Hands-on Skill Development workshops and tutorial on Robotics for Good

Hands on Skill Development workshops and tutorial for staff, faculty, researchers, students and school students in December 2016 as part of RAHA 2016. Inspired a powerful, creative spirit that transcended science and technology. Using robotics and automation solutions to help solve societal challenges is such a blessing, and Amrita Vishwa Vidyapeetham is at the forefront of this pioneering work.

Workshop Social Entrepreneurship - Research to Commercialization By Rejin Narayanan, Ingen Robotics, Abheek Bose, Systemantics Ltd. and Snehal Shetty, Amrita TBI Get ready for your own Robotics Startup! Take a walk through the challenges of building a robotics startup, and taking your product from concept to production.

Figure 1Robotics Entrpreneurship led by from Ingen Robotics and Systemantics India Pvt. Ltd

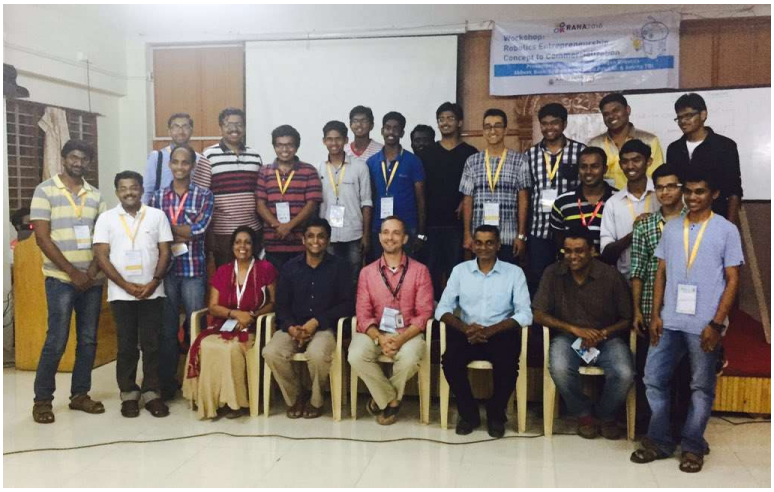

Figure 2Group photo of the Robotics Entrepreneurship workshop presenters, participants, and guests

Tutorial 1 Design & Deploying Control Algorithms for Robotics Application using Matlab By Dhirendra Singh, and Application Engineer, Math Works India Learn about three crucial issues: how to design and simulate a robot, how to prototype and test its algorithms, and how to connect to robot platforms and peripherals.

Tutorial 2 Learning Robot Kinematics using RoboAnalyzer and ABB Robots By Rajeevlochana Chittawadigi, Amrita University, Bengaluru, Vishnu Rajendran, Amrita University, Amritapuri, Prof. Subir Kumar Saha, IIT Delhi, New Delhi We will go deep into RoboAnalyzer and ABB Robots to give you the skills needed to visualize sophisticated concepts in robotics.

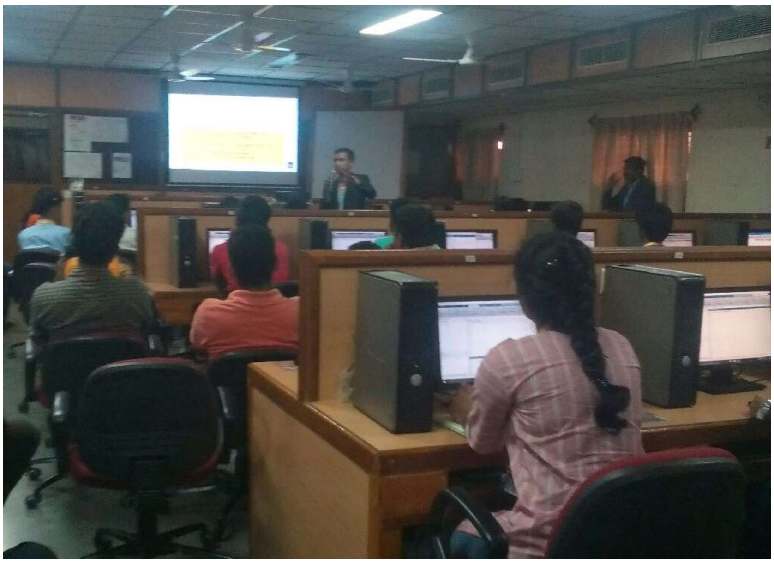

Figure 3utorial on Learning robot kinematics using RoboAnalyzer and ABB Robots

Tutorial 3 Cable-Driven Parallel Robots by Dr. Vineet Vashista, IIT Gandhinagar Cable driven robots have some unique properties that make them exciting choices for a wide range of applications. This tutorial will go deeply into cable driven robots in theory and practice. The conference includes one workshop and several tutorials specializing in various robotics themes.

Figure 4Engaging young minds! Dr. Vineet Vashishta, IIT Gandhinagar on Cable Driven Parallel Robots

Figure 5So much focus in one room! Students in the zone with Dr. Vineet Vashishta, IIT Gandhinagar on CDPR

Tutorial 4 Introduction to Robot Navigation using Robot Operating System (ROS) By M. Vasanthakumar, PSG Tech, Coimbatore, Gayathri Manikutty, AMMACHI Labs, Amrita University This tutorial will offer a hands-on introduction to ROS applied to embedded platforms where you can use ROS to control your custom made mobile robots and extend its application to localization, navigation and control.

Figure 6Introduction ROS tutorial by Prof. Gayathri M and Prof VasanthaKumar

Tutorial 5 Digital Manufacturing - Tools for the Maker By Viswesh Srinivasan, SVP Laser Pvt. Ltd, Akshay Nagarajan, AMMACHI labs, Amrita University This tutorial provides a hands-on training in the use of subtractive prototyping tools that form the foundation for robot design for any engineering student or researcher.

