

# **A study of 3D Synthetic Aperture Focusing Technique**

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The Synthetic Aperture Focusing Technique (SAFT) used in ultrasonic imaging can enhance image resolution. This technique is now widely employed in ultrasonic non-destructive testing (NDT). With the advancement of computing technology, there is a growing demand for 3D SAFT to achieve high-resolution ultrasound images. However, implementing 3D SAFT is both expensive and time-consuming. This study aims to provide insights into the advantages of employing this technique. Consequently, the 3D SAFT processing technique was developed, 3D targets were constructed, and 2D and 3D SAFT images were compared with analytical solutions in this study. Subsequently, a comparison between 2D and 3D SAFT for 3D targets will be discussed to highlight the benefits of utilizing the 3D approach. The study results demonstrate the significant superiority of 3D SAFT images over those produced by 2D SAFT. Nonetheless, it's important to note that the scanning and processing involved in 3D SAFT are more intricate and time-consuming compared to 2D SAFT. In cases where the scan line is perpendicular to the object's orientation, 2D SAFT is adequate for revealing the object's shape although the image quality is not as good as those of 3D SAFT. Conversely, when a highly detailed image of the target's shape is required, opting for the 3D SAFT technique is recommended.