Abstract submitted to ICEE 2004
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Abstract - This article presents and discusses the implementation of interactive computer visualization tools for robotics analysis, design, and education.
Recent advances in computer graphics hardware and software tools associated with the rise and establishment of the Internet make it possible to easily develop 3D graphics, visualization, and interactive animation tools that can be viewed and interacted with on any personal computer.
Robotics typically involves several objects interacting in motions that are sometimes hard to visualize without having a well equipped robotics laboratory. It is now possible to develop low cost, realistic-looking, virtual robots and observe their motions on a computer display from a variety of different view points. In robotics, virtual reality scenes and computer graphics techniques help illustrate robot manipulator modeling, kinematics, end-effector trajectories, robotic collisions, and in general, provide invaluable assistance in learning and understanding.
This visualization tools discussed here are developed using the Virtual Reality Modeling Language (VRML) to illustrate robotics concepts and help students achieve a better understanding of robotics, 3D motions, and processes. An interactive virtual reality visualization tool for DH-parameters and robot modeling is presented as an example of such tools. The creation of 3D models allows more involved visualization tools leading to the development of virtual robotics laboratories. A Virtual Reality PUMA 560 Robotic arm that can be animated from an initial joint configuration to a final one as entered by the user is presented as another example of the effectiveness of visualization tools in robotics. These tools represent a technological advance in engineering education and, in robotics, offer the ability to visualize 3D motions at will on a computer display.
RobotDraw, a robot manipulator modeling software, developed by the author and his students and available on the internet will be presented in this article as well. RobotDraw generates a virtual reality 3D model of a robot manipulator using only a Denavit-Hartenberg model description entered by the user. While discussed in relation to robotics education, the ideas and concepts in this research are also applicable to many other science and engineering disciplines.