Title of the project

Intra-operative Ultrasound Tomographic System for Guidance in Spinal Surgery

Category (translational/bioengineering/biodesign): BioDesign

Investigators

Dr. Manish Arora

Prof. Dibakar Sen

Dr. Rajkumar Deshpande

Statement of research

Spinal fusion surgery is a common surgery in recent times; it is performed for a wide variety of clinical conditions that affect the spine [1]. To perform these surgeries, X-rays are commonly used to visualize different parts of the spine. Fluoroscopic assistance is used very often to guide placement of screws, cages and other implants into the spine. This entails exposure of personnel in the operating theatre to substantial doses of radiation. In the emerging field of minimally invasive spine surgery, there is an increasing dependence on fluoroscopic guidance with increased radiation dosage to surgeons, anesthetists, nurses and other operating room personnel [2]. Ultrasound is safe and effective modality for diagnostic imaging and is already in use for intraoperative guidance as well for last 3-4 decades in soft tissues like breast and liver [3,4]. Imaging around bony structure is challenging. This limitation originates from the fact that diagnostics imaging systems approximate scattering in the tissue to as 'weak scattering' and do not account for multiple scattering and specular reflections are strong interfaces like bones. New approaches have been recently proposed to recursively construct the images by tomographic [5] but not yet implemented in physical system. As the patient is immobilized, spinal fusion surgery gives an ideal scenarios such an approach can be applied. Fig 1 below shows a possible implementation realization such as system. In this project we propose to design an Intra-operative Ultrasound Tomographic System for Guidance in Spinal Surgery.

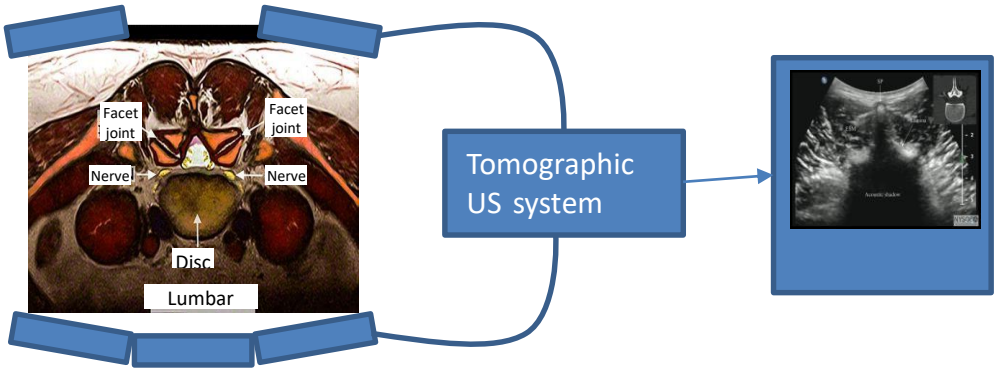

Figure 2 Intraoperative tomographic ultrasound system