

Vehicle's Driving Mode and External Appearance:

Effects on Pedestrians' Road-Crossing Behavior

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Public perception of Automated Driving

AAA NewsRoom

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Three in Four Americans Remain Afraid of Fully Self-Driving Vehicles

AAA believes testing, experience and education will aid acceptance

ORLANDO, Fla. (Mar. 14, 2019) – A year after profile automated vehicle incidents, AAA's self-driving cars have not rebounded. AAA's vehicle survey found that 71 percent of people are afraid of fully self-driving vehicles – indicating that

FOR MORE INFORMATION:
Ellen Edmonds
Manager,
AAA Public Relations

CNBC

MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV

SEARCH QUOTES

AUTOS

Self-driving cars are scaring more people


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SHARE f t in e

KEY POINTS

- More Americans say they wouldn't ride in a self-driving car than those surveyed in 2017, according to AAA.
- The report attributes the increased concern to highly publicized accidents involving self-driving cars.



A Field Study of Pedestrians and Autonomous Vehicles

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ABSTRACT

Autonomous vehicles have been in development for nearly thirty years and recently have begun to operate in real-world, uncontrolled settings. With such advances, more widespread research and evaluation of human interaction with autonomous vehicles (AV) is necessary. Here, we present an interview study of 32 pedestrians who have interacted with Uber AVs. Our findings are focused on understanding and trust of AVs, perceptions of AVs and artificial intelligence, and how the perception of a brand affects these constructs. We found an inherent relationship between favorable perceptions of technology and feelings of trust toward AVs. Trust in AVs was also influenced by a favorable interpretation of the company's brand and facilitated by fit into everyday life. To our knowledge, this paper is the first to surface AV-related interview data from pedestrians in a natural, real-world setting.

Author Keywords

Autonomous vehicles; field study; trust; human-vehicle interaction.

CCS Concepts

- Human-centered computing ~ Field studies

INTRODUCTION

Autonomous vehicles (AVs) have been in development for nearly thirty years [30] and have recently begun to operate in real-world settings since 2009. AVs are of great interest in many domains and has also garnered significant media attention. For example, in 2018, TechWorld

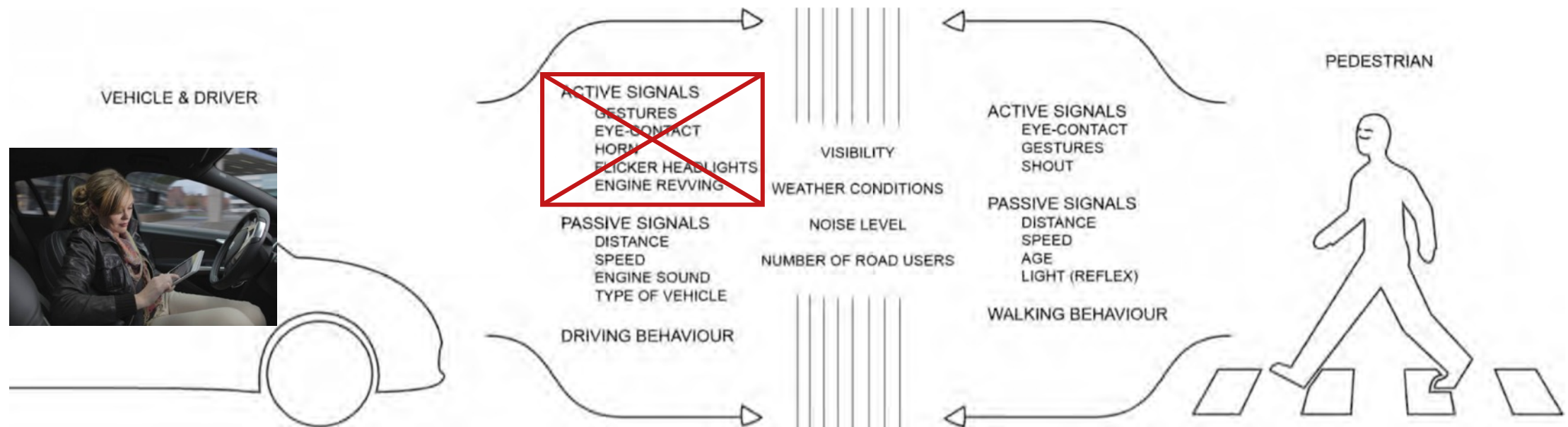
Permission to make digital or hard copies of this work for personal or classroom use is granted by ACM, provided that the fee of \$15.00 is paid directly to ACM. ISBN 978-1-4503-5946-7/18/09\$15.00. <https://doi.org/10.1145/3239060.3239064>

