ABSTRACT

Software reliability is one of the important parameters of software quality and system dependability. It is defined as the probability of failure-free software operation in a specified environment for a specified period of time. Its means that the probability that given software operates failure free for a specified time on the machine for which it was designed, given that it was within design limits and that the last failure occurred at a given time. A software failure occurs when the behaviour of the software departs from its specifications, and it is the result of a software fault, a design defect, being activated by certain input to the code during its execution.

Chapter 1 is an introductory part of thesis, which describes some fundamental aspects of Software Reliability Growth Model, Non-Homogenous Poisson Process including important parametric models and statistical models, cost criteria and release policy.

Chapter 2 presents a brief of development of research work in Software Reliability Growth Models (SRGMs) in chronological order. Twenty eight landmark research contributions have been selected for giving a thorough insight into the SRGMs designs problems and solutions, which
covered almost entire spectrum of the software reliability growth models.

Chapters 3 deals with software reliability growth models with a Pareto-testing effort. In this testing, the error detection phenomenon is modelled by Non-Homogenous Poisson Process. It is assumed that the error detection rate to the amount of testing effort spent during the testing phase is proportional to the current error content. For the model, the software reliability measures and estimation methods of parameters are investigated. Here we show that Pareto-testing effort function can be expressed as a software test effort curve. Using the model, the method of data analysis for the software reliability measurement with actual software data is developed. Also tables, figures and conclusion are given at the end of this chapter.

Chapter 4 develops a software reliability growth model based on the Non-Homogenous Poisson Process incorporating the amount of test-effort expenditures during the software testing phase. The time dependent behavior of test-effort expenditures is described by a Burr Type III curve and parameters involved in SRGM are estimated by least square estimation and maximum likelihood estimation methods. SRGMs proposed by most researchers incorporate the effect of testing effort in the software reliability growth and the software development effort can
be described by the traditional Rayleigh, Weibull or Exponential curve. However, in much software testing environment it is difficult to describe the testing-effort function by the above three consumption curves. Here, we will show that a Burr type III testing-effort function can be expressed as a software development/test effort curve. Experiments have been performed based on real test/debug data set. The results show that the SRGMs with a Burr type III testing-effort function can estimate the number of initial faults better than previous approach. Comparative studies are also performed to see the fitness our model with other models studied previously and conclude that Burr Type-III performs better. Also tables, figures and conclusion are given at end of chapter.

Chapter 5 presents a realistic software reliability growth process. The software reliability assessment measure and the estimation methods of parameters are investigated. The software reliability assessment is discussed. We know that actual test effort data expresses various consumption pattern, sometimes the test effort consumption are difficult to describe only by Exponential, Weibull, Pareto, Burr type III & Logistic curve. Therefore, we try to incorporate a Burr type X test effort function instead of above consumption functions as the test effort function during the software development process. Computational results are performed
using three actual data sets. Comparative studies that Burr Type-X
distribution fit the data better as compared to previous studies. In addition
software release policy based on reliability criteria using three actual
software data sets area also discussed.