A System and Method for Ultrasound Imaging Using Arbitrary Virtual Array Sources of Aperture Excitation

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Problem Statement

- Non-destructive testing (NDT) is widely used to evaluate the properties of material or system without causing damage.
- Further there are other techniques like phase array, total focusing method which are used to generate images with other deficiencies like in terms of taking **higher computation time**, **more extensive data recording during experimentation** and other associate problem.
- The technical problems underlying the prior arts inventions are overcome by introducing the present Invention which provides the technical solution to the technical problems efficiently.

Technology Category/ Market

System and Method for **ultrasound imaging** using arbitrary virtual array sources aperture **(AVASA)**

Application: Automated Defect Recognition, material Inspection**; Software** for automated Defect identification and recognition;

Market: The global ultrasound imaging system and software market growth is expected to accelerate at a whopping of (7.5% to 11.1%) of CAGR, during period of assessment from 2022 to 2031.

Technology

- Present invention describes a **system and method for ultrasound imaging using arbitrary virtual array sources of aperture** (AVASA) excitation.
- The system comprises a data acquisition and control module, transducer array multiple AVASA, a pulse delay module, atleast one ultrasound beam transmitted from the activated transducer element into at least one sample module and a reflected ultrasound beam from sample module received and recorded by all transducer elements.
- The system and method explained with a test specimen in few steps depicted in the smart chart and figures shown herein below.

AVASA technique is applied to the defect test specimen and observed SNR values for 2mmand 1mm defects, the SDHs have lesser SNR due to lesser interaction of incident ultrasound.

In FMC-TFM technique, the API for 2mm and 1mm SDHs is better because the defect size at -6dB is smaller due to unfocused beam transmitted into the medium.

The 2mm SDHs imaging with AVASA is comparable to the actual defect size and the maximum time the ultrasound beam interacts with the defects which helps to create better defect shape than a few no of excitations

Key Features / Value Proposition

❖ ***Technical Perspective:***

1.Present invention facilitates **enhanced image resolution and reduce imaging artifacts** and image processing **time** by creating beam forming at random virtual source locations.

2. Enables **increased energy transmission** by activating a group of elements in the phased array transducer by employing a computed predetermined focal law for each arbitrary virtual source position.

❖ ***Industrial Perspective:***

1.Claimed system facilitates an **enhanced image resolution** in terms of defect identification**, reduced inspection time, efficiency in generating image** .

2.Claimed invention is objected to **manufacture** the **pulse-received device** cost-effective manner.

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Images with Experimental Results

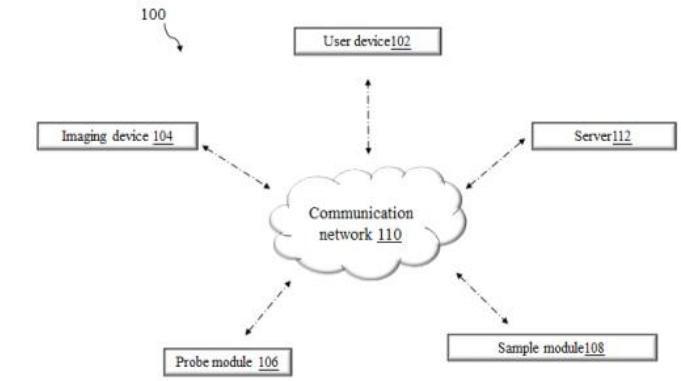

Fig. 1: Illustrate a system for ultrasound imaging using arbitrary virtual array sources of aperture (AVASA)

