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Visual servo control of robotic systems: Applications and challenges

Conventional robotic systems operate on open loop kinematic chain for positioning tasks and hence they are not robust to operate in unstructured environments. Uncertainties in target object's position, unplanned compensation for object's motion, bending of the links due to the load and accelerations, and joint slippages are examples of the elements frequently encountered in many industrial operations. Significant effort and expenses are therefore extended to enable robots' operation in uncertain environments. Reprogramming and calibration of robots for recurrent or new tasks also add to the cost of robots' operations. In this talk, I will review the fundamentals of direct end-point control of robots using vision sensor, i.e., visual servoing, and will show how this framework could overcome many of the aforementioned practical problems. The main structures and theoretical as well as practical issues in development and integration of visual servo control will be reviewed. Recent results in my laboratory including sensor fusion schemes, uncertainty modeling, and robust control for visual servoing will be shown. Next, I will show how integration of visual servoing would facilitate robots programming. A recently developed novel vision-based programming by demonstration approach (PbD) will also be discussed and its practical implications will be demonstrated.

Biography

Farrokh Janabi-Sharifi received PhD degree in Electrical and Computer Engineering from the University of Waterloo, Canada in 1995. He is a Professor of Mechanical-Industrial Engineering and the Director of Robotics, Mechatronics and Manufacturing Automation Laboratory (RMAL) at Ryerson University, Canada. He has also been Visiting Professor in a few universities in Korea, Germany and France. His research interests span over image-guided control and planning of robots. He has published more than 190 refereed papers in the journals and conference proceedings, authored/coauthored several book chapters, and edited/co-edited four proceedings in the field. He serves as the Associate Editor of several journals including *International Journal of Optomechatronics*.

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