Overview:

High quality, real-life vehicle network datasets are needed by CISE researchers who are advancing the state of the art in automotive and related systems. However, when it comes to passenger cars and heavy vehicles, such datasets are hard to obtain, which prevents the research community from growing the discipline. The vision for PIVOT (Platform for Innovative Use of Vehicle Open Telematics) is to transform the ad-hoc, small-group endeavors for vehicle data curation into a scientific body of work done by a larger synergistic community.

The phrase “vehicle open telematics”’ indicates telemetry data transmitted between electronic control units both within and external to a vehicle. The dominant form of in-vehicle networking utilizes the controller area network (CAN). Telemetry data available on the CAN bus can also be transformed and transmitted over cellular networks, which has sprouted a rapidly growing industry for fleet and vehicle management. Since this aggregated telemetry data is of interest to researchers, the PIVOT project, through a collaboration with Geotab (a telematics service provider), will provide free access to high-level aggregated datasets.

The word “platform” in PIVOT means the project will build the infrastructure to support the needs of researchers. This infrastructure utilizes five pillars to realize the vision for PIVOT: (a) dedicated platform, (b) curated data, (c) user tools, (d) researcher services, and (e) community outreach and engagement. The incorporation of these aspects of the infrastructure creates complexity that will be managed through a disciplined systems engineering approach that utilizes community feedback mechanisms to continuously improve the PIVOT platform.

PIVOT will be built utilizing existing successful implementations. For example, access to Geotab’s raw telematics data will use the existing Spindle program where Geotab has supplied telematics devices toa mini fleet of volunteer researchers willing to share the data from their vehicles. Also, in-vehicle data collection efforts will be crowdsourced by providing effective open-source data collection devices (e.g., the CAN Logger 3 or a Raspberry Pi) to participants for community data collection efforts.

For PIVOT to be successful, not only will the data need to be collected, but it will need to be measurably useful for the research community. A searchable index of vehicle data and software-based tools will provide utilization insights for PIVOT resources. Community outreach and engagement effort will elicit actionable and measurable feedback to utilize as inputs for requirements utilized in system development.

Keywords: CAN bus data; vehicle telematics data; vehicle cybersecurity; intelligent transportation; smart cities and communities

Intellectual Merit:

The PIVOT system contains five pillars of merit: (a) robust and reliable hardware/software platform upon which the system runs, (b) the curation and sharing of the data and contextual information, (c) researcher-centric services for sharing, securing, and evaluating datasets, (d) common software-based tooling to collect, transform, combine, filter, and visualize the data, and (e) extensive community outreach and engagement to improve the data utility using design feedback mechanisms. These pillars focus on satisfying the needs of CISE researchers consuming and producing vehicle data as they pursue research in fields from cybersecurity, intelligent transportation, automation, and smart and connected cities. The community will benefit from access to new, hard-to-get CAN and telematics datasets, new tools and tool add-ons to enhance researcher capabilities, and telematics from millions of vehicles through our commercial collaborator. The project will also strengthen the community by providing a forum to exchange ideas and resources, and help researchers form and expand collaboration teams.

Broader Impacts:

Successful execution of this project will result in new datasets and tools available to the CISE community that will enable new, innovative research in automotive and transportation-related areas, and strengthen the research community through collaborations built around common datasets, toolsand industry collaborations. PIVOT will provide artifacts to educate the next generation of automotive cyber engineers through classes in computer science (networking, security, machine learning, digital forensics) as well as classes in transportation and smart and connected communities. The project will emphasize diversity through efforts targeting minority institutions and underrepresented groups and by reaching outto students participating in the industry sponsored CyberAuto and CyberTruck Challenge events. Core concepts in PIVOT came from the results of an initial community workshop. PIVOT will continue with annualworkshops to build and enhance community and support strong advances in automotive security, smart transportation, smart cities and communities, security, safety, privacy, sustainability, and energy.

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