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Clutter-Compensating Adaptive Waveforms with Cognitive Radar for Target Classification

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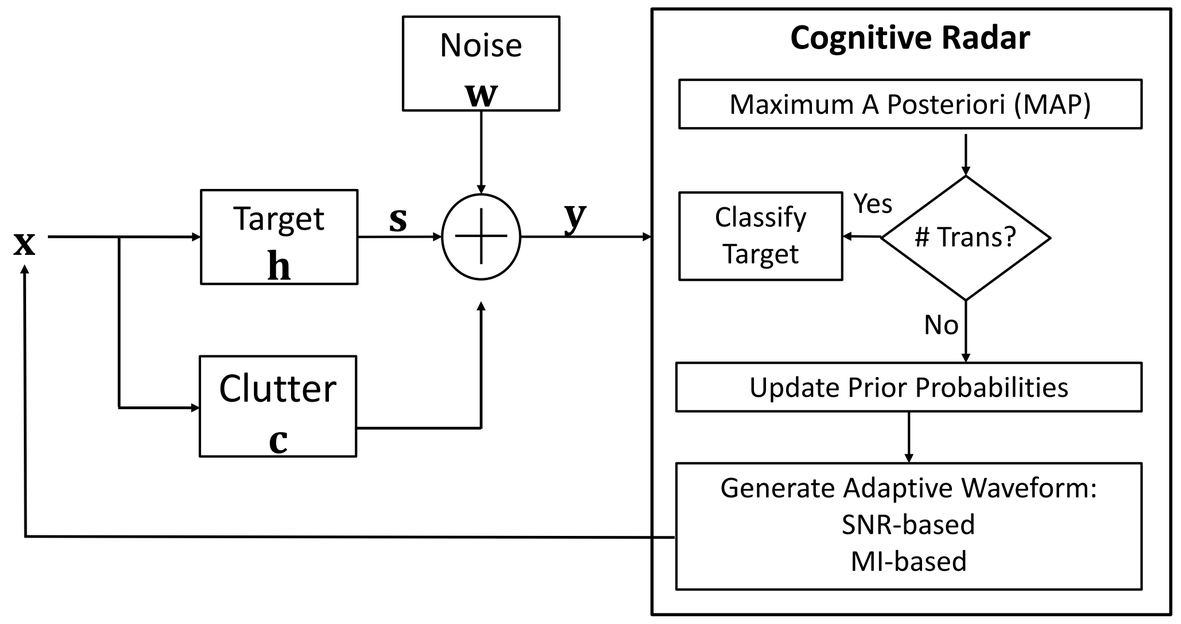
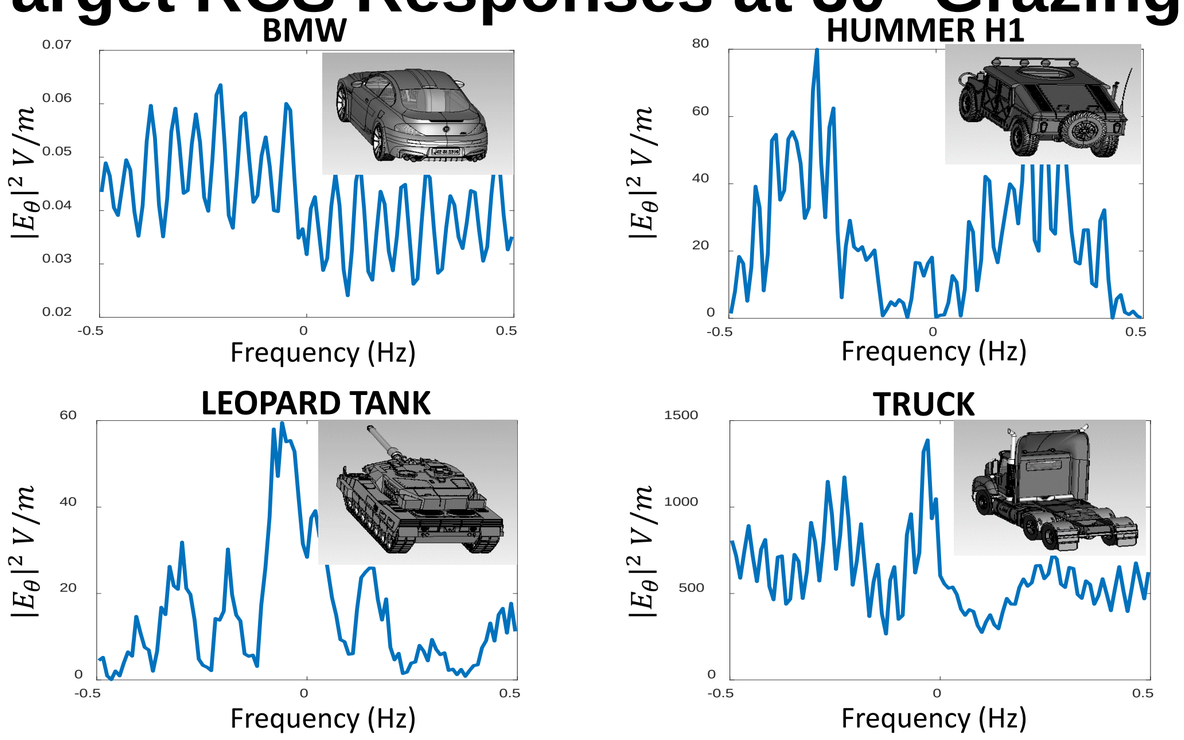
Objectives

