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I-ImaS: Intelligent Imaging Sensor - application to intelligent X-ray imaging

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Conventional x-radiography uniformly irradiates the relevant region of the patient. Across that region, however, there is likely to be significant variation in both the thickness and composition of the tissues present, which means that the x-ray exposure conditions selected, and consequently the image quality achieved, are a compromise. The I-ImaS concept eliminates this compromise by intelligently scanning the patient to identify the important diagnostic features, which are then used to adaptively control the x-ray exposure conditions at each point in the patient. In this way optimal image quality is achieved throughout the region of interest whilst maintaining or reducing the dose.
An I-ImaS system has been built under an EU Framework 6 project and has undergone pre-clinical testing. The system is based upon two rows of sensors controlled via an FPGA based DAQ board. Each row consists of a 160 mm x 1mm linear array of ten scintillator coated 3T CMOS APS devices with 32 μm pixels and a readable array of 520 x 40 pixels. The first sensor row scans the patient using a fraction of the total radiation dose to produce a preview image, which is then interrogated to identify the optimal exposure conditions at each point in the image. A signal is then sent to control a beam filter mechanism to appropriately moderate x-ray beam intensity at the patient as the second row of sensors follows behind.
Tests performed on breast tissue sections found that the contrast-to-noise ratio in over 70% of the images was increased by an average of 15% at an average dose reduction of 9%.
The same technology is currently also being applied to baggage scanning for airport security.

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