Analysis of the Information Content in Aggregated Driving Data

Relevance to the Automotive Industry:	The increasing ability to collect operational data of real customers on public roads offers a huge potential to optimize vehicle design based on actual user behavior. At the same time, it is important to protect customer privacy because broad customer acceptance of new technologies is essential for the effective use of this big data. Besides using encryption to protect customer privacy, it is desirable to first aggregate the data before it is processed. Such aggregation will help remove individual customer-specific data, while keeping the technically relevant information that is necessary for vehicle design optimization.
Research Location:	TUD Institute for Mechatronic Systems (IMS)
Homepage (Engl.):	http://www.ims.tu-darmstadt.de
Faculty Mentor:	Prof. Dr.-Ing. S. Rinderknecht
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Project Description: Jun 06 - Aug 11, 2017 (10 weeks, 40 h/week)	The Institute for Mechatronic Systems (IMS) is concerned with research on the flexible synthesis of representative load cycles from aggregated data. Higher degrees of aggregation can protect customer privacy, but will also reduce the quality of the synthesized cycles. The aim of this NSF REU project is to analyze this tradeoff using predefined driving cycles. With different forms of aggregation for these cycles, the outputs of the synthetization process will be evaluated with regards to specified parameters (such as the specific acceleration energy), and be categorized according to their error. The NSF REU student will explore the possibility of using additional information, such as frequency content, to improve predictions under high degrees of aggregation. **PHASE A** (2-3 weeks): During this introduction phase, the student will review relevant research and investigate existing software. **PHASE B** (3 weeks): Next, the student will develop characteristic values that can be used to categorize the synthesized driving cycles. Using these values, the information content of different aggregations will be analyzed and evaluated. **PHASE C** (3 weeks): Next, the use of additional information to improve predictions under high degrees of aggregation will be investigated. **PHASE D** (1-2 weeks): Finally, the NSF REU student will document the research performed, prepare a written report to support subsequent publications, and deliver an end-of-summer presentation on the research performed.
Target publications:	• 2018 IEEE 87th Vehicular Technology Conference
Necessary Skills/ Knowledge:	• Experience with Matlab
Desirable Skills/ Knowledge:	
Additional Online Resource(s):	

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.