ABSTRACT

Software reliability is the probability that the software will not cause the failure of a system for a specified time under specified conditions. Software reliability is also an important factor affecting system reliability. Statistical methods applied during software test can estimate/forecast reliability. The modeling technique for software reliability is reaching its prosperity, but before using the technique, we must carefully select the appropriate model that can best suit our case.

The Gompertz model is widely used in demography and in various branches of science. Initially, the model was developed by Gompertz to describe age patterns of mortality. Overtime, researchers have started using it as a growth model. Demographers found mixed results in the fit of the Gompertz model to empirical fertility schedules. Later Gompertz fertility model is used to get a better fit for a given empirical fertility schedule by relating it to an appropriate standard fertility schedule. Many software reliability growth models with practical applications have been proposed and analysed by number of researchers.

The Gompertz curve model is one of the simplest S-shaped software reliability growth model applied by Japanese computer manufacturers. The Gompertz curve model gave good approximations to cumulative number of software faults observed in testing software for a
switching system. Three procedures can be used to estimate the parameters of the Gompertz curve model; a method of Maximum likelihood, a non-linear least squares estimation, and an ordinary least squares estimation.

This work is focused on a Non Homogenous Poisson software reliability model called Gompertz model to predict the reliability of the software. It is shown that the proposed model can be derived from the well-known statistical theory of extreme value and has the quite similar property to the classical Gompertz curve. We apply the Gompertz software reliability model to assess the software reliability and to predict the number of initial fault contents.

In this work, the issue of parameter estimation problem for the software reliability modeling framework is addressed. A relationship function among model parameters and the reliability prediction using the Gompertz model framework is proposed.

In the literature, there was no method seen to estimate the parameter in Gompertz reliability model. Most of the works concentrated on the estimation of parameter using Maximum likelihood or Least Mean Square estimation with only number