

In conventional graphical slice positioning, the PE and RO directions are calculated based on the SS direction. Let  $s$ ,  $c$  and  $t$  represent sagittal, coronal and transverse directions, and  $\vec{P}_0 : (P_s, P_c, P_t)$ ,  $\vec{R}_0 : (R_s, R_c, R_t)$  and  $\vec{S}_0 : (S_s, S_c, S_t)$  represent the vectors in the PE, RO and SS direction respectively for the first long-axis imaging slice. Using this representation, and depending on the orientation of  $\vec{S}_0$ , the PE vector can be given as follows:

$$\vec{P}_0|_t = [0, S_t/K_{ct}, -S_c/K_{ct}]$$

$$\vec{P}_0|_c = [S_c/K_{sc}, -S_s/K_{sc}, 0]$$

$$\vec{P}_0|_s = [-S_c/K_{sc}, S_s/K_{sc}, 0],$$

where  $K_{ij} = \sqrt{S_i^2 + S_j^2}$  and the suffixes to  $\vec{P}_0$  indicate the direction of the SS vector.  $\vec{R}_0$  is then simply calculated by computing the vector cross-product,

$$\vec{R}_0 = \vec{S}_0 \times \vec{P}_0.$$