# Registration of Human Breast Mammography and Ultrasonography for Improved Breast Cancer Detection: Abstract

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Breast cancer is the second leading cause of death for women in the United States. In 2016 alone, over 250,000 new cases will be diagnosed. The current standard of care for breast cancer screening is primarily dependent on mammography. Magnetic resonance imaging (MRI) is extremely valuable for diagnosing patients who have dense or scarred breast tissue; however, the integration of MRI is often not covered by insurance for screening purposes and is, therefore, often not conducted. Radiographic alternatives to MRI are avoided to prevent risks associated with increased radiation exposure. Volumetric ultrasonic imaging, while inadequate for standalone screening, is a potential solution for complex screening cases if the modality can be fused with mammography projections. The additional information provided by volumetric ultrasound allows for clearer discrimination between soft tissues possessing similar radiographic densities. This project aims to fuse volumetric ultrasound images with mammography scans by developing a new registration algorithm. This algorithm first reduces the dimensionality of the volumetric ultrasound to that of the target mammography projection. The ultrasound projections are then used to align the ultrasound volume and mammography images in three dimensional space and account for differences in deformation between the two modalities by framing the registration as an optimization problem.