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Classifying Guardrail System Radar Signatures using Full Physics Simulation for 77 GHz Automotive Radar

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July 10, 2020

Abstract

Automotive radar is one of the key sensor technologies for active safety and comfort advanced driver assistance systems(ADAS). Vehicles equipped with radar sensors can determine the range, velocity and angle of arrival of multiple targets simultaneously in a highly dynamic environment. At 77 GHz, road infrastructure and buildings are an ever present source of clutter that can affect crucial target detection. Guardrails present a unique clutter challenge due to their ubiquity, proximity to ego vehicle and extremely large radar cross section(RCS). Due to their large RCS, guardrails can mask the existence of soft targets such as pedestrians in their vicinity. Therefore, it is crucial for sensor perception algorithms to identify and filter out the effects of guardrails. This paper presents a full-physics, simulation-based study of several full-scale road traffic scenes with different guardrail arrangements. By studying the Range-Doppler(RD) plots of each of the scenes at 77 GHz, we demonstrate the distinctly different radar signatures of guardrails in four key road settings that normally occur in driving. Using the results from this study, we characterize both the range and velocity behavior of various guardrail sections. Results from this study can be used to train perception algorithms to accurately identify and filter out guardrail systems in different driving scenarios and thus potentially prevent future accidents.

Title

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Running Title

Automotive Radar Guardrail Classification

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Acknowledgements

The Author would like to acknowledge C. Matara and S. Carpenter for their constructive comments during the development of this work.

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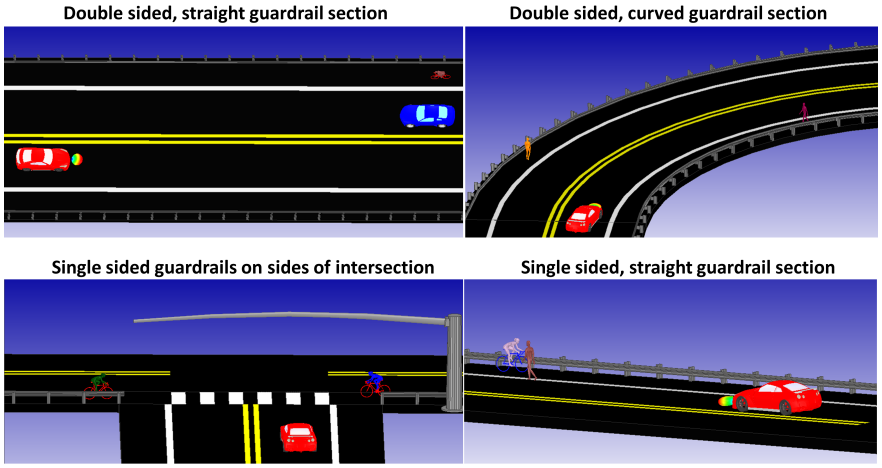

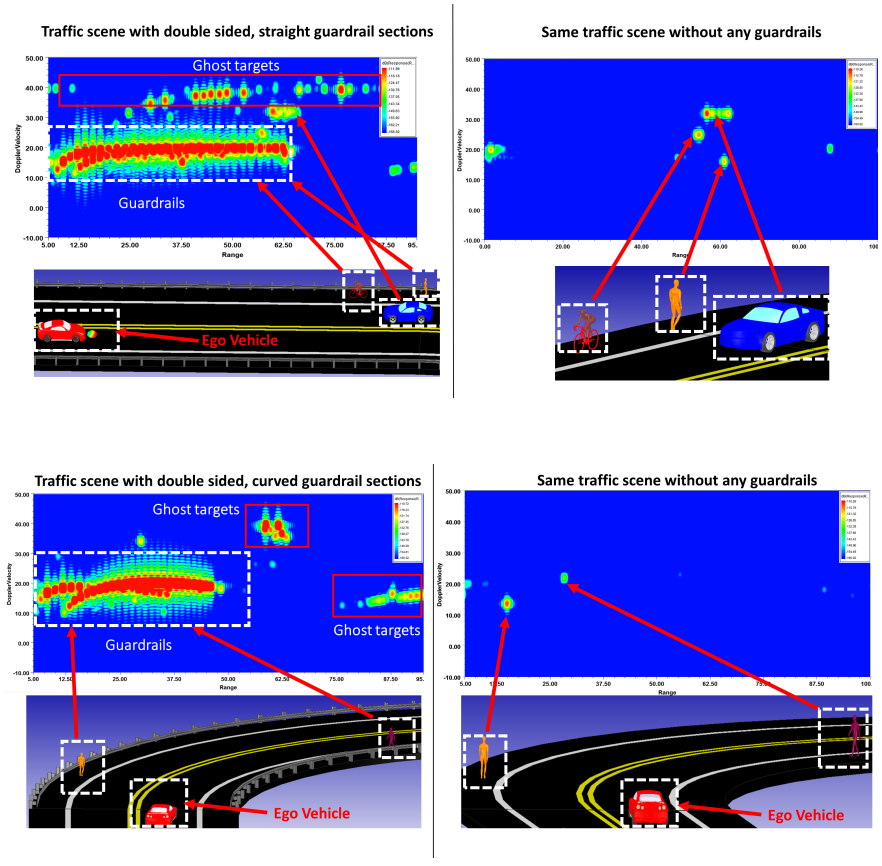

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