- Our goal is to show viability of cognitive radar (CRr) technology for both commercial and military systems.
- Use of high-fidelity EM-simulated ground-based targets or radar cross section (RCS) responses.
- Clutter is transmit-waveform dependent, which makes the classification problem difficult.
- Ground-based vehicles modeled at grazing angles.
- Clutter-mitigating adaptive waveforms are designed.
- Improve classification performance using CRr.



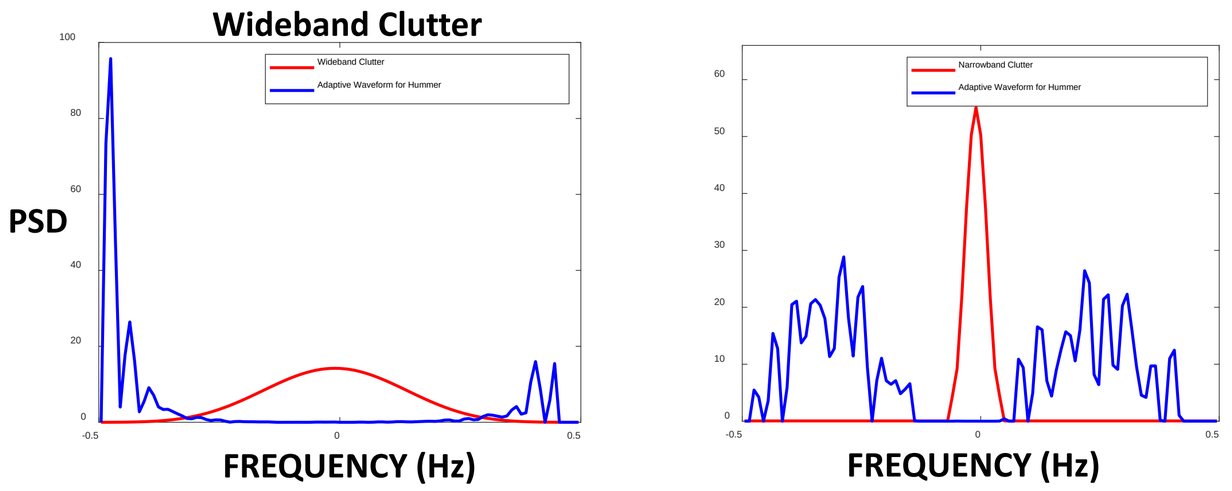
Block diagram of a cognitive radar application using adaptive waveforms to mitigate transmit waveform-dependent clutter

