



### Industrial Consultancy & Sponsored Research (IC&SR)

#### Image-Free Ultrasound for Non-Invasive Assessment of Early Vascular Health Markers

#### IITM Technology Available for Licensing

##### Problem Statement & Unmet Need

- **Early detection and timely intervention** helps in reducing the mortality and morbidity in the cardiovascular disease. Currently age, family disease history, dyslipidemia, diabetes, central obesity etc. gives an **indirect hint** of the **development and progression** of the disease in the **blood vessels and the heart**.
- The earliest sign is **endothelium functional changes** that controls dynamic ability of the blood vessel to **regulate** the **vessel wall stiffness** in response to autonomic regulatory activity of body.
- **Loss of endothelial function leads** to increased stiffness of the vessel wall, increased wall thickness and plaque formation, in time leading to an **adverse cardiovascular and cerebrovascular event** like angina, ischemia, heart failure, stroke.
- However, the **routine clinical use** of such markers is **hampered** by the **lack** of **easy-to-use technology** for **reliable non-invasive assessment** at **low price**.
- The present patent addresses above mentioned issues with an **image-free ultrasound system**.

##### Technology Category/ Market

**Industry:** Life Science, Medical and Surgical Equipment, Transducers & Sensors,

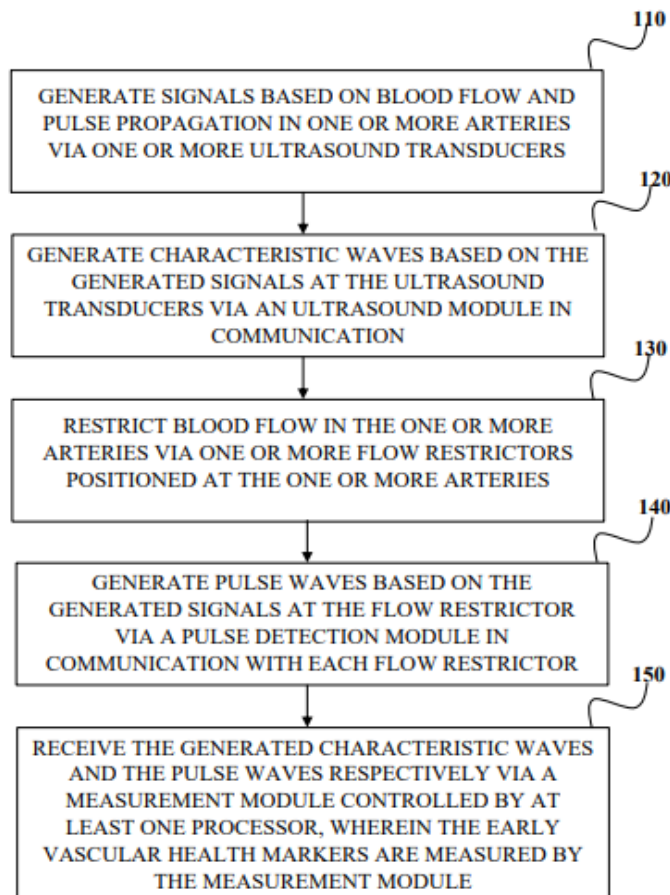
**Applications:** Ultrasound System, Hospitals

**Market:** The global ultrasound transducer market size was valued at **USD 3.2 B** in 2018; is expected to expand at **3.6% CAGR** by 2026.

##### Technology

The present patent discloses an **image-free ultrasound system** to provide a comprehensive evaluation of vascular health by performing the **non-invasive** assessment of endothelial function, local vascular stiffness at any superficial artery, and regional vascular across an arterial segment. The system consists of a **compact, easy-to-use, field-deployable ultrasound device** that does not construct any form of ultrasound images.

**FIG 1:** Illustrates the **method** for simultaneous and real-time non-invasive assessment of early vascular health markers using an image-free ultrasound system 100.



##### Intellectual Property

- **Application Number: 202041013190**
- **IITM IDF Ref. 2063**

##### Key Features / Value Proposition

- Detects early markers that indicate vascular stiffness, both local and regional, in routine clinical diagnostic practices.
- especially inbuilt with provisions for easy-to-use, minimal operator dependency, portability, and field deployability.
- the present disclosure may take the form of an entirely hardware embodiment, a software embodiment or an embodiment combining software and hardware aspects.

