This system incorporates a stereo endoscope system (shown in Figure 2) \cite{7989412}. The systems enable high-resolution 3D imaging and precise pose estimation. Initially, the system feasibility is verified using a marker-based method for pose estimation, followed by the implementation of a marker-less approach to generate accurate 3D coordinates. Trajectory planning is performed by combining the 3D coordinate information with the stereoscopic data from the Stereo Laparoscope System, ultimately achieving visual control to adjust the probe’s pose dynamically. The setup distributes tasks across two PCs: the first PC handles all image processing, including pose estimation, depth reconstruction, and 3D fusion, and transmits signals via TCP/IP to a second PC. The second PC manages robotic control. The dVRK-ROS bridge establishes a connection between the dVRK system and the ROS (Robot Operating System), while the CISST/SAW controller operates the dVRK controller, enabling continuous control of the da Vinci robot.