

Sensors and Measurements for Robotics and Automation

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Robots have changed the way we work, play, live and unfortunately fight wars. Robots invaded the workplace many decades ago, initially for factory automation. They are increasing their presence in the home at a very rapid pace, primarily for assisted living. Wars are being fought using robots on the ground, above and below the waters and in the air. In the next decade, the world will witness the largest growth of robots in the service industry. From the days of industrial automation using monstrous robots, the world has advanced to micro and nano robots traversing the veins of a human body to deliver drugs.

What makes the robots so capable and versatile as they are today? Will they ever be able to attain the full functionality, intelligence and versatility of human beings? Or is it a wishful thinking? What will be the breakthrough technology that will enable the robots to make that quantum jump in their capabilities?

For successful completion of tasks, robots have to perceive the world around them, the workspace in which they operate. At the heart of this perception are the inputs from a gamut of sensors. Accurate measurement of physical parameters and fusion of sensory data has a profound influence on the accuracy of the perception model. While a lot of energy and resources are still being expended for research into robot locomotion and actuators for motion, it is the advancement in sensors and measurement technology that will catapult the robots to the next level of versatility and acceptance. Miniaturization of sensors and precision measurement will be the flavor of research in the next decade which will make a career in instrumentation and measurement a very attractive proposition for young scientists and researchers.

This tutorial will -

- Highlight the importance of sensing and measurement in the world of robotics
- Give an overview of the various sensors and sensing technologies that are in vogue in robotics
- Discuss future direction of research and development of sensors for robotics – MEMS, biological sensors etc.
- Illustrate case studies of advanced sensing and instrumentation in food texture measurement/analysis, a robot to inspect plant health and growth in a laboratory, and a manually operated robot to move hospital beds with dexterous control.