



Ronald E. Hatcher
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Electromagnetic Screening for Airport Security
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ABSTRACT:

The metal-detecting airport security scanners for airline passengers are being replaced by millimeter-wave imagers, which reveal concealed manmade objects. The technology that allows touchless inspections is a recent advance over older conventional sensing science, but it can be improved

Our lab investigates whole-body imaging for concealed object detection using multistatic millimeter-wave radar. We use a novel specially-shaped “blade beam” reflector antenna to focus on a single narrow horizontal slice of the body at a time. The radar moves up from toe to head in three seconds, scanning a person like a CT scanner (only using non-ionizing mm-waves rather than x-rays). With only one slice illuminated at a time, the field that bounces off the person will be due to just this narrow portion of the body, allowing for relatively simple reconstruction of the skin contour, rather than an entire two-dimensional skin surface. Stacking the reconstructed contours for various horizontal positions gives the full object image. Assuming smooth variations of the human body profile, foreign objects are detected by comparing the retrieved surface with a smooth one, alarming if the differences are big. Our system promises to be both more accurate and less expensive than the currently employed passenger scanners, providing images that are so clear that it will be unnecessary to have humans look at the images to determine threats.



BIOGRAPHY:

Carey M. Rappaport received five degrees from the Massachusetts Institute of Technology: the SB in Mathematics, the SB, SM, and EE in Electrical Engineering in June 1982, and the PhD in Electrical Engineering in June 1987.

Prof. Rappaport has worked as a teaching and research assistant at MIT from 1981 until 1987, and during the summers at COMSAT Labs in Clarksburg, MD, and The Aerospace Corp. in El Segundo, CA. He joined the faculty at Northeastern University in Boston, MA in 1987. He has been Professor of Electrical and Computer Engineering since July 2000. In 2011, he was appointed College of Engineering Distinguished Professor. During fall 1995, he was Visiting Professor of Electrical Engineering at the Electromagnetics Institute of the Technical University of Denmark, Lyngby, as part of the W. Fulbright International Scholar Program. During the second half of 2005, he was a visiting research scientist at the Commonwealth Scientific Industrial and Research Organisation (CSIRO) in Epping Australia. He has consulted for CACI, Alion Science and Technology, Inc., Geo-Centers, Inc., PPG, Inc., and several municipalities on wave propagation and modeling, and microwave heating and safety. He was Principal Investigator of an ARO-sponsored Multidisciplinary University Research Initiative on Humanitarian Demining, Co-Principal Investigator of the NSF-sponsored Engineering Research Center for Subsurface Sensing and Imaging Systems (CenSSIS), and Co-Principal Investigator and Deputy Director of the DHS-sponsored Awareness and Localization of Explosive Related Threats (ALERT) Center of Excellence.