Novel medical device uses multimodal sensing and advanced AI processing to track digital biomarkers.

ThermoMind Vision One breast screening device relies exclusively on multimodal image processing for a safe, radiation-free yet accurate diagnostic. Gidel FantoVision edge computer ensures precise acquisition of image data at high speed and high resolution.

Breast cancer is one of the most worrisome health concerns facing women, but early detection and active patient monitoring are crucial to survival. The chances of a cure are high when detected and treated in the early stages.

Standard breast cancer diagnostic methods such as mammography, ultrasound, and MRI have limitations such as ionizing radiation, high false-positive rates, and/or high expenses.

ThermoMind as supplementary technology

ThermoMind, an Israel-based tech company, has developed groundbreaking technology that leverages the latest multimodal sensing technologies and advanced AI to track digital biomarkers related to metabolic abnormalities caused by cancer cells, enabling efficient breast cancer detection. This innovative adjunctive physiologic imaging technology employs state-of-the-art infrared sensors and sophisticated computer processing to create a digital skin, monitoring over 300 data points associated with metabolic and vascular changes linked to cancer cell activity.

ThermoMind's unique, non-contact screening modality requires only four minutes and involves neither radiation exposure nor invasive procedures, ensuring safety for both patients and trained personnel. Unlike mammography and ultrasound, which primarily depend on detecting structural and anatomical variations of tumors within the breast tissue, ThermoMind identifies pathophysiological changes such as metabolic and vascular alterations caused by cancer. As heat transfer in the body is facilitated by the circulatory system, thermography-detected pathologies are typically associated with changes in blood perfusion, making ThermoMind a vital tool in early breast cancer detection.

No radiation, non-invasive, no touch screening

ThermoMind has developed Vision One, a flagship medical device that utilizes advanced multimodal sensing technology as a data source. Vision One is a compact imaging system designed with patient comfort and privacy in mind. Its distinctive

structure features a large ring at chest height connected to a console, housing multiple infrared and depth sensors targeted at the patient's chest and axillae to capture a comprehensive 180° view.

Vision One operates under controlled temperature and ventilation conditions. The screening process involves monitoring temperature changes on the skin surface when exposed to variations, capturing high-resolution images from different angles. These images are analyzed in real-time by sophisticated AI algorithms, providing actionable insights such as vascular mapping and metabolic anomaly detection, significantly enhancing clinical decision-making.

The device integrates Long-Wave Infrared (LWIR), Near-Infrared (NIR), and 3D imaging to gather detailed data on thermal, vascular, and structural variations in breast tissue. Its AI component analyzes the captured data to identify digital biomarkers of cancer, aiding in risk assessment and streamlining the diagnostic process. The patient-centric design ensures a comfortable and private screening experience, supported by user-friendly software operated by skilled technicians. Additionally, the integrated digital platform facilitates remote consultations with oncologists and radiologists, enhancing the diagnostic process and creating personalized care plans. This combination of advanced screening, portable diagnostics, and telemedicine capabilities optimizes the accuracy and efficiency of patient care.

The efficient analysis by Vision One speeds up the delivery of results and minimizes downtime, providing physicians with quick access to screening results and enabling them to consider individual risk factors for a more personalized diagnosis.

FantoVision inside: high-bandwidth image acquisition and processing

When designing Vision One, ThermoMind teamed up with Gidel, another Israeli tech company specialized in high-resolution, high-frame rate image acquisition and processing for computer vision applications. "The challenge was that we needed to capture multiple high-resolution image data streams simultaneously and process them in real time", explains Najeeb Ayoub, CEO of ThermoMind.

Gidel's FantoVision was the ideal solution. FantoVision is a compact embedded computer specially designed for high-bandwidth imaging. The core of FantoVision is an NVIDIA Jetson system on module, paired with Gidel high-bandwidth frame grabbers supporting the most popular high-bandwidth camera interfaces 10GigE, CoaXPress, and Camera Link. Because of its embedded platform, FantoVision is 134 x 90 x 60 mm small, so it could easily be integrated into the Vision One housing.

The cameras implemented into Vision One rely on a CoaXPress interface, so the FantoVision40 version was selected, which allows image acquisition and processing at up to 40Gb/s.

With 15 sensors capturing high-resolution images at 30-60 frames per second simultaneously, the data stream needs to be compressed on the FantoVision edge computer to be transferred to the cloud for AI processing. Gidel's proprietary compression algorithm compresses the data in real-time during acquisition to avoid any bottleneck.

"Gidel's contribution to Vision One is not limited to the FantoVision hardware. The real-time compression was key to allow us to process the image data during and not after the acquisition", said Najeeb Ayoub.

Making breast cancer screening accessible to all

One key benefit of ThermoMind's Vision One concept is that it is much easier and more affordable to deploy than other medical imaging technologies. It only requires a climate-controlled room and power supply. It is therefore well suited for developing or emerging countries that often do not have sufficient infrastructure to provide early screening to all women.

ThermoMind initiated large-scale, prospective, multicenter, international clinical trials that evaluates the diagnostic performance of thermal video streams coupled with advanced Artificial Intelligence algorithms for early-stage breast cancer screening and diagnosis. This study is currently conducted in cooperation with the University of Heidelberg, Germany, MD Anderson in the USA, Assuta medical Centers in Israel among other 7 medical facilities worldwide. It will be crucial for the validation of this new imaging modality that aims to be both cost-effective and to carry a minimal level of risk, facilitating screening of women of all age groups and breast densities, enabling early detection of abnormalities caused by malignant processes and improving patient monitoring.