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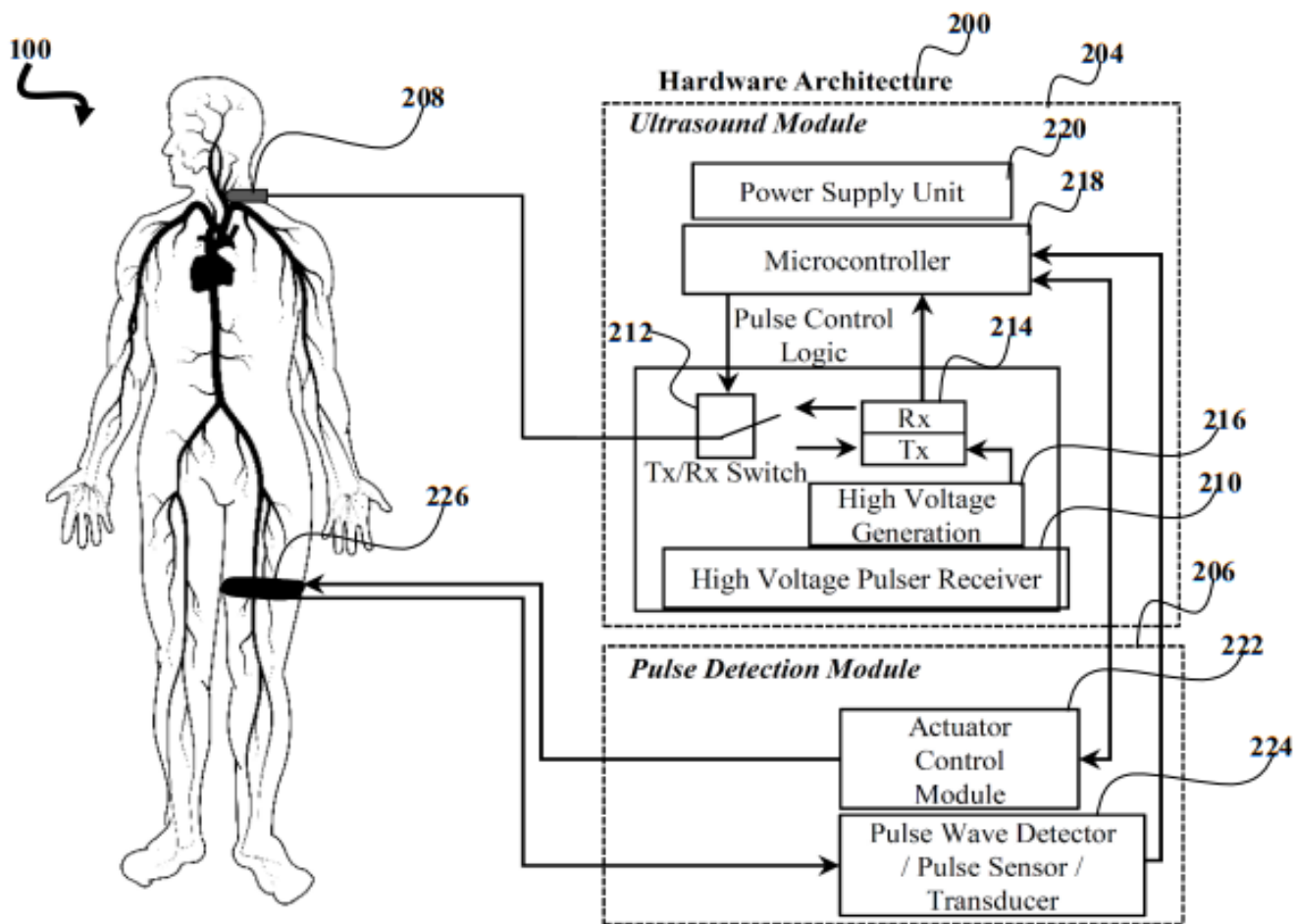
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Insert Image



**FIG. 2a** illustrate a schematic view of a hardware architecture of the image free ultrasound system and software architecture that is associated with the hardware architecture, wherein the schematic view illustrates different steps involved in performing simultaneous and real-time non-invasive assessment of early vascular health markers using an image-free ultrasound system.

### TRL (Technology Readiness Level)

**TRL- 4,**  
Proof of Concept ready, tested and validated in Lab.

### Research Lab

**Prof. Jayaraj Joseph**  
Dept. of Electrical Engineering, IIT Madras  
**Prof. Mohanasankar Sivaprakasam**  
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