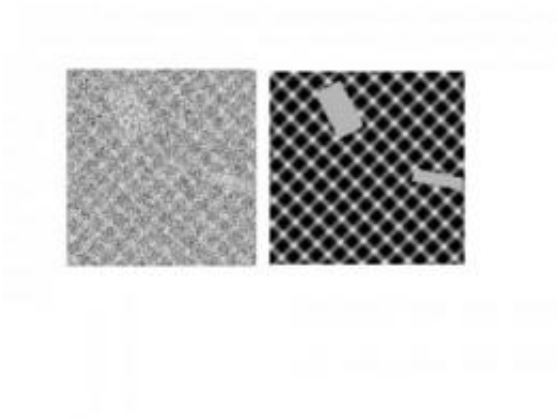
New algorithms for computerized, large-scale surveillance

December 2 2009



A synthetic scene showing two very faint buildings as seen from above. On the right, the buildings are much more visible because image analysts used algebra to make them more distinct. Credit: Credit: Myoung An and Richard Tolimieri, dB Research

A recent AFOSR-funded technology should enable the Air Force to achieve advances in object and target detection technology by using sophisticated algebraic theories called groups, rings and fields.

Better detection methods will allow for effective reviewing of photographic, video and radar images to facilitate military planning and order of battle.

"This technology is the result of several remarkable insights by two

innovative mathematicians, Dr. Myoung An and Dr. Richard Tolimieri," said lead researcher, Dr. Richard A. Albanese of Air Force Research Laboratory.

A related technology, crafted by Drs. An and Tolimieri for the U.S. Navy, was successful in detecting shallow water mines by means of sonar -- a technology much like radar but with sound waves instead of electromagnetic waves -- but the Air Force is adapting the methodology to examine images for surveillance purposes.

In the past, careful human review of a large amount of surveillance material required a considerable investment of time. This new technology cuts the time overhead by 99%. However, even with the vast improvements the new technology brings, the human factor is still essential in several aspects such as the validation and verification of transmitter and receiver configurations.

"One challenge of the research is the matching of the algebraic structure to the data and problems at hand," Albanese said. "We are applying algebraic structures to data index sets and in this way finding patterns that were not easily detectable before."

Through bringing in even more advanced algebraic structures, the researchers believe they will come up with enhancements that detect subtle patterns or features under conditions of dust, fog, bushes and other visual obstructions.

In the future Albanese would like to see related technologies expand to the medical and linguistic fields including speech and language recognition. This could mean life-saving capabilities in a combat scenario.

Source: Air Force Office of Scientific Research

Citation: New algorithms for computerized, large-scale surveillance (2009, December 2) retrieved 25 April 2024 from https://phys.org/news/2009-12-algorithms-computerized-large-scale-surveillance.html

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