Awareness of AVs



Awareness Level	Rating 'AVs are important for me'	Rating 'AVs are trustworthy'	Rating 'AVs are important for society'	Rating 'I am interested in AVs'
Little to no awareness	~1.6	~2.5	~2.2	~1.8
Some awareness	~2.5	~3.5	~3.1	~3.0

Missing Driver-centric communication

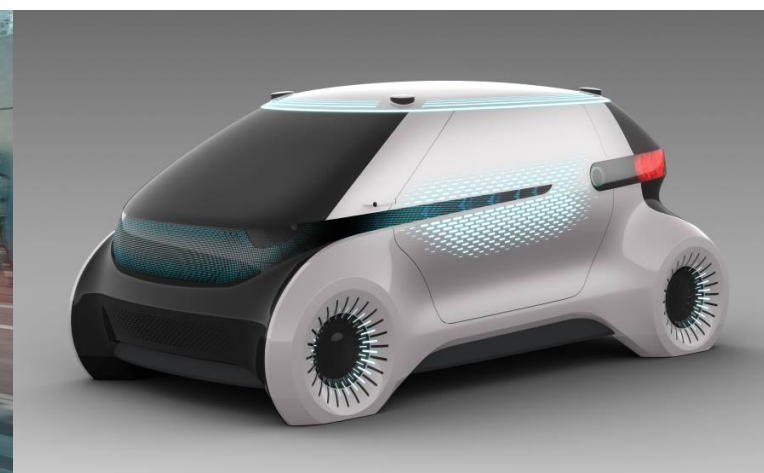
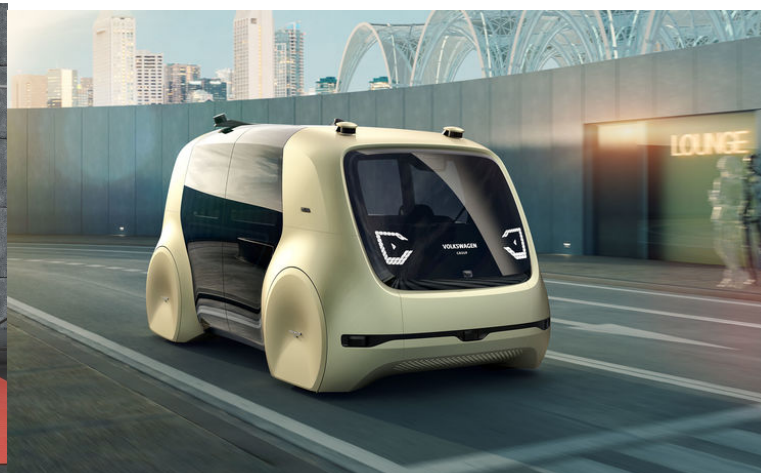


Source: Lundgren, V. M. et al. (2015). AVIP : An Interface for Communicating Intent of Automated Vehicles to Pedestrians.

Vehicle appearance



AV appearance



Research Questions

Effects of:

- Perceived driving mode (normal vs. automated vehicle)
- External appearance
 - Friendly vs. aggressive
 - Ordinary vs. futuristic

