

METHOD AND APPARATUS USING WEIGHTED NONLINEAR BEAMFORMER FOR ULTRASOUND IMAGING

IITM Technology Available for Licensing

Problem Statement

- Generally, Ultrasound(US) imaging techniques are popularly used in a wide range of clinical applications. And the **beamformer** is one of the **most critical unit** in the US imaging systems which can affect the overall reconstructed image quality. Also Delay & Sum beamformer is having **limitations of lower image resolution** outside the focal region & **less off-axis interference rejection**.
- The **adaptive beamformer** based systems require complex computational factors which **limits its use** in the US systems. Further, a few prior arts method/techniques have discussed to enhance resolution, image quality including other features, however unable to provide solutions.
- Hence, there is a need to mitigate above challenges by discussing present apparatus & method for Ultrasound (US) imaging.

Technology Category/ Market

Technology: Weighted Nonlinear Beamformer for Ultrasound Imaging ;
Industry: Healthcare, Medical ultrasound imaging; **Applications:** Medical & surgical device;
Market: The global medical ultrasound imaging equipment market size is projected at a **CAGR of 4.5%** during period of 2022-2030.

Intellectual Property

IITM IDF Ref.:1960
Patent Application No. 201941046642

TRL (Technology Readiness Level)

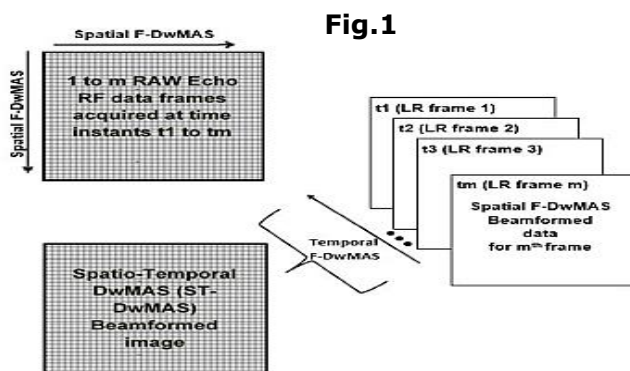
TRL- 4/5, Proof of Concept, Tested & validated

Research Lab

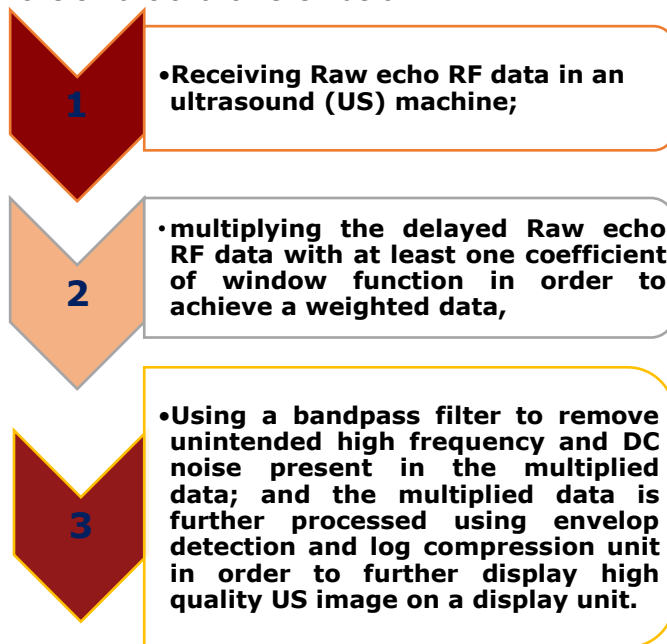
Prof. Arun K Thittai,
 Dept. of Applied Mechanics & Biomedical Engineering,

Technology

- Present invention describes a **method for ultrasound imaging using weighted non-linear beamformer**, shown in Fig.1.



The coefficient of **window function** can be a **raised** to the power of Euclidian distance computed between the combinations of delayed raw echo RF data in order to obtain weighted data (**FDewMAS beamformer**). Said method follows a few steps depicted in the smart chart hereinbelow:



CONTACT US

Dr. Dara Ajay, Head
 Technology Transfer Office,
 IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

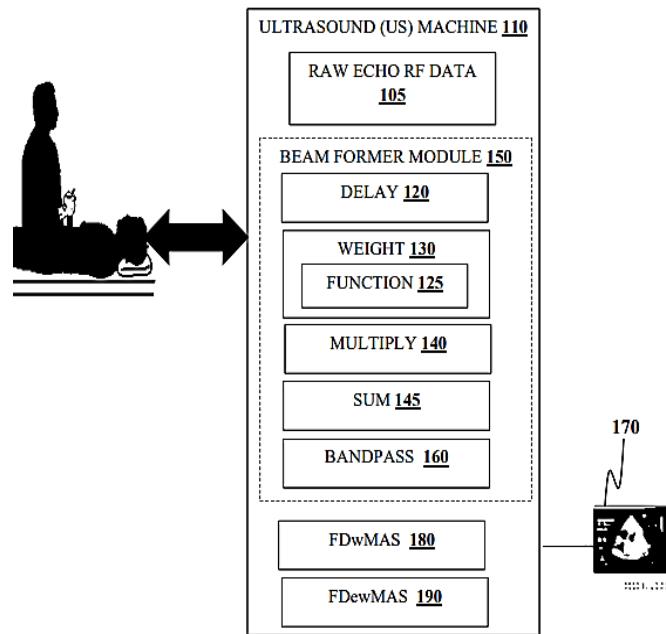
Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
 Phone: +91-44-2257 9756/ 9719

Technology

- Present Invention also describes an **ultrasound imaging apparatus with weighted non-linear beamformer**.
- Said apparatus comprises a **beam former module operatively configured** with the **US machine** wherein the **processed data with improved image quality is displayed** at the **display unit**, depicted in **Fig 2**.
- The **beam former module** comprises a **delay profile** to excite at least one element of the transducer to transmit the US beam in order to **receive the echoes using the transducer elements** and store it as **Raw echo RF data**.
- The **weighted data** is obtained by **multiplying the delayed Raw echo RF data with at least one coefficient of window function** (either F-DwMAS or F-DewMAS) which is **combinatorially coupled, multiplied & summed** using the **multiply and sum modules of the beamformer module**.

Layout of proposed Apparatus

Fig.2 : Illustrates a block diagram of an apparatus for developing a weighted nonlinear beamformer for Ultrasound system;



Key Features / Value Proposition

❖ Technical Perspective:

- Facilitates a **cost-effective apparatus** which includes beamformer module, **performs sign preservation and dimensionality reduction steps** on the data using a **square root operation**.
- A **bandpass filter** used to filter **unintended high frequency & DC noise** present in the **multiplied data** and the multiplied data is **processed** using **envelop detection and log compression unit** in order to further display **high quality ultrasound image** on the display unit.
- **Experimental Results** show an improved UltraSound imaging for both **medical (1-15 MHz)** and **pre-clinical/ high-frequency (>=15MHz)** applications.

❖ Industrial Perspective:

- **Increased efficiency** in term of **obtaining high quality ultrasound imaging by using the claimed Apparatus and method in cost-effective manner**.
- Highly demanding apparatus in the field of **Biomedical Engineering**, used as **Medical device** for identification of lifestyle- related diseases.

CONTACT US

Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719