

A Multi-Release Software Reliability Growth Models Incorporating Imperfect Debugging and Change-Point under the Simulated Testing Environment and Software Release Time

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Abstract : The testing process of the software during the software development time is a crucial step as it makes the software more efficient and dependable. To estimate software's reliability through the mean value function, many software reliability growth models (SRGMs) were developed under the assumption that operating and testing environments are the same. Practically, it is not true because when the software works in a natural field environment, the reliability of the software differs. This article discussed an SRGM comprising change-point and imperfect debugging in a simulated testing environment. Later on, we extended it in a multi-release direction. Initially, the software was released to the market with few features. According to the market's demand, the software company upgraded the current version by adding new features as time passed. Therefore, we have proposed a generalized multi-release SRGM where change-point and imperfect debugging concepts have been addressed in a simulated testing environment. The failure-increasing rate concept has been adopted to determine the change point for each software release. Based on nine goodness-of-fit criteria, the proposed model is validated on two real datasets. The results demonstrate that the proposed model fits the datasets better. We have also discussed the optimal release time of the software through a cost model by assuming that the testing and debugging costs are time-dependent.

Keywords : software reliability growth models, non-homogeneous Poisson process, multi-release software, mean value function, change-point, environmental factors

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