

**ENSC488: Introduction to Robotics**  
**Simon Fraser University, Fall 2016**  
**Demo 1**

Group #

Member 1:

Member 2:

Member3:

**Lab Project Demo 1 Instructions**

**Materials to be submitted:** You need to hand in the following (printouts/drawings) at the demo time:

- This page with the name and student no. of your group members written at the top.
- Homogenous matrix transformations (symbolic form) for all the link frames  $\{0\}$ ,  $\{1\}, \dots, \{5\}$ , i.e.  ${}^{i-1}_iT$  for  $i = 1, \dots, 5$ . Note: frames  $\{0\}$  and  $\{5\}$  are the base frame and tool frame, respectively.
- Symbolic equations for the position  $(x, y, z)$  and orientation  $\varphi$  of the tool frame with respect to the station frame.
- All the possible inverse kinematic solutions (symbolic form) as functions of the tool position and orientation.
- A sketch of the robot with all the frames clearly shown.

**Demonstrations:**

Your program should demonstrate the following:

- Emulator: Move the robot to a given robot configuration, i.e., joint values provided by us, in the emulator where it can grasp an imaginary object. You do not need to render the object in the display.
- Forward Kinematics: For the above configuration compute and report back the corresponding position and orientation of the tool.
- Inverse Kinematics: For given position and orientation of the tool (provided by us), compute and report back the corresponding robot configuration.
- Real Robot: Move the real robot to the configuration computed in the previous step, and grasp a real object provided by us.

**Please note that since the part of the demo is on the real robot, you will need to use the 488-lab computers for it. Please make sure you have compiled and tested your code on those machines well in advance of the demo date to avoid last minute compilation/version issues.**