

B-mode Ultrasound Imaging System (BUSIS)

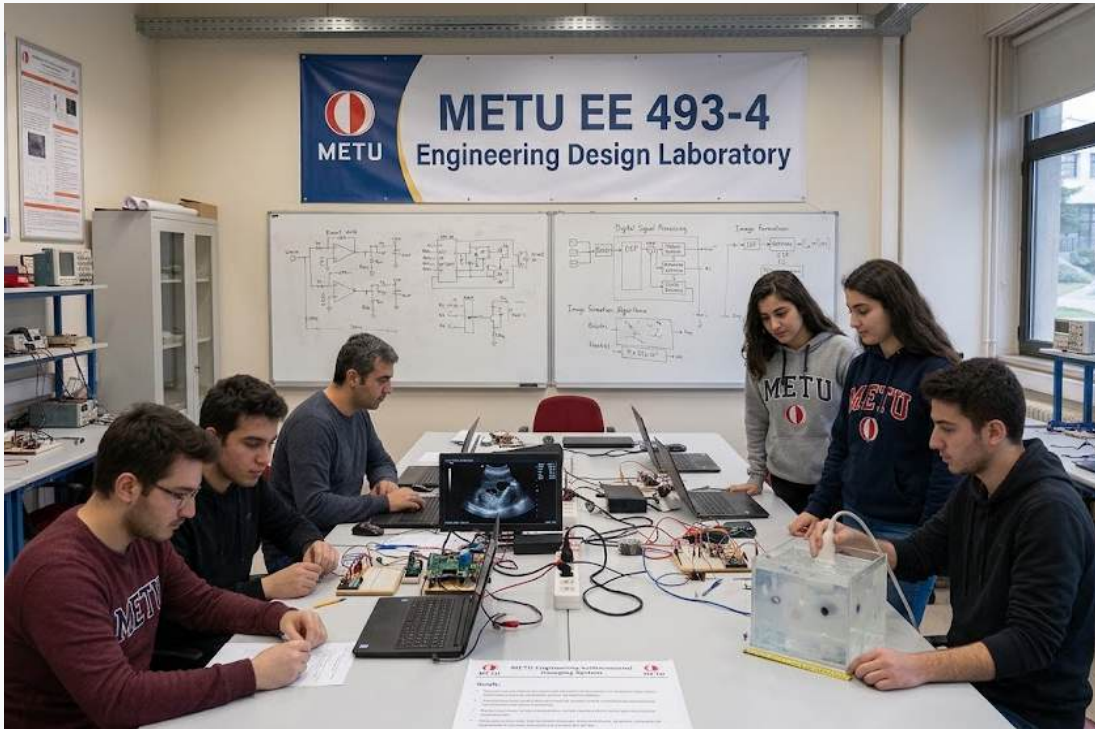


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Medical ultrasound (US) is one of the commonly utilised clinical imaging modalities due to its radiation-free, real-time and economical nature. The aim of the project is to develop an ultrasound imaging system that generates B-mode images (from channel data acquisition to image display) and to quantitatively evaluate imaging performance of the system:

- A B-mode ultrasound imaging front-end system will be developed using discrete electronic circuit components for raw echo signal acquisition;
- Front-end electronics should be capable of driving a 2-3MHz curvilinear array US transmitter/receiver transducer probe. The US probe will be provided within the scope of the project;
- The front-end electronics should be capable of driving at least an eight channel curvilinear array;
- Near real-time imaging (scan time in less than 1 minute including data acquisition and image formation) is required (aiming "the best axial and lateral resolution");
- Use of personal or laptop computers is not allowed for data acquisition, echo signal processing, or image formation. The system must include an embedded processing unit for all three operations. Reconstructed images should be displayed on a screen;
- The imaging performance of the developed system (SNR, axial and lateral resolution, contrast resolution and computational speed in frames/s) should be quantitatively evaluated using a 15x15x15 cm phantom (e.g. water filled tank with embedded anomalies). The phantom should also be developed within the scope of the project.
- The modeling phantoms should include high-contrast point targets to allow quantification of axial and lateral resolution of the developed imaging system, as well as demonstration

of general B-mode imaging scenarios including inhomogeneities with tissue-like acoustic impedances (1.5 – 2 MRayl), hyperechoic and anechoic regions.

- The developed system should be capable of dynamic imaging as well as static imaging.

Extra Features

- Multiple beam forming methods (delay-and-sum, plane-wave compounding, synthetic aperture, etc.) could be explored and quantitatively compared in terms of lateral /axial resolution, acquisition speed.
- B-mode sweep and angulation scanning methods can be implemented.
- In addition to basic B-mode imaging, Doppler imaging can also be implemented.
- AI-based image enhancement/beamforming can be utilised and compared with conventional approaches.