
Mukund Mitra is presenting
Forward Kinematics
• Given joint variables, the pose of end effector (EE), unique solution
Inverse kinematics
• Given link lengths and pose of EE, find joint variables, not unique solution
Uses
• FK: path planning, define trajectory
• IK: computing joint torques, feasible configuration
$x = l_1c_1 + l_2c_{12} + l_3c_{123}$
$y = l_1s_1 + l_2s_{12} + l_3s_{123}$
$\phi = \theta_1 + \theta_2 + \theta_3$
Nafis uddin Khan has left the meeting
Mukund Mitra
Alok Kumar
Ajay Kumar Singh
Munish Sood
Rajiv Kumar
Vikas Baghel
10 others
You
Pin Nishant Jain to your main screen
15:17 | vpa-gete-adr


meet.google.com/vpa-gete-adr?authuser=1
Mukund Mitra is presenting
Path planning for manipulator
• Finding a continuous trajectory between start and goal
Properties
• Trajectory must be $\mathbb{C}^2$ continuous
Classification
• 1. Joint space scheme
• 2. Cartesian space scheme
Mukund Mitra
Alok Kumar
Ajay Kumar Singh
Munish Sood
Rajiv Kumar
Vikas Baghel
Nishant Jain
10 others
You
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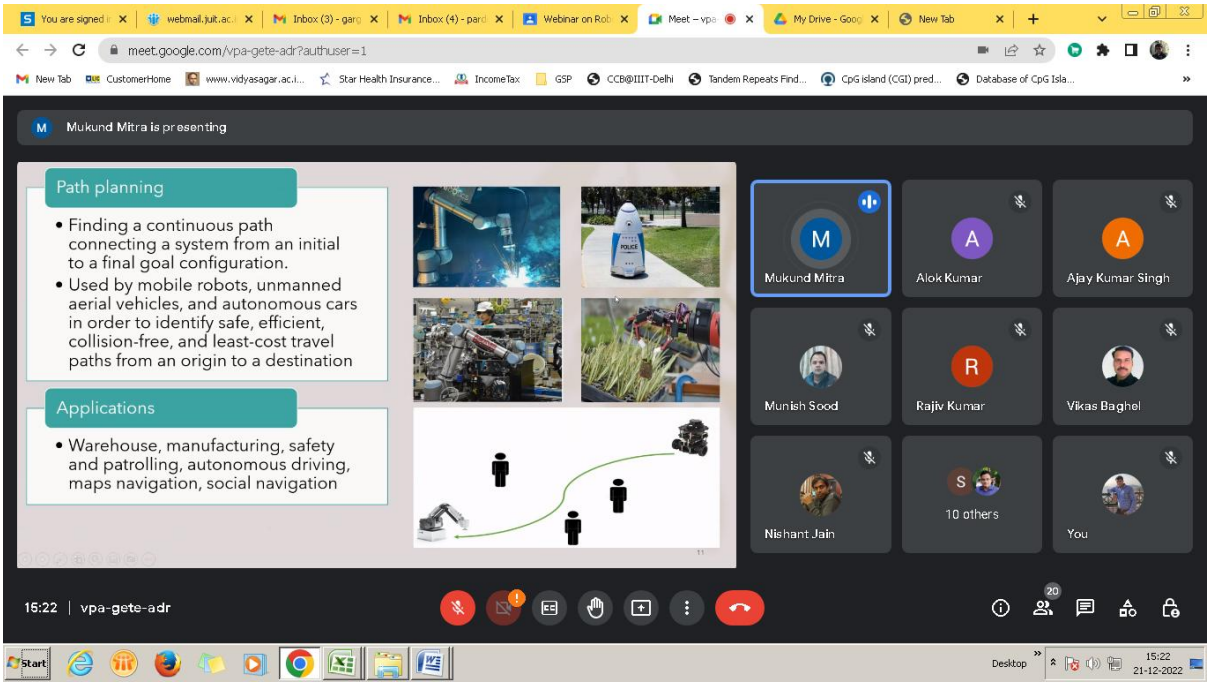

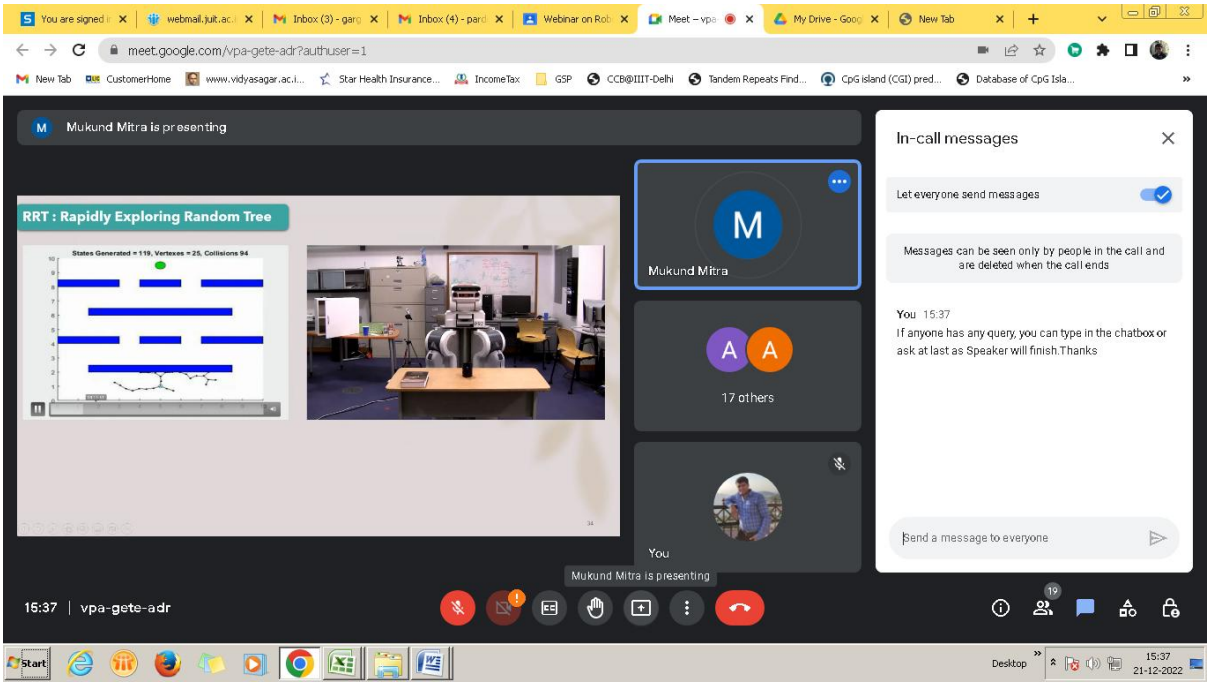

Prof. Rajiv Kumar (Prof. & Head, ECE department) thanked Mr. Mukund Mitra for accepting the invitation to be the resource person for the webinar. Dr. Pardeep Garg (Webinar Coordinator) gave the vote of thanks to the speaker and all the participants. The webinar was ended at 4 PM.