

COSC 6370: Fundamental of Medical Imaging

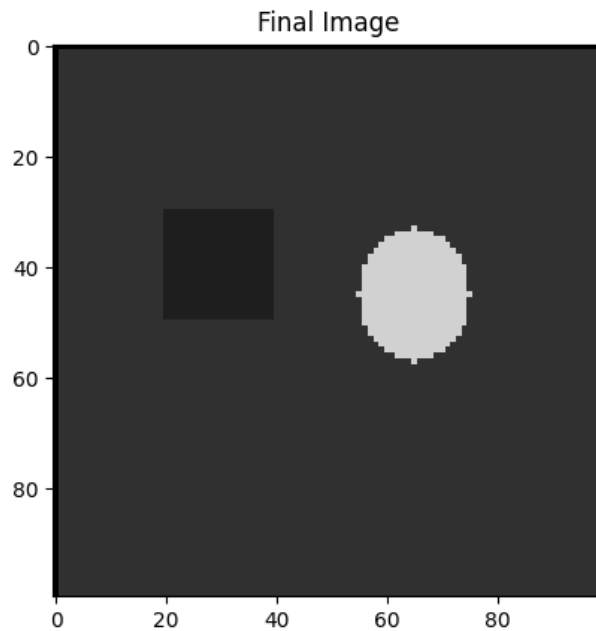
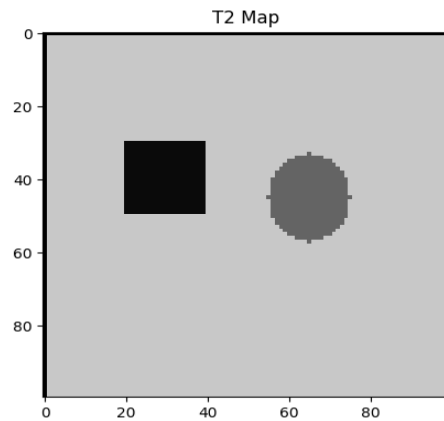
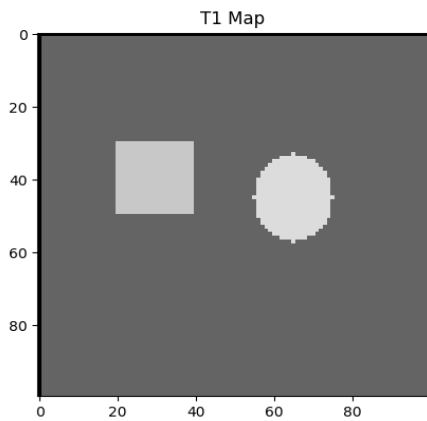
Assignment – 2

By Dinesh Narlakanti (2083649)

Assignment Tasks:

Q1: Implement the code to calculate the $SI(m, k)$ and generate images of the MyPhantom

