2024년도 대한전자공학회
하계종합학술대회 튜토리얼 발표정보

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▌튜토리얼 정보

제 목	**Towards Monolithic Mobile Ultrasound Imaging System for Medical and Drone Applications**
Abstract	Ultrasound Imaging System (UIS) has been widely used in medical imaging with its non-invasive, non-destructive monitoring nature; but so far the UIS has large form factor, making it difficult to integrate in mobile form factor. For drone and robotic vision and navigation, low-power 3-D depth sensing with robust operations against strong/weak light and various weather conditions is crucial. CMOS image sensor (CIS) and light detection and ranging (LiDAR) can provide high-fidelity imaging. However, CIS lacks depth sensing and has difficulty in low light conditions. LiDAR is expensive with issues of dealing with strong direct interference sources. UIS, on the other hand, is robust in various weather and light conditions and is cost-effective. However, in air channel, it often suffers from long image reconstruction latency and low framerate. To address these issues, this tutorial introduces UIS ASIC design for medical and drone applications. The medical UIS ASIC is designed to transmit pulse and receive echo through a 36-channel 2-D piezoelectric Micromachined Ultrasound Transducer (pMUT) array. With its small form factor, Intervascular Ultrasound (IVUS) and Intracardiac Echocardiography (ICE) becomes a viable application. Also, the ASIC for drone applications generates 28 Vpp pulses in standard CMOS and the digital back-end (DBE) achieves 9.83M-FocalPoint/s throughput to effectively translate real-time 3-D image streaming at 24 frames/s. With an 8×8 bulk piezo transducer array, the UIS ASIC is installed on an entry-level consumer drone to demonstrate 7-m range detection while the drone is flying. The tutorial will conclude with interesting research directions lying ahead in UIS.