

相关系数对软件可靠性验证测试的影响分析

马振宇¹, 吴纬², 张威¹, 刘福胜¹, 韩坤²

(¹ 装甲兵工程学院, 北京 100072; ² 北京特种车辆研究所, 北京 100072)

摘要: 针对在软件可靠性验证测试过程中传统贝叶斯方法存在着不区分历史信息与试验信息的问题, 提出了基于混合贝叶斯软件可靠性验证测试方案. 引入相关系数概念, 分别通过主观定量法、拟合优度法、Kullback 信息量法、Spearman 相关系数法以及 Kendall 相关系数法确定混合贝塔分布中的相关系数. 最后通过实验分析, 证明了这 5 种计算相关系数方法的可行性, 并且同时证明了区分历史信息和试验信息, 会对软件可靠性验证测试的可接收质量水平产生影响.

关键词: 混和贝叶斯; 相关系数; 软件可靠性; 可靠性验证测试

Analysis of Correlation Coefficient Influence on Software Reliability Demonstration Testing

MA Zhen-Yu¹, WU Wei², ZHANG Wei¹, LIU Fu-sheng¹, HAN Kun²

(¹ Academy of Armored Force Engineering, Beijing 100072, China;

² Institute of Special Vehicle, Beijing 100072, China)

Abstract: In the process of software reliability demonstration testing there is a problem that traditional Bayesian method did not distinguish between historical information and experimental information. A hybrid Bayesian software reliability demonstration testing scheme is proposed. By introducing the concept of correlation coefficient, the correlation coefficients in hybrid Beta distribution are determined by subjective quantitative method, goodness of fit method, Kullback information method, Spearman correlation coefficient method and Kendall correlation coefficient method respectively. Finally, through experimental analysis, prove the feasibility of the 5 kinds of calculation method of correlation coefficient, and prove that differentiating the historical information and experimental information impacts acceptable quality level of software reliability demonstration testing.

Key words: hybrid Bayesian; correlation coefficient; software reliability; reliability demonstration testing

作者简介:

马振宇男, (1991-), 博士研究生. 研究方向为软件可靠性、可靠性验证测试、软件测试. E-mail: 625181316@qq.com.

吴纬男, (1963-), 博士, 高级工程师. 研究方向为装备全寿命、可靠性增长.

张威男, (1968-), 博士, 教授. 研究方向为软件工程、软件测试、军用软件保障.

刘福胜男, (1975-), 博士, 副教授. 研究方向为装备保障.

韩坤男, (1985-), 博士, 工程师. 研究方向为软件可靠性、可靠性测试.