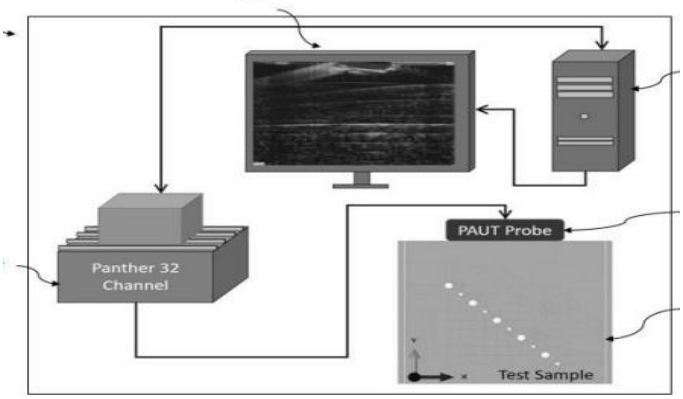

Fig. 2: Illustrate a block diagram of experimental setup

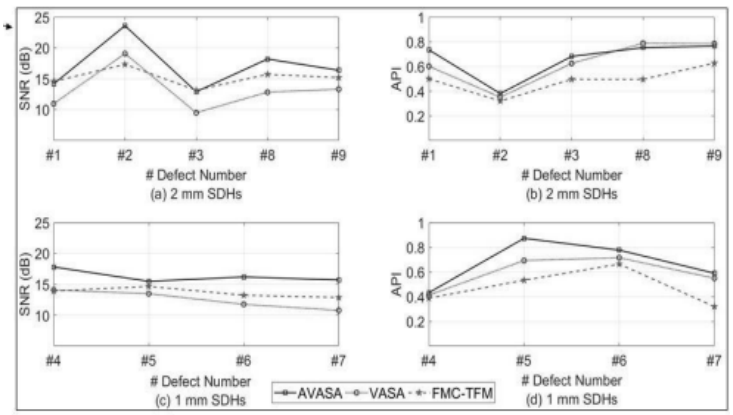

Fig. 3: Illustrates quantitative evaluation for the test specimen 2

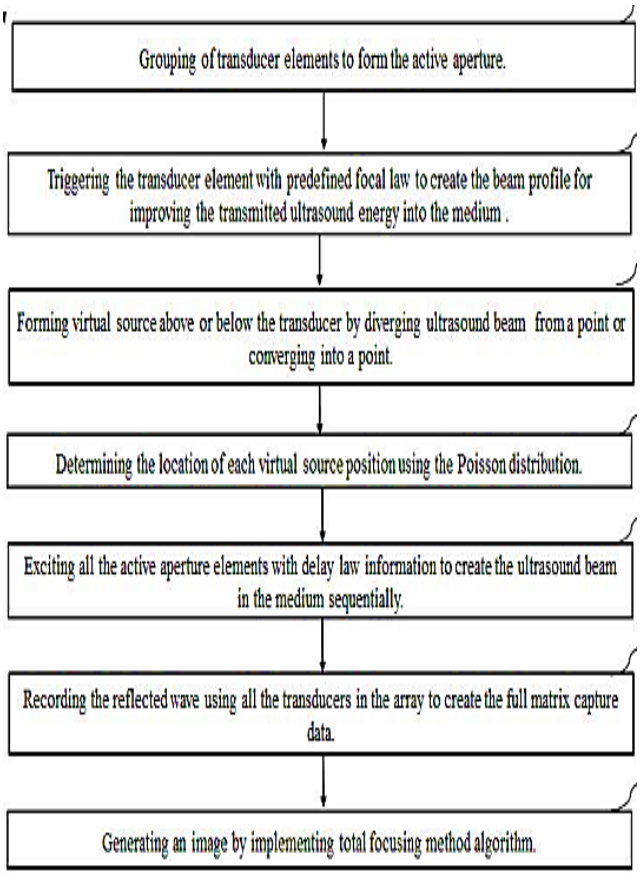

Fig. 4: Illustrates flowchart depicted a method for ultrasound imaging using AVASA

Intellectual Property

IITM IDF Ref. 2392;
IN Patent No. 533930 (Granted)
PCT Application No: PCT/IN2023/050487

TRL (Technology Readiness Level)

TRL- 3/4, Proof of Concept Ready Stage

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