

In the evaluation of patient response to therapy through measurements on thoracic computed tomography (CT) scans, the selection of anatomically equivalent sections in temporally sequential scans is required. We developed an automated method based on normalized mutual information (NMI) to expedite the selection process and reduce observer variability. The method requires as input two temporally sequential scans from the same patient. A section from the baseline scan is then compared with the sections of a follow-up scan. Each section in the follow-up scan is successively translated relative to the baseline section, and NMI is calculated. The section in the follow-up scan that yields the highest NMI relative to the baseline section is selected as the matching section. The method was applied to a database of 22 pairs of temporally sequential CT scans from mesothelioma patients. Five observers manually selected the best anatomically matched sections, and the range of selected sections was recorded. The automated method was applied to the same baseline sections to determine the computer-based equivalent sections in the corresponding follow-up scans. The automated process was performed using both original sections and sections automatically segmented so only intra-thoracic pixels contributed to NMI calculations. Accuracy of the automated method was quantified by comparison with the range of sections selected by the observers. The automated method without segmentation selected equivalent sections within the observers' range for 53 of the 66 matching tasks (80%). A 10% improvement in this rate was achieved when thorax segmentation was performed. S.G.A. shareholder R2 Technology, Inc.