Abstract

Movement of a robot head between desired points in a 3D volume from (x_1,y_1,z_1) to (x_2,y_2,z_2) is crucial for high accuracy. When the knowledge of a 3D volume is only partial, obtained as a data set of cross-sectional image planes, control parameters for movement of the robot head are critical for best accuracy. In the present approach an attempt is being made to develop an interface for transforming control parameters of a robot system for desired movements of the robot head in the 3D volume from a sequence of cross-sectional image planes. Coordinates of a desired location from image data are obtained, and their corresponding locations on the object are estimated. These coordinates are transformed through matrix transformation into control parameters for the desired movements of the robot system. Most diagnostic medical imaging modalities obtain cross-sectional image planes of vital human organs. Treatment procedures often require 3D volume considerations. In the present approach a hypothetical radiation treatment procedure for a prostate cancer tumor in a 3D volume from given 2D cross-sectional sequential image planes is presented. Diagnostic ultrasound images of the prostate are obtained as sequential cross-sectional image planes at 2 mm apart from base to apex of the gland. An approach for robot coordinate movements for a simple robotic system with five degrees of freedom (Eshed Robotics, ER VII) is presented.

Citation

"Robot control from sequential image planes of a 3D object," with Premkumar, et. al., International Symposium on Optical Instrumentation and Applied Science, San Diego, SPIE Vol. 2018, July 1993.