Experiment Setup



Renault Twizy

Friendly
Small
Low-power
Novel
Futuristic

BMW 3 series sedan

Aggressive
Large
High-power
Ordinary
Commonplace

Experiment Setup



Experiment Setup



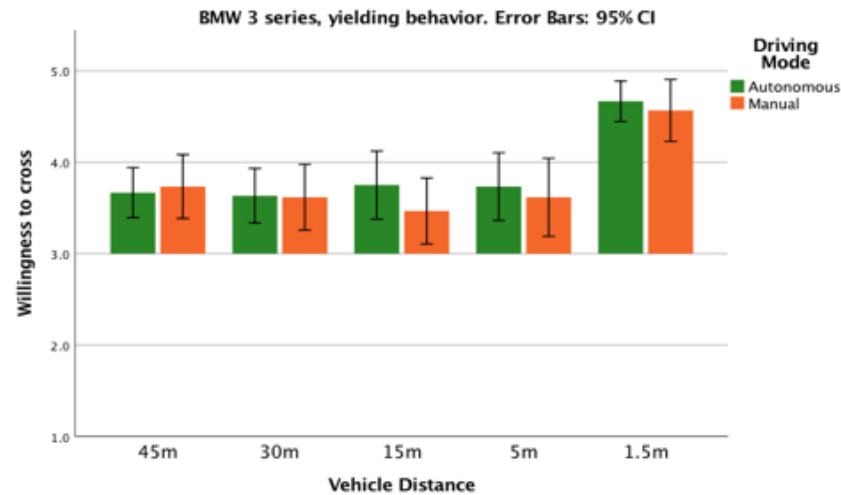
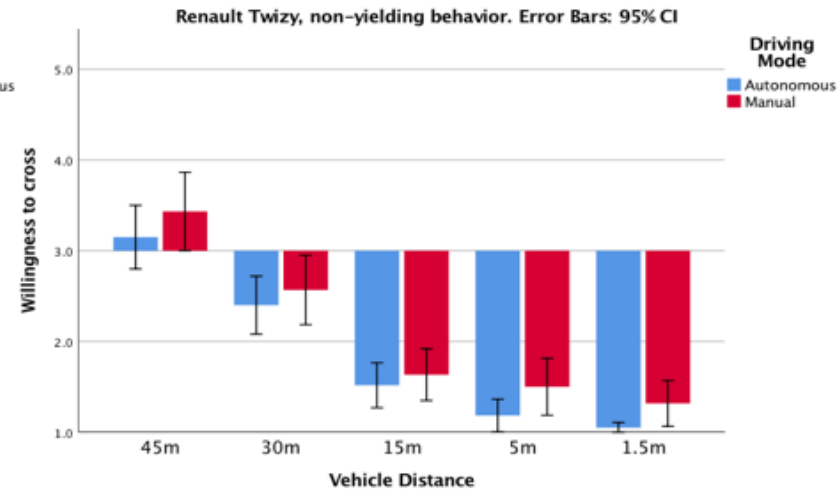
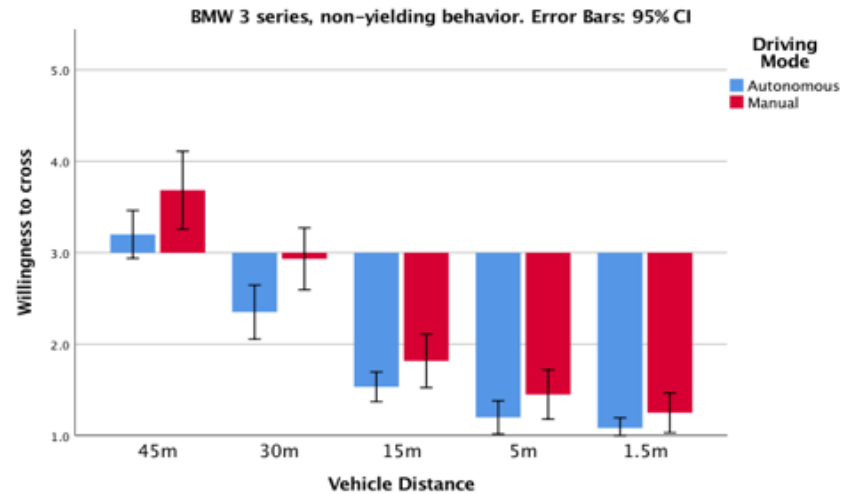
Independent variables:

- Vehicle type (appearance)
- Vehicle behavior (Yielding/ non-yielding)
- Vehicle driving mode (automated/ non-automated)
- Between subjects

Measurement points:

- 45m, 30m, 15m, 5m, 1.5m
- Car started to brake gently at 54m away (1.8m/s^2)

How does Willingness to Cross change?



Takeaways

Driving behavior is the most important determinant of crossing decision (implicit communication of intent)

Driving mode (automated/ manual) had no statistically significant impact on crossing behavior

External appearance had a significant impact in the “ambiguous zone” (neither too far away, nor too near)

- Pedestrians were less willing to cross in front of the Twizy
- Futuristic and novel appearance caused hesitation. <Experimental vehicle?>

Follow-up: Appearing like an AV



- How effective is a sensor system make a vehicle look more “self-driving”?
- Will a “self-driving capable” appearance have a positive effect on willingness to cross?
- How does an external HMI (eHMI) as an explicit intention indicator affect willingness to cross?

