Appendix E1

The modified algorithm included additional steps (points 2–4 below) to reduce the variability in size of lung penumbra included in the initial overinclusive region of interest I_1 of volume V_0 that enclosed the nodule. The specific steps were as follows:

1. User drew I_1, which resulted in the initial nodule map (N_1) and its volume (V_1).

2. The mean thickness (in millimeters) of the penumbra region of I_1 was estimated as

$$t_1 = \sqrt[3]{\frac{3V_0}{4\pi}} - \sqrt[3]{\frac{3V_1}{4\pi}}.$$

3. A morphologic erosion (peel/grow) operator was applied to region I_1 to either reduce or increase the thickness of the penumbra region, yielding I_2. Let t_0 denote the desired thickness value in

$$I_2 = \begin{cases} \text{peel}(I_1, t_1 - t_0), & \text{if } t_1 > t_0 \\ \text{grow}(I_1, t_0 - t_1), & \text{if } t_0 > t_1 \end{cases}.$$

The fractional 3D peel and grow operators have been described (34). We used t_0 equals 1.5 mm.

4. The resulting region of interest I_2 was processed as in step 1, giving corrected nodule map (N_2) and its volume (V_2).

A C++ language program (initially developed for Unix-based operating system [Solaris 8; Sun Microsystems, Santa Clara, Calif]) to implement the algorithm was executed in software (Windows XP environment; Microsoft, Redmond, Wash).