Figure 7utorials for Introduction to Digital Manufacturing by Viswesh Srinivasan

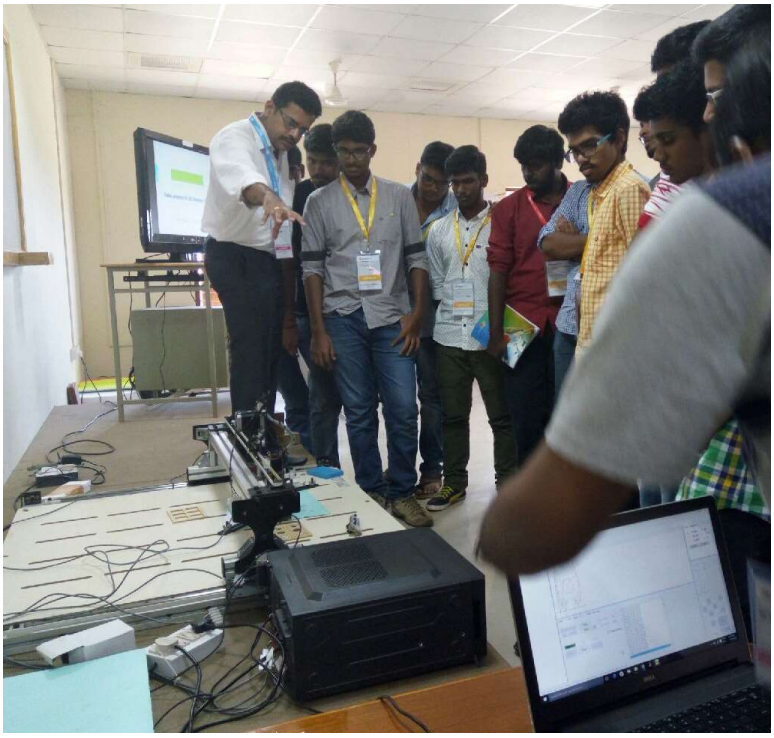

Figure 8Hands on experience with CNC routing machine

Tutorial 6 Robotics for Children (RoC) By Akshay Nagarajan, Alekh Velayudhan, Nidhin Sugunan, Abel Varghese, Gayathri Surendran, Gayathri G., Thejas Menon, Rahul Ravindran, Pradeep Venna, Amrita University, Amritapuri This tutorial offers a primer to robotics touching upon its various components such as sensors, actuators and controllers. We further will teach you to control a cartesian robot to draw shapes, following a path using a laser light source, pick and place objects, and create your own designs on thermocol and vinyl stickers.

Figure 9Robotics for children

Figure 10Live Demo session at ABB lab

Figure 11 More about the ABB robots

About RAHA 2016

RAHA 2016, an International Conference on Robotics and Automation for Humanitarian Applications, was held December 18- 20, 2016, at Amrita Vishwa Vidyapeetham, Amritapuri campus. It was the world's first conference dedicated to robotics solutions for social good. Speakers included Dr. Vijay Bhatkar, father of the Indian supercomputer; Ms. Meg Jones, Chief of Economic Empowerment at UN Women; rehabilitation robotics expert, Dr. Sunil Agrawal of Columbia University; founding co-chair of the IEEE Robotics and Automation Society; Technical Committee of Ethics; Dr. Ronald Arkin of Georgia Tech and Dr. Hajime Asama, University of Tokyo, Vice President of Robotics Society, Japan. Dr. Asama was involved with the deployment of robotics technologies during the Fukushima disaster response. Highlights included talks, paper and poster presentations, robotics competitions, workshops and tutorials. Over 385 registrants included students, staff, and international delegates from all over the world

In her role as Chancellor of Amrita Vishwa Vidyapeetham, Amma met with the invited experts and renowned scientists who had come to attend the conference. The wide-ranging conversation touched on Amma's concern for those living in the radius of Fukushima and her appreciation for the role robots had played in the decommissioning of the plant; her observations on the state of technological innovation in India today and the potential for that innovation to improve the quality of life, especially for India's rural poor. She also explained her view of the importance of maintaining an open, beginner's mind in order to stay receptive to one another and engage in lifelong learning. The researchers and experts expressed their appreciation to Amma for having hosted the world's first conference on robotics for humanitarian application, and requested her to deploy solutions innovated at Amrita throughout the developing world. Amma expressed a willingness to do so and also offered broader insights on the deeper spiritual significance of all the service-oriented work and research done by Amrita Vishwa Vidyapeetham, and how a spiritual outlook can magnify both our will and ability to make a positive impact in the world.

World-renowned economist and leader in the fight against global poverty, Dr. Jeffrey Sachs, Director of Earth Institute and University Professor at Columbia University, also shared his thoughts on Amrita Vishwa Vidyapeetham during his plenary talk. "I follow your work and innovative teaching methods that you're developing, the haptic controlled teaching, the water projects and other sustainable development projects... And I just admire tremendously what you're doing and hope that I can be a good partner with you as you continue to expand your work and your reach."

A special "Beyond RAHA" task force was formed to ensure that the progress made at the conference forms the foundation for an international research agenda geared towards the humanitarian applications of robotics technology while following appropriate ethical guidelines. Overall, RAHA inspired a powerful, creative spirit that transcended science and technology. Using robotics and automation solutions to help solve societal challenges is such a blessing, and Amrita Vishwa Vidyapeetham is at the forefront of this pioneering work.