Target RCS Responses at 30° Grazing



Clutter-compensating Waveforms

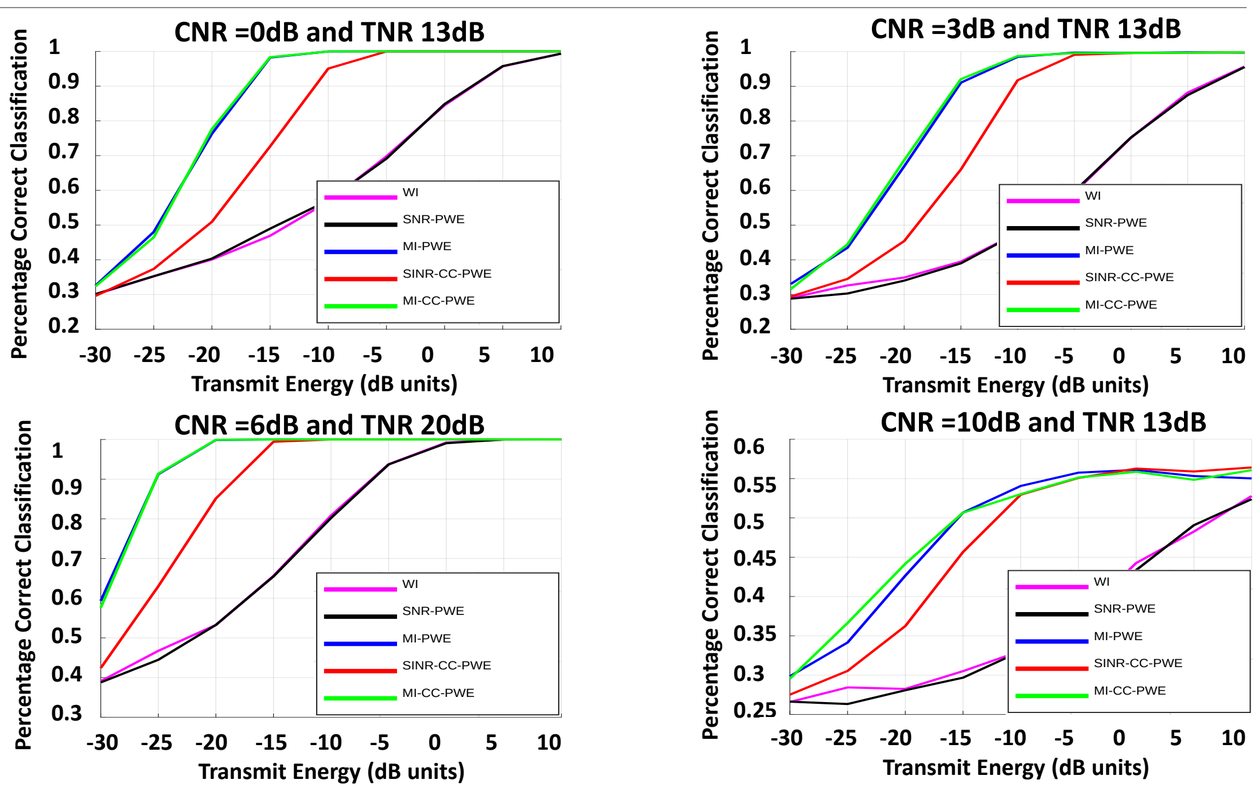
Mutual Information Adaptive Waveforms



- Use of narrowband and wideband clutter.
- Employ clutter mitigating waveforms.

Results

- MAP detection rule is used to determine which target is present for one transmission.
- For CRr, multiple transmissions are considered.
- The target with the highest hypothesis probability after last waveform transmission is selected as the system's decision.
- Percentage of correct classification (Pcc) against transmit waveform energy (Ex) over 10,000 Monte Carlo simulations.



Recommendations for Future Works

- To implement in a closed-loop system in hardware and to validate clutter-mitigating adaptive waveforms with cognitive radar for target classification.

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