



Mean Residual Life-based Replacement in Multi-Unit Systems

Won Young Yun

Department of Industrial Engineering, Pusan National University, Busan, South Korea

Abstract: In this talk, we deal with a preventive replacement problem for multi-unit systems. First, we assume that the units in systems are identical, and the failures of units are independent and follow an exponential distribution. Secondly, it is assumed that the replacement time is negligible, the fixed and variable costs to replace failed units are included, and the expected cost rate is used as an optimization criterion.

We propose a preventive replacement policy based on the mean residual life of the system. If the system is failed before the mean residual life of the system is greater than the specified threshold (the decision variable), then the system is replaced correctively. Otherwise, the system is replaced preventively when the mean residual life of the system is less than the threshold. A procedure to obtain the expected cost rate is developed and an algorithm to find the optimal threshold of the mean residual life is also proposed under some well-known system structures in reliability.

Numerical examples are studied to know the effects of model parameters on the optimal solutions in various system structures. The optimality of the policy proposed is investigated by some machine learning techniques approximately in cases of discrete failure distributions. For further studies, we analyze preventive replacement policies for extended failure and cost models and promising optimization problems.

Keywords: Multi-unit systems, Preventive replacement, Mean residual life, Expected cost rate, Machine learning

Biography: Won Young Yun is a Professor in Department of Industrial Engineering, Pusan National University, Korea. He received his B.S. degree in Industrial Engineering from Seoul National University, Korea, in 1982 and his M.S. and Ph. D. degrees in Industrial Engineering from KAIST, Korea, in 1984 and 1988, respectively. His current research interest includes maintenance optimization of complex systems, machine learning applications in reliability and maintenance. He has published his papers in international journals of reliability and operations research, for example, IEEE Transactions on Reliability, Reliability and System Safety, IIE Transactions, International Journal of Production Economics, etc.