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Evaluating Acoustic Gunshot Sensors through Unnoticeable Audios and Encryption Algorithms

Encoded ultrasonic test signals allow police to validate gunshot detection systems safely without audible disruption to nearby communities.

Police departments sometimes rely on gunshot detection systems within neighborhoods and large buildings to reduce response time and enhance area surveillance. These systems must be rigorously tested to ensure accuracy. These tests generally involve real controlled gunshots alongside simulated false alarms, such as car backfires, nail guns, or popped balloons. Testing gunshot detection systems is a loud, disruptive, and potentially hazardous process, sometimes inciting panic among people in the area. Related to gunshot detection system inventions 2025-DAI-70843 and 2025-DAI-70881, researchers at Purdue University have developed an algorithm that will allow police departments to test their gunshot detection systems with no disturbance to the occupants of the area in which the sensors are operating. This novel testing system relies on encoded audio, which can be played as simulated gunshots for the test while remaining at a frequency above the range of normal human hearing.

Technology Validation:

The researchers report a 0.59 parts per million false positive rate (0.000059%) with two acoustic sensors. This may be more effective than existing, commercial gunshot detection systems.

Advantages:

-Test sound undetectable by most humans

-Reliable and accurate testing of gunshot detection systems

-Enhanced public safety

-Greatly reduces disturbance to local occupants while tests are being performed

Technology ID

2025-DAI-71082

Category

Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition

Aerospace & Defense/Defense Electronics & Surveillance Technologies

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-Appropriate for both a single acoustic microphone and multiple microphone arrays

Applications:

-Testing of gunshot detection systems.

TRL: 3

Intellectual Property:

Provisional-Patent, 2025-06-26, United States

Keywords: audio encryption, Computer Technology, evaluation of gunshot sounds, gunshot detection, high frequency audio, Law Enforcement, Public Safety