



Industrial Consultancy & Sponsored Research (IC&SR)

METHOD AND DEVICE FOR ULTRASOUND IMAGING USING COMPRESSED SENSING APPROACH

IITM Technology Available for Licensing

Problem Statement

- Conventional ultrasound transducer consists of many array elements & a focused beam forming (CFB) uses a subset of transducer array elements for the transmission & reception of ultrasound signals.
- The backscattered signals are received by the active aperture & appropriate time delays are applied to perform dynamic focusing on receiver, to obtain a single beam formed amplitude line (A-line).
- Further prior arts ultrasound system(s) and compressed sensing techniques suffer **costlier complex heavy system** and having **disadvantages to store the sample data** in the computer for processing purpose.
- Hence, there is needed to address above issues in efficient manner.

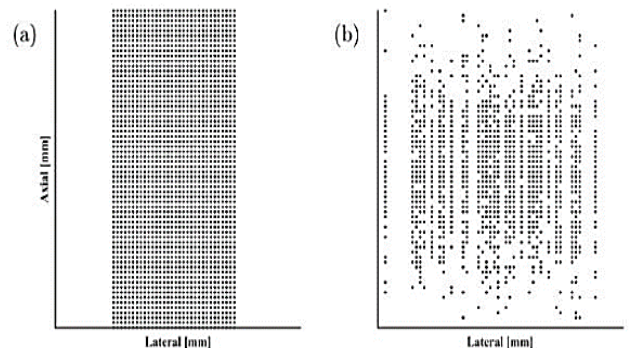
Technology Category/ Market

Technology: Ultrasound imaging using Compressed sensing approach;
Industry: Material Inspection/Manufacturing;
Applications: Ultrasound imaging applications;
Market: The global ultrasound imaging system & software market is expected to grow at a **CAGR of (7.5%-11.1%)** during **2023 to 2031**.

Technology

- An improved **method & device** for **ultrasound imaging** using **compressed sensing (CS) approach** is disclosed depict in Figures.
- Explains about **focused image acquisition strategy based on Gaussian distribution**.
- The proposed invention specifically describes about the **strategically acquire raw ultrasound echo RF signal from only underdamped transducer array aperture** and utilize **compressed sensing calculations** on these RF data **to recover the missing data**, before **an image is formed**.

- The proposed method involved said **CS-recovered RF data** which are analogous to the full sampled RF data of a larger aperture being **under sampled** in both **lateral & axial** direction.
- The proposed sampling scheme chooses **the location of active receive elements randomly** from a larger aperture wherein the locations of the active receive elements are chosen from the Gaussian distribution, with a mean of the distribution at the center of the larger aperture.
- RF data acquired from the chosen receive elements are then randomly under sampled in the axial direction based on either using **uniform distribution** or **Gaussian distribution**, with a mean of the distribution at the transmit focus.
- The beam formed RF data matrix is demodulated & log compressed **to obtain the ultra sound image**.



Intellectual Property

IITM IDF Ref. 1679; Patent No: 416703

TRL (Technology Readiness Level)

TRL-4, Proof of Concept ready validated

Research Lab

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Technology including Experimental Images

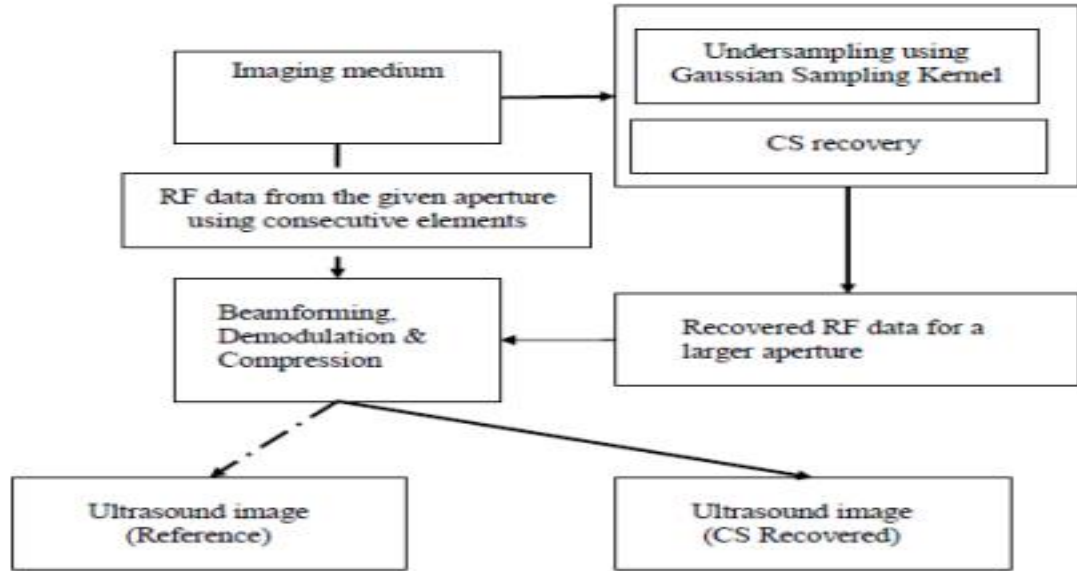


Fig.1: Illustrates block diagram of a method for ultrasound imaging using compressed sensing (CS) approach;

Key Features / Value Proposition

❖ Technical & Industrial Perspective:

1. The patent facilitates the **strategic lateral-under sampling** for channel data, which is extended to synthetic transmit aperture techniques using uniform distribution approach & **achieve improved image quality** for a given number of **active elements**.
2. **Cost-effective method for Industrial manufacturing and inspection process.**

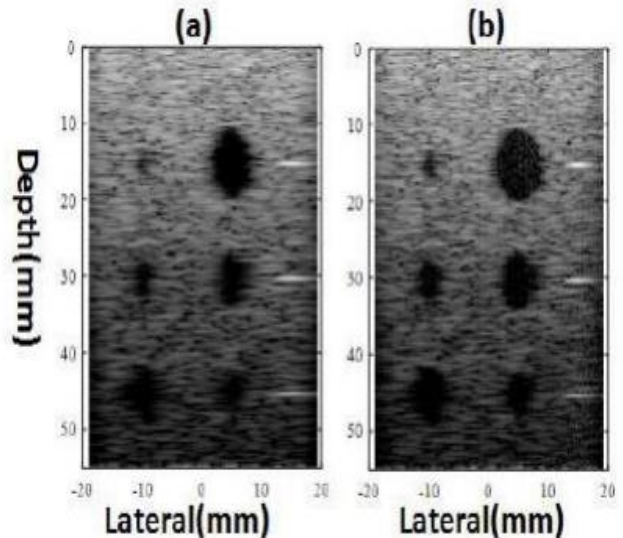


Fig.2a & 2b: Illustrates a comparative presentation of the ultrasound images of the different RF data obtained

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