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Brandon Schoettle	SWT-2017-12

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The University of Michigan Sustainable Worldwide Transportation 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.	11. Contract or Grant No.

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16. Abstract

This white paper analyzes and compares the sensing capabilities of human drivers and highly automated vehicles. The key findings from this study are as follows:

• Machines/computers are generally well suited to perform tasks like driving, especially in regard to reaction time (speed), power output and control, consistency, and multichannel information processing.

• Human drivers still generally maintain an advantage in terms of reasoning, perception, and sensing when driving.

• Matching (or exceeding) human sensing capabilities requires autonomous vehicles (AVs) to employ a variety of sensors, which in turn requires complete sensor fusion across the system, combining all sensor inputs to form a unified view of the surrounding roadway and environment.

• While no single sensor completely equals human sensing capabilities, some offer capabilities not possible for a human driver.

• Integration of connected-vehicle technology extends the effective range and coverage area of both human-driven vehicles and AVs, with a longer operating range and omnidirectional communication that does not require unobstructed line of sight the way human drivers and AVs generally do.

• Combining human-driven vehicles or AVs that can "see" traffic and their environment with connected vehicles (CVs) that can "talk" to other traffic and their environment maximizes potential awareness of other roadway users and roadway conditions.

• AV sensing will still be critical for detection of any road user or roadway obstacle that is not part of the interconnected dedicated short-range communications (DSRC) system used by CVs.

• A fully implemented connected autonomous vehicle offers the best potential to effectively and safely replace the human driver when operating vehicles at NHTSA automation levels 4 and 5.

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