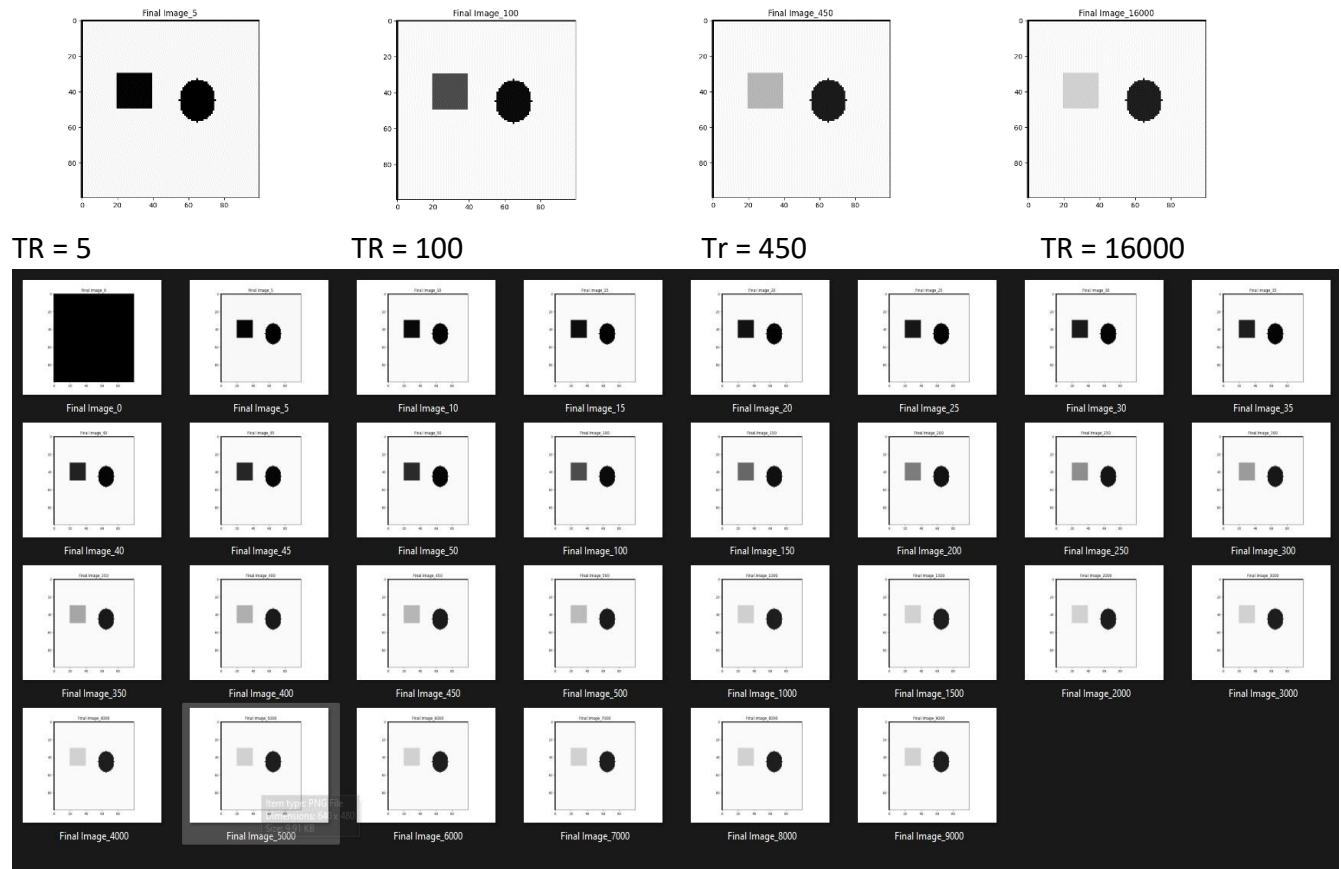
A1. From the below images, Final image is the $SI(m, k)$ and T1 map, T2 map are the images generated of My Phantom.



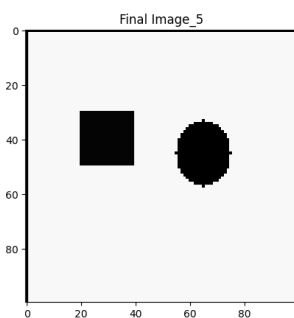
Q2: Set TE =5. At what values of TR, (a) the contrast between B and C becomes the greatest and (b) gets minimized?

A2.

- (a) While experimenting with the values, I observed that increasing the TR parameter, the contrast between B and C keeps increasing. It is because contrast of B is decreasing. So, higher the value of TR, higher is the difference of contrast between B and C.

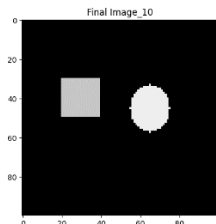


- (b) The lowest contrast between B and C will be when both TR and TE has the same value. According to the question, the lowest contrast between B and C will be at TR = 5 since TE is 5.

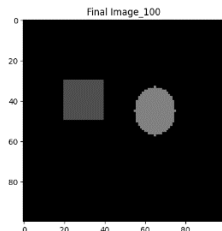


Q3: What happens as you keep increasing the TE for a set TR? Show that with a few images of MyPhantom

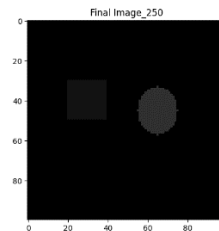
A3. Even if we set TR to a constant value, both the ellipse's and the square's contrast is reducing as we increase the TE value.



