Wasted time, multiplied by three billion

Each year more than 3 billion air passengers worldwide wait in line to have their hand luggage scanned prior to boarding. Unfortunately, there has been little innovation in the security scanning field over the last several decades. Airport security scanning is still largely based on traditional single- or dual energy X-ray technologies. Danish high-tech start-up Exruptive is developing an innovative scanning technology together with lean processes to achieve three to fourfold increases in scanning speed at better detection levels.

Exruptive turned to LINX to get a better understanding of the fundamental properties and performance limitations of the X-ray detectors used for security scanning. This understanding will benefit not just Exruptive but all users of multi-energy X-ray detectors.

Exruptive's vision for a fully automatic trolley scanner in airports. The passenger simply places his/her hand luggage on a trolley, and the entire trolley is then conveyed through the scanner. The scanner consists of a number of X-ray sources and a high number of X-ray detectors. There is no need to unpack liquids or electronics.

Morten Pankoke, CEO, Exruptive
With LINX we are enhancing the utility and reliability of a known component to fit our vision. Minimising false alarms in airport security scanners has a direct positive effect on the efficiency and passenger perception.

The issue

To be able to capture the complexity of the content of a modern air passenger's hand luggage, Exruptive decided to forego traditional single- and dual energy detectors and instead opt for state-of-the-art multi-energy detectors. These detectors capture much more information but for this exact reason are also inherently prone to deliver a higher number of false positives (i.e. a harmless item is identified as dangerous).

Exruptive therefore turned to LINX to develop a better understanding of the types of artefacts usually seen from multi-energy detectors. This understanding is a prerequisite and important reference for the development of appropriate corrective computer algorithms, and/or in time, new purpose designed detector hardware.

What we did

Scientists from DTU Physics and KU NBI tested the multi-energy detector used by Exruptive at the ESRF synchrotron facility in Grenoble. Based on this they build a lab model at DTU for the technologies used in the Exruptive concept.

As opposed to a traditional X-ray source, the synchrotron allows the scientists to control the exact energy levels of the photons hitting the detector. The signal output of the detector is then analysed and correlated with the energy level to yield an exact map of the types of artefacts presented at particular energy levels, and not least, the corrections needed to improve the performance of the detector.

What's next?

Based on data collected at the ESRF synchrotron facility new corrective algorithms are now in development in a collaboration between Exruptive, its other technology partners and DTU. These corrective algorithms will greatly enhance the efficiency of multi-energy detectors and are envisioned to become the gold standard in the industry, not just for security scanning but for all non-destructive testing purposes.

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