OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Vehicle Year, Make and Model Analysis Black Box and White Box Studies

Describe the need: Forensic image analysts are often asked to determine the make, model and year of a vehicle depicted in a questioned image (e.g., CCTV recording) to help advance an investigation. This process can also allow an analyst to exclude a suspect vehicle from consideration. Acceptance of this type of examination in court can be supported by black box testing to measure the accuracy of analysts in this task, particularly at different levels of image quality. The inclusion/addition of white box testing can help identify specific features used by analysts in reaching their decisions under both "ideal" and less than ideal conditions. The effect of image quality and the feature sets determined through these black & white box tests can then be incorporated into standards of practice for these exams.

Keyword(s): Vehicle, Make, Model, Year, Automotive, Truck, Car, Motorcycle

Submitting subcommittee(s): VITAL **Date Approved:** February 26, 2021

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

To date, research in the accuracy of humans in photographic comparison has focused on facial identification. However, image analysts are often requested to determine the Make, Model and Year of a vehicle depicted in surveillance video or captured images. The VITAL subcommittee seeks to have multiple black box studies conducted to determine the accuracy of examiners in making these types of determinations at varying degrees of "Quality" within submitted imagery. The standards of practice and strength of opinions ("conclusions") developed by VITAL can be scoped by the results of such black box testing (e.g., strength of opinion may be moderated by lower quality images). Likewise, multiple white box tests should also be performed at varying degrees of quality to help define the specific features used by analysts to reach their decisions under different quality conditions. Identification of "most" and "least" useful features can be incorporated into the standard of practice for conducting a make/model/year determination.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

There have been multiple "case studies" offered over time regarding individual vehicle make/model determinations and comparisons, but at this time, no "ground-truthed" research on the accuracy of vehicle make/model/year determinations is known. Likewise, there is no known forensic research on defining common characteristics and classifiers for make/model/year determination. The Society of Automotive Engineers (SAE) or the self-driving vehicle community might have classifiers that can be used.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

SWGDE Vehicle Make/Model Comparison Form; DOD uses WEFT to identify an aircraft and military equipment.

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest? Is your research need identified by NIJ?

No.

5. In what ways would the research results improve current laboratory capabilities?

The research results would explore the scientific basis for photographic vehicle comparisons and make/model/year determinations, including exploring error rates related to the quality of images and the feature sets found to be most diagnostic in the process. For the purposes of these studies, quality could be defined by the percentage of the imagery that captures the vehicle or the number of pixels that capture the vehicle, and the number of perspectives of the vehicle (multi-camera). Other factors like overall illumination of the scene, contrast, and color fidelity could conceivably be incorporated.

6. In **what** ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

The research would assist in determining which features of a vehicle are most conducive to making a vehicle make/model/year determination, as well as assisting in defining the "Quality" of imagery needed for an examiner to make an accurate determination of a vehicle make, model and year.

7. In what ways would the research results improve services to the criminal justice system?

The research would help identify ways to improve the ability of examiners to perform make/model determinations for lead generation.

8. Status assessment (I, II, III, or IV): I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.