The Linear Sampling Method in Inverse Scattering Theory

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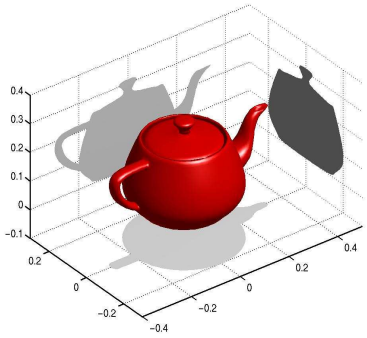
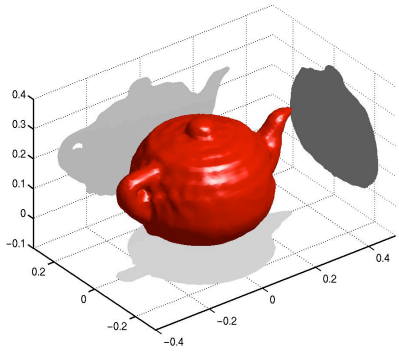
Radar is one of the most important inventions of the twentieth century. However,until recently,radar has been mainly used for the purpose of detection rather than identification. The first effort to address the problem of target identification was the invention and use of synthetic aperture radar (SAR). However, although achieving remarkable success in certain applications, SAR is inherently limited since it is based on the so called weak scattering approximation which ignores both multiple scattering and polarization effects. In an effort to overcome the limitations of such an incorrect model, considerable effort has recently been put into the development of nonlinear optimization techniques. Unfortunately,the success of optimization techniques is based on strong a priori knowledge of the scattering object and hence is inappropriate for many practical applications. In view of the problems inherent in the weak scattering and nonlinear optimization approaches to target identification,a new method has been developed in the past few years called the linear sampling method. This lecture provides a basic introduction to the linear sampling method for together with numerical examples showing the practicality of this new approach to the problem of target identification.



(a) Exact Scatterer



(b) Reconstructed Scatterer