## C27 Vehicle Forensics: A Method of Validation for Infotainment System Tracklog Maps Using Java™ OpenStreetMap Editor®

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After attending this presentation, attendees will better understand potential methods for creating and validating infotainment system tracklog maps recovered using a commercial vehicle forensics tool and the free, open source Java™ OpenStreetMap Editor®.

This presentation will impact the forensic science community by introducing a means of validation for infotainment system tracklog maps.

Traditionally, the majority of digital forensic evidence comes from personal computers and digital devices. The locations where digital evidence can be found continue to expand as technology further develops. Vehicles provide a medium for new technologies. Today's vehicles consist of a series of computers and Electronic Control Units (ECUs) ranging from navigation and communication units to automatic, rain-sensing wipers. Newer vehicles can contain more than 70 ECUs, each handling a separate task.[1] Infotainment, a portmanteau of information and entertainment, is a computer system that combines tasks such as navigation, communication, cell phone operations, and internet functions.

There are three main types of stored data found on infotainment systems: navigational data, vehicle event data, and user data.[2] This research focuses on navigational data; more specifically, tracklog maps which consist of data generated by the Global Positioning System (GPS). Tracklog maps contain a series of connected nodes that show the path the car traveled at a given moment. This can include speed, bearing, and distance traveled. Navigational data can also include recent locations, favorite places, waypoints, and trackpoints.

Research and method validation of obtaining digital artifacts from vehicle infotainment systems have been limited to this point, most likely due to the newness of the vehicle forensics field. At this time, there is only one vehicle infotainment system forensic tool that is currently available in the commercial marketplace.[2,3] This means there is currently not another tool to validate evidence obtained by this commercial tool. While this tool is still relatively new in the digital forensic field, it currently supports over 5,200 different models of vehicles from 22 different vehicle manufacturers.[3] This research provides a means of validation for tracklogs not found in any previous research regarding vehicle forensics.

This research was guided by the following questions: What third-party tools can be used to map coordinates with existing road overlays? How do tracklog maps produced by commercial tools compare to tracklog maps produced by other third-party tools? How accurate are tracklog maps created by both the commercial and third-party tools? How can a third-party tool be used to validate the commercial tool's method of creating tracklog maps?

For this study, data from a physical acquisition of a 2015 Ford® F-150 was used. An abundance of data was recovered from the acquisition, including all three types of data found on infotainment systems. Tracklog maps were produced automatically by the commercial tool for three years of the vehicle's life. Third-party tools such as Google® Maps™, Google® Earth™, and Java™ OpenStreetMap Editor® were evaluated as possible useful applications in the validation process. Google® Maps™ and Google® Earth™ did not have a convenient means of entering data to map a tracklog. Java™ OpenStreetMap Editor® was found to have the functions necessary for use as a third-party tool to validate the tracklog mapping function of the commercial tool.

Mapping tracklogs using Java™ OpenStreetMap Editor® produced route maps that were identical to the ones produced by the commercial tool's mapping function. It was found that Java™ OpenStreetMap Editor® could enhance the data obtained by the commercial tool by creating an overlay of street maps and satellite imagery. This provided a visual representation of the actual route taken by the vehicle. Lastly, a validation method was produced using Java™ OpenStreetMap Editor® as a third-party tool to validate the mapping functions of the commercial vehicle's forensics software.

**Reference(s):**

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2. Coronetto A.D., LaMere B., McGee C. Vehicle System Forensics: Introducing Your New Star Witness. *US Law*. 2015 Fall/Winter.
3. Berla Corporation. *Infotainment and Vehicle System Forensics.* Retrieved from https://berla.co/-products/ive/. 2017.

**Vehicle Forensics, Infotainment Systems, Method Validation**



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