Experiment setup



Baseline



eHMI

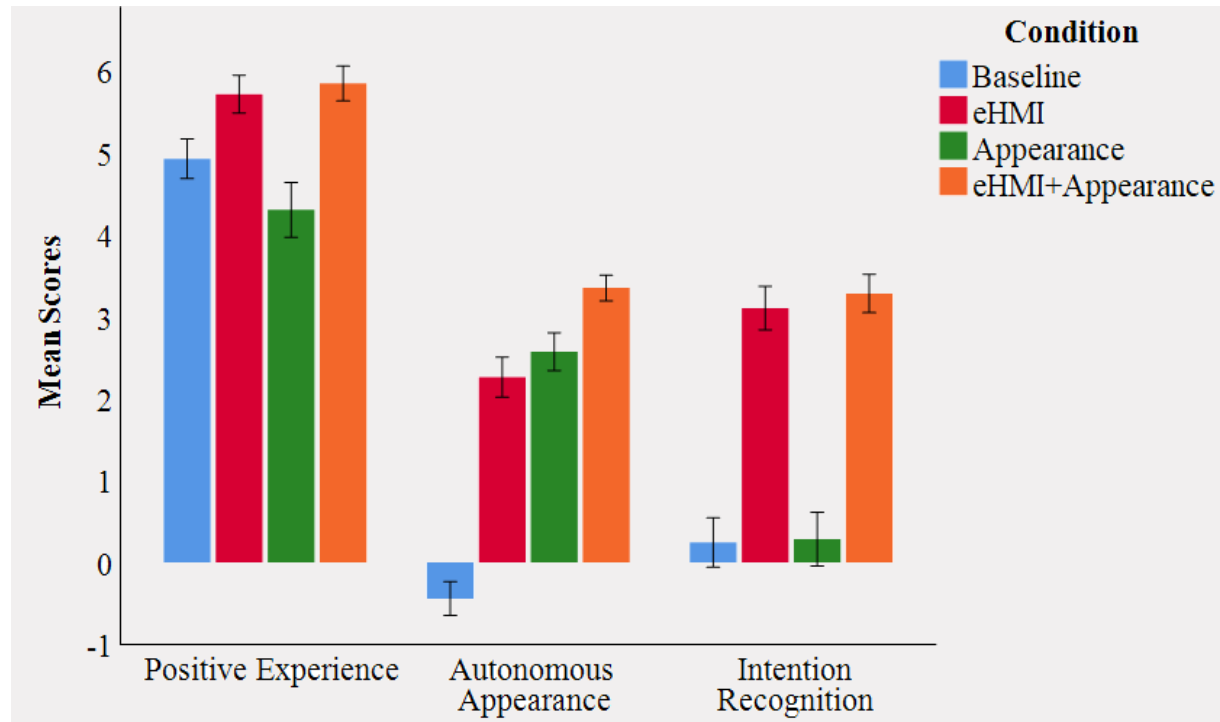


Appearance



eHMI+Appearance

Findings

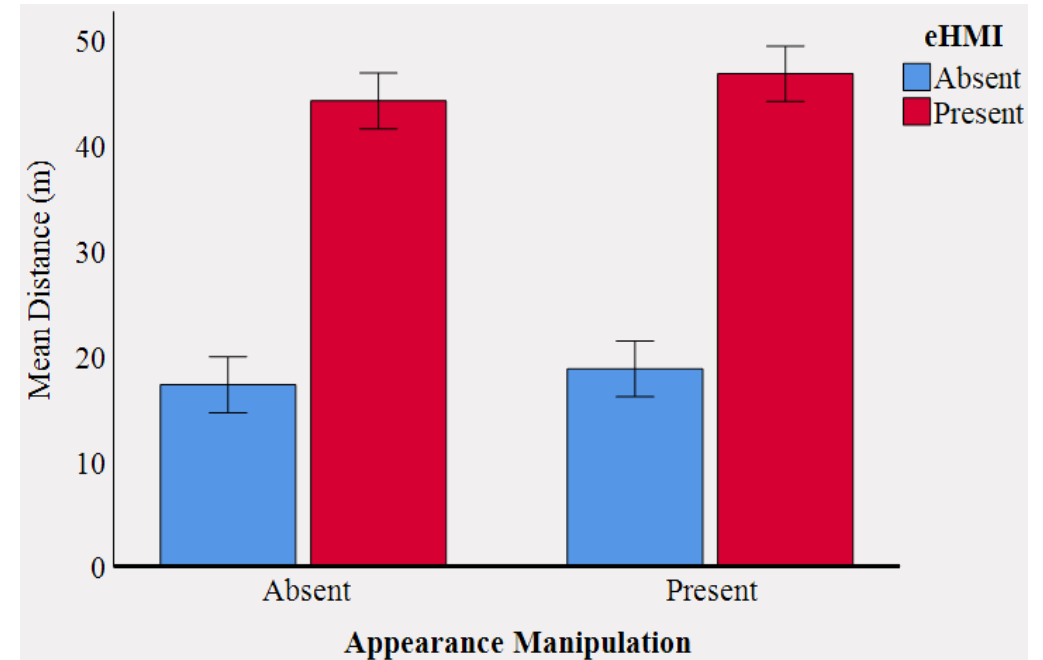
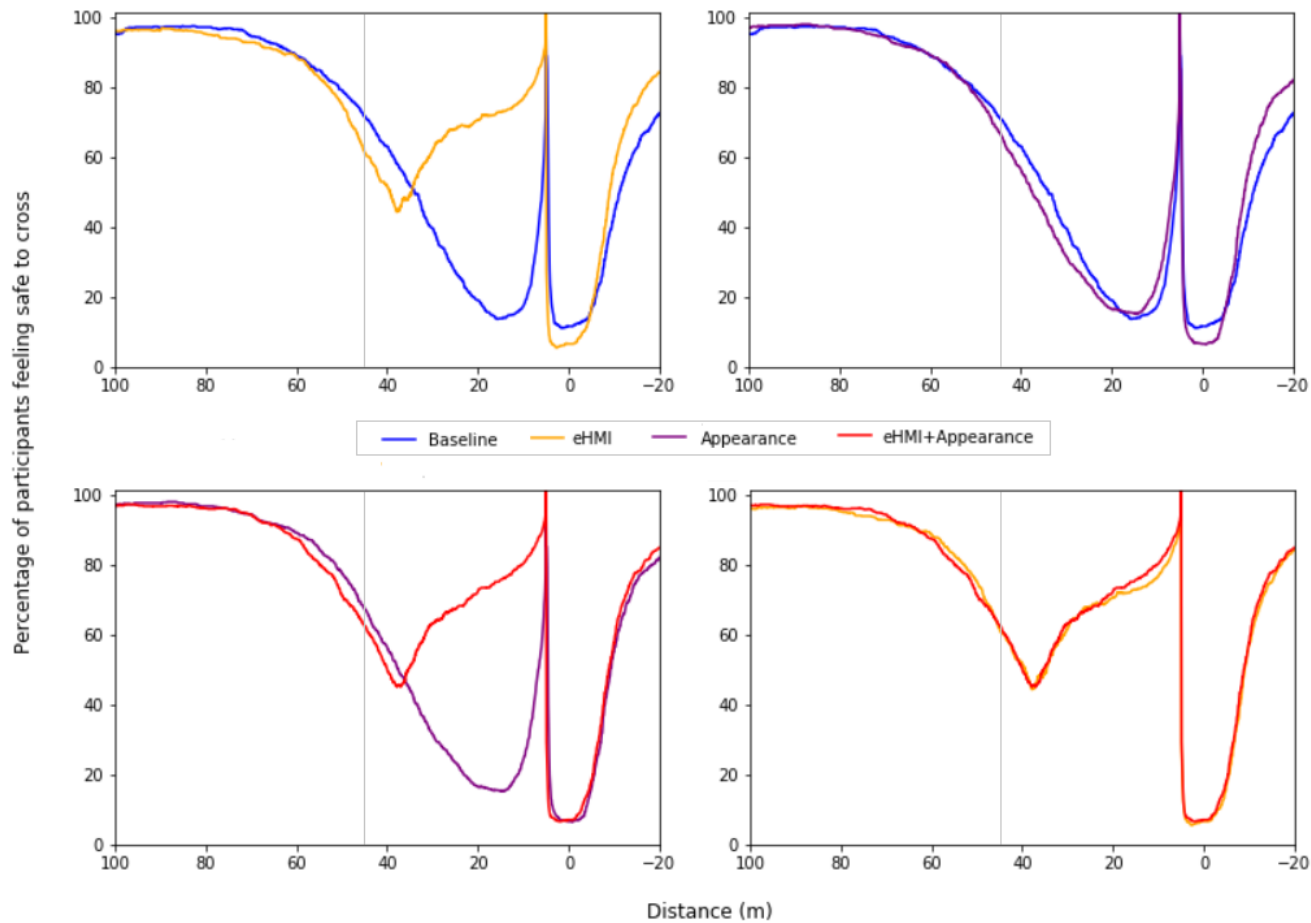


Both sensors and eHMI made the car look more like a “self-driving car”

Even when such cars are not popularly seen in The Netherlands

Findings

Yielding Vehicles



- Sensors had no detrimental effect on pedestrian behavior.
- eHMI had a positive effect

Takeaways

- Sensors seem to make people think that a car is “self-driving”
- Despite that, people are not necessarily ‘afraid’ to cross the road
- eHMI appears to aid crossing decisions

When AVs behave in an expected manner, people seem to behave around them just as around ordinary cars

Putting the previous findings together: a highly futuristic design can cause hesitation by breaking mental models. But sensor systems do not.

For future AV introduction: design choices are important. It may be beneficial to not make AVs stand out as too futuristic to ease social acceptance in the early stages

Let's talk!



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