EE101 Quiz 1 Solution

Question:

Given $I_{0L}, I_{0H}, I_{1L}, I_{1H}, K_H, K_L$. After subtracting by the combination of sequencing and energy, what will the final subtraction image **S** be? (*Hint: The subscript 0 and 1 represent the regular image and contrast image, H and L represent high energy and low energy, respectively*)

Solution:

The general idea is to first do dual-energy subtraction to the original image and the contrast image respectively. This will generate the subtraction image of original tissue (S_{0T}) and the contrast tissue (S_{1T}), where T represent the tissue we want to observe. Then subtract S_{1T} from S_{0T} will get the final subtraction image where $S = S_{0T} - S_{1T}$ (1).

$S_{dual-energy}$ can be calculated in the following way:

$$S_{dual-energy} = K_H ln I_H - K_L ln I_L$$

So that we can get S_{0T} and S_{1T} as:

$$S_{0T} = K_H ln I_{0H} - K_L ln I_{0L} \quad (2)$$
$$S_{1T} = K_H ln I_{1H} - K_L ln I_{1L} \quad (3)$$

Combining (1)(2)(3), we can get the final subtraction image:

$$S = S_{0T} - S_{1T} = K_H ln I_{0H} - K_L ln I_{0L} - K_H ln I_{1H} + K_L ln I_{1L}$$