UCF DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCEINCE

Spring 2015 Seminar Series

Presented by the ECE Division

BENDING THE COST CURVE: TOWARDS A $1000 DIAGNOSTIC X-RAY IMAGER FOR SCALABLE AND SUSTAINABLE HEALTHCARE

TUESDAY FEBRUARY 24, 2015

9:30 AM – HEC 450

Cost, quality and accessibility are major barriers to disease detection globally. For an easily communicable disease like tuberculosis, diagnostic or screening tests based on sputum, blood and urine analysis have slow response, are difficult to administer in remote locations, and have relatively high transportation and storage costs. Medical-grade state-of-the-art digital x-ray imaging systems are versatile in disease detection, faster, incorporate teleradiology for remote diagnosis, but are prohibitively expensive making them affordable only by major hospitals or labs that are located mostly in urban centers with high patient volumes. Here, a low-cost, high quality, digital x-ray imaging system could address many global health issues by enabling fast, accessible and inexpensive early detection of curable diseases including tuberculosis especially in rural, remote or under-populated areas.

In this research, we propose a path to achieving an inexpensive, high quality, digital X-ray system by focusing on the X-ray imager, a component that can reach 50% of the manufacturing cost of an imaging system. High manufacturing costs today are largely a function of small production volumes and various specialized fabrication processes. Our approach leverages two technologies developed in-house that leverage existing manufacturing infrastructure because they are fully compatible with older generation amorphous and poly-silicon TFT display manufacturing lines: the first is a low dark current, high quantum efficiency optical radiation sensor that rivals state-of-the-art amorphous silicon pin photodiodes and the other an amplified pixel circuit having a straightforward offset and gain correction scheme that yields higher signal-to-noise ratio than state-of-the-art passive pixels. When our sensor and pixel circuit technologies are integrated, the result is a high performance, low manufacturing cost diagnostic X-ray imager that can help achieve sustainable healthcare globally.

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Karim S. Karim received a PhD degree in electrical engineering from the University of Waterloo and joined Simon Fraser University in February 2003 as an Assistant Professor. In July 2007, he joined the Department of Electrical and Computer Engineering at the University of Waterloo (Canada) where he is currently a Professor. Dr. Karim's research interests (http://star.uwaterloo.ca) encompass system, circuit, device and process development using amorphous semiconductors for digital imaging applications. To date, he and his graduate students have co-authored over 200 publications, 20 of which have received either best paper awards or honorable mentions. He is an IEEE Electron Devices Society Distinguished Lecturer, a Full Member of the American Association of Physicists in Medicine, a program committee member for the SPIE International Medical Imaging Symposium and is a registered Professional Engineer in Canada.

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