CLAIMS

The conversion of Standard Ultrasound Transducers with the addition of an attachable Smart Sensor will result in reproducible, consistent Standardized Ultrasound Images and improved Ultrasound Image quality of target organs, resultingin the following benefits:

- **Improved 2D Ultrasound image quality**
- **Provide a real-time feedback mechanism to Sonographers to optimize and quantify the Ultrasound image capture process providing reproducible andconsistent Standardized Ultrasound 2D images.**
- **Provide a real-time feedback mechanism regarding the Ultrasound Transducerhead positioning, tracking and velocity in sub-millimeter accuracy during the image capture process whether by a Sonographer or by an Automated RoboticImage capture process to the primary Ultrasound parent device control panel and informatics through a USB data and power cable (Fig.5) (Fig.8(b)(g)).**
- **The Smart Sensor will have a SD Card Port (Fig.6) (Fig.8(c)(g)) for the storageand retrieval of all Smart Sensor performance data.**
- **Provide real-time data during the scanning process regarding the Ultrasound Transducer head patterning, tracking and percentage coverage of the target organ on the Smart Sensor's LCD display screen (Fig.1) (Fig.8(e)(f)(g)).**
- **Increase Ultrasound Image Diagnostic qualitative and qualitative features andreal-time image capture performance data.**
- **Enable Standardized 2D Ultrasound Images to be accurately 'stitched' into 3D Ultrasound images utilizing the sub-millimeter accurate coordinates recordedin real-time by the Smart Sensor of the 2D Ultrasound images.**
- **Enable more accurate Interpretation and Diagnostics resulting in faster treatment decisions.**
- **Reduce misdiagnosis by utilizing Standardized Ultrasound Images with enhanced image quality thus enabling accurate 2D to 3D stitching of the captured 2D images.**
- **The Smart Sensor has a HD Camera (Fig.4) (Fig.8(d)(f)) and Shutter mechanism(Fig.7) (Fig.8(a)(f)) focused on the targeted anatomy being examined in real- time, providing complementary visual imaging data further corroborating the Ultrasound image data for a more accurate assessment and subsequent Diagnosis of the target organs and soft tissues.**
- **The Smart Sensor shall have a KINETIC ENERGY HARVESTING capability tocapture the energy produced by the Sonographers movements during the Ultrasound image**
- **Provide a real-time feedback mechanism for the Academic Instruction of Ultrasound Image capture processes, procedures, and protocol.**

DESCRIPTION

Standardized 2D Ultrasound images are acquired utilizing the Smart Sensor attachedto any standard Brand-agnostic Ultrasound Transducer's body. The real-time data from the 3D-axis Gyros/ Inertial Measurement Units (IMUs) provide the Sonographer or Automated Robotics a real-time feedback mechanism regarding the Ultrasound 2Dimage capture process.

- **The Smart Sensor provides the mechanism for obtaining quantified real-time image capture data for repeatable, consistent image capture process, resultingin high quality, Standardized 2D Ultrasound images.**
- **The Smart Sensor provides the necessary Ultrasound image capture processand real-time performance data to the Sonographer or an Automated Robotic Image Capture Device by employing the Smart Sensor's 3D-axis Gyro- Inertial Measurement Unit (IMU) Sensors.**
- **The Smart Sensor is securely fastened (Fig.2(a)(b)) (Fig.3(a)(b)(c)) to the baseof the industry standard, Brand-agnostic Ultrasound Transducer, providing real-time data regarding the Transducer position relative to the targeted anatomy in sub-millimeter precision.**
- **The real-time data of the Ultrasound Transducer's positioning, image capture patterning, tracking, velocity, and percentage of targeted anatomy imaged, is transmitted to the Smart Sensor LCD Display (Fig.1) (Fig.8(e)(f)(g)), and via theUBS Data and Power cable (Fig.5) (Fig.8(b)(g)) to the Transducer's original base Control and Monitoring unit.**
- **The Smart Sensor's also incorporates Kinetic Energy Harvesting hardware,capturing the energy from the Sonographer or Automated Robotic unit's movements.**
- **The Smart Sensor's data is processed and the 2D imaging data is anatomicallyannotated and labelled in real-time, and the targeted anatomy's co-ordinates are displayed in sub-millimeter precision for every 2D Ultrasound image.**
- **The Smart Sensor has the capability to display the real-time scanning process,the sub-millimeter precise coordinates, and targeted anatomy's labelling, which is essential for real-time stitching for the Standardized 2D images captured into 3D Ultrasound images.**
- **The Smart Sensor's Programming software provides real-time feedback from the Smart Sensor Ultrasound guiding the Sonographer or Automated Roboticsfor a Standardized Ultrasound Image capture process.**