# k-Space Sampling Using Various Filters and Fourier Image Reconstruction

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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, various 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. Using proposed Gaussian and circle equations as MRI filters enable another advantage that neither square function filter nor common Gaussian function filter provides. A circle equation, using its radius to define the area of selection, is able to capture k-space data in all directions. The function has an equation: r = r=sqrt((x-M/2)^2+(y-N/2)^2), where M and N are the total number of rows and columns of the K-space matrix respectively. According to the circle filter in this paper, r=sqrt((x-M/2)^2+(y-N/2)^2), where x=[0,M], y=[0,N], the size of frequency matrix (M,N), the resolution of the resulting image shows differed based on choosing the variable r. As the variable r is increased from 0 to 100, the filter can capture more data in k-space data and the best image is shown when r= 70. For the higher values of r, the resolutions are not much different from those produced when r=70.

The resulting image produced using the selected part is similar to those from Square function or Gaussian function. When the data located at the center of K-space is selected, the Inverse Fourier Transformation provides a clear image. However, when the data located at the periphery of K-space is selected, the resulting image only contains clear border without any details. In addition, according to data, as the radius of a circle function increases, the quality of the respective image also increases.

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