

## ABC Robotics Monthly Seminar

**Speaker:** Prof. Inna Sharf, Department of Mechanical Engineering, McGill University

**Date:** Monday, April 26, 2021

**Time:** 16:10-17:00

**Location:** via zoom <https://zoom.us/j/5647021747>

**Title:** Path Planning Problems for Timber-Harvesting Machinery

**Abstract:** Timber-harvesting is an important industry for Canada where the process of harvesting trees is typically carried out in wild ‘uncultivated’ forests. The tree-harvesting process itself involves several operations including felling, delimiting, bucking and off-road transportation. Currently, many of these operations involve large machines with hydraulically driven crane-like manipulator arms equipped with specialized end-effectors. These machines are operated by human operators through joysticks, buttons and pedals, at a fairly low level of control. Although the machines are highly capable and developed from a mechanical perspective, they are lacking in intelligence and automation, especially when compared to the advances and technologies available in robotics and other application domains.

In this talk, I will present selected research of my group dealing with aspects of increasing intelligence and automation of tree-harvesting machines. From the robotics perspective, these machines fall into the category of mobile robots and we explore the application of several established solutions in the robotics community to the tree-harvesting context. The focus of the talk will be on solving the motion planning problem in three instantiations. First, we consider the path planning for a log loading machine where we adapt the Probabilistic Road Map to the specific environment of the loader and also explore fast solutions for collision-free planning. Second, we consider the trajectory and path planning problems for a generic articulated machine with the added consideration of dynamic stability, during both the arm manipulation and the relocation of the machine. Dynamic stability is particularly relevant when the machine handles heavy loads, such as trees, and when it operates on uneven or steep terrain. Finally, we present a path planning algorithm for a feller-buncher machine, taking inspiration from observations of human operators on how they maneuver the arm for cutting trees within the arm’s reach. The talk will conclude with a statement on future directions for our research.

**Bio:** Dr. Inna Sharf is currently a professor in the Department of Mechanical Engineering at McGill University, Montreal, Canada. She received her B.A.Sc. in Engineering Science from the University of Toronto (1986) and her PhD at the Institute for Aerospace Studies, University of Toronto (1991). Prior to relocating to McGill in 2001, she was on faculty with the Department of Mechanical Engineering at the University of Victoria. Sharf’s research activities are in the areas of dynamics, control and state estimation with applications to space systems, forestry robotics and unmanned aerial vehicles. Sharf has published over 150 conference and journal papers on her academic research. She is an associate fellow of AIAA and a member of IEEE and ASME.