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Design and development of automated robotic systems for inspecting pipes

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Pipeline infrastructure is aging. Failure in transmission/distribution water pipeline networks and also the oil/gas pipelines could be catastrophic. Automated and precise inspection of the pipes at the manufacturing stage and also conducting inspection on live pipes in use would be paramount in making the industry sustainable. In this talk Dr. Mehrandezh presents his research work on design and development of automated robotic systems for inspecting pipes. He will start with a review of the pipe crawling robot developed in his group. This invention was highlighted as one of the 5 high-tech fixes to infrastructure in the Popular Mechanics magazine in 2009. He will then present his work on design and development of an omni-directional laser optics technology for automated inspection of pipes. This system was first used in Alberta, Canada to inspect 5 miles of 80-ft casing pipes in the summer 2012. It was also recently utilized in the Evraz, one of the largest steel pipe manufacturers in the world with plants in Regina, Calgary, and Portland. This laser optics sensor technology, when used on a mobile robot moving inside a pipe, can: (1) detect defects at high resolution, (2) classify defects (i.e., sliver, crack, bad weld trim, etc.), (3) size the defects through Structure From Motion (SFM), and (4) position-reference them via Visual Odometry (VO). The first part of the talk will focus on design, development, dynamic analysis, and control of the locomotion system used to carry the sensor module inside pipes called Regina Pipe Crawler (RPC). The second part of the talk will focus on design, development, and configuration optimization of the omni-directional laser optics sensor module.

Biography

Mehrandezh received his PhD and MSc in Mechanical Engineering from the University of Toronto, and the Queens University in 1999 and 1995, respectively. He is currently an Associate Professor in the Industrial Systems Engineering program at the University of Regina, Canada. His research revolves around robotics, machine vision, and control. A pipe crawling robot co-invented by him was highlighted in the Popular Mechanics magazine as one of the 5 high-tech fixes to infrastructures in 2009. He also holds a patent on “design and development of an adaptable climbing machine”. He is a member of IEEE and served as the vice-president of the IEEE (south Saskatchewan section) for two consecutive terms. He is also a registered professional engineer (P. Eng.) in Canada. The focal point of his research for the past 6 years has been on design, development, and control of robotic inspection systems with the focus on automated pipeline inspection using laser optics. His research has been supported by Evraz, one of the largest steel pipe manufacturers in the world. He has co-authored over 80 peer-reviewed conference/journal articles and book chapters.

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