Frequency Domain Sampling in MRI for Artifact Reduction

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The main purpose of this research is to develop a better algorithm that would both enhance the quality of the final MRI image and decrease the amount of time taken to produce it. In this paper, different Gaussian filters were proposed and tested on the human brain to reduce the size of original full frequency domain, which is relatively huge in k-space. The size of original full frequency matrix is 557x365 and, the data are obtained from a patient using 12 coils in a lab. All the Gaussian filters used on the brain show their distinct features. The Gaussian functions, or exponential functions, reduced ringing artifact in every image they produced, compared to those produced by the Square functions. However, present study shows that not all the Gaussian functions show better images in resolution, compared to those produced by the Square functions. According to the proposed Gaussian function in this paper, `y=1-exp[-(w^2)/h^2)], where w=k-L/2, k=[0,M], L=2*7*N/40, and N=500`, the size of frequency matrix `(M,N)`, the resolution of the resulting image shows differed based on choosing the variable h. As the variable h is increased from 0 to 200, the filter can capture more data in k-space data since the Gaussian filter becomes wider, and the best image is shown when p= 60. For the higher values of p, the resolutions are not much different from those produced when p=60.

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