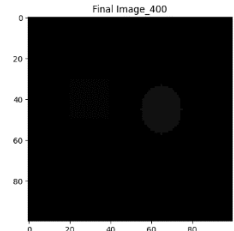
TE = 10



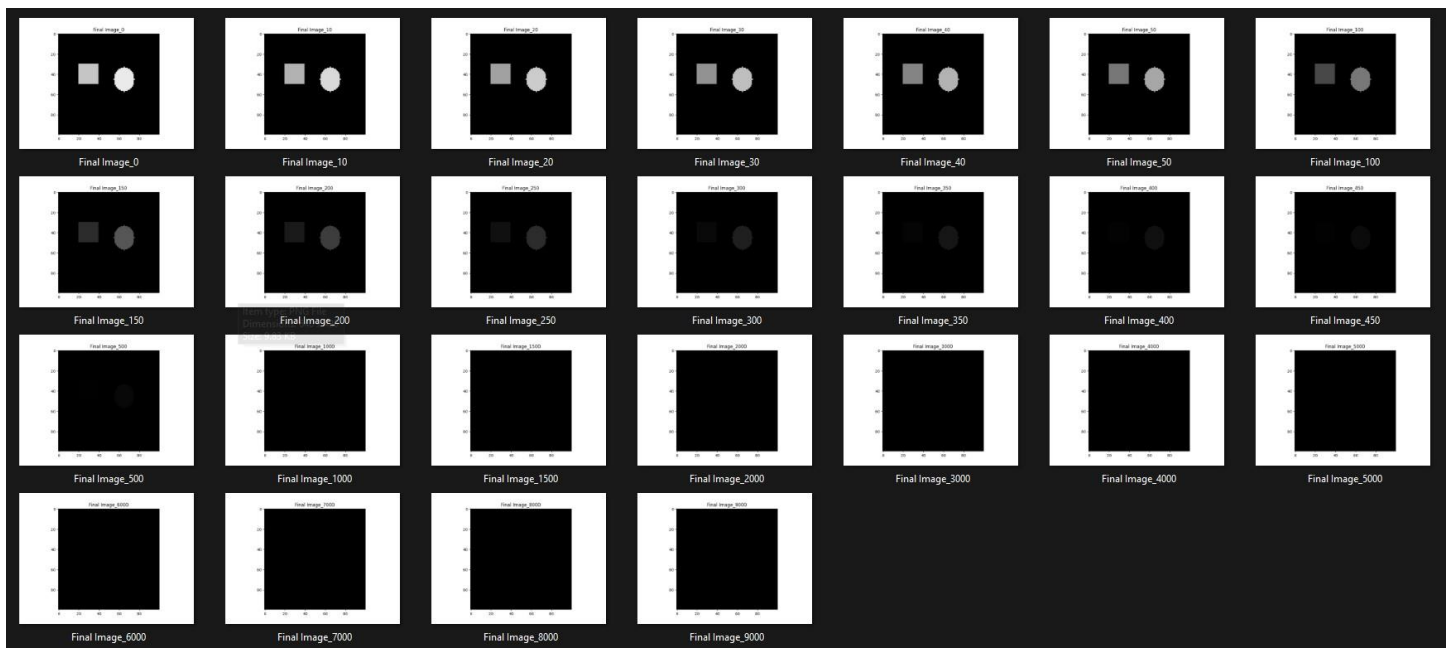
TE = 100



TE = 250



TE = 400

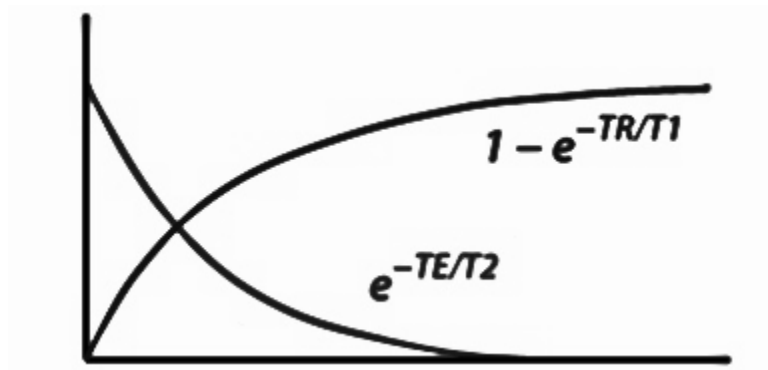


Q4: How the units of TR, TE, T2star and T1 relate to the use of the EXP function

A4.

- First important things to understand about T1, T2, TR and TE are that:
 - T1 effects are based on TR value
 - T2 effects are based on TE value.
- I'm dividing my understanding into 4 parts to explain the relation of exp with T1, T2, TR and TE:
 - Case 1: If $TR > T1$:
 - $\text{Exp}(-TR/T1)$ lends to zero.
 - So, T1 effects disappears.
 - Case 2: If $TR < T1$:
 - Importance of $\text{exp}(-TR/T1)$ weighing term increases
 - T1 weighting happens
 - Case 3: If $TE > T2$:
 - Importance of $\text{exp}(-TE/T2)$ weighing term increases
 - T2 weighting happens
 - Case 4: If $TE < T2$:
 - $\text{Exp}(-TE/T2)$ lends to zero.
 - So, T2 effects disappears.

Below graph clearly tells how exp effects TR, TE, T1 and T2:



Link to the code: <https://github.com/DineshNarлакanti/Fundamental-of-Medical-Imaging>

References:

1. [MedImaging_Matlab_Simulations_Part2.ppt](#)
2. [SimExample_1.m](#)
3. <https://mriquestions.com/image-contrast-trte.html>