Department of Industrial Systems Engineering & Management, NUS, Singapore

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Sequential Test Planning for Polymer Composites

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Abstract: Polymer composite materials are widely used in areas such as aerospace and alternative energy industries, due to their lightweight and comparable levels of strength and endurance. To ensure that the material can last long enough in the field, accelerated cyclic fatigue tests are commonly used to collect data and then make predictions for the field performance. Thus, a good testing strategy is desirable for evaluating the property of polymer composites. While there has been a lot of development in optimum test planning, most of the methods assume that the true parameter values are known (i.e., the true values are used as the planning values). However, in reality, the true model parameters may depart from the planning values. In this paper, we propose a sequential strategy for test planning, and use a Bayesian framework for the sequential model updating. We also use extensive simulations to evaluate the properties of the proposed sequential test planning strategy. Finally, we compare the proposed method to traditional optimum designs. Our results show that the proposed strategy is more robust and efficient, as compared to the optimum designs, when true values of parameters are unknown.

Biography: Yili Hong received a BS in statistics in 2004 from University of Science and Technology of China. He received his MS in statistics in 2005 and PhD in statistics in 2009 from Iowa State University. He is currently an Associate Professor in the Department of Statistics at Virginia Tech. His research mainly focuses on statistical reliability. Areas include lifetime data analysis, field failure prediction, accelerated life test planning and analysis, accelerated degradation test planning and data analysis, system health monitoring, and applications in engineering, chemistry and material sciences. His research has been published in top journals such as Technometrics, JQT, Annals of Applied Statistics, JASA, IEEE Transactions on Reliability, and Quality Engineering. He is one of the recipients of the 2011 DuPont Young Professor Award. He is an associate editor for Technometrics and JQT. He is a co-guest editor for a special issue on big data in reliability for JQT. He is an elected member of International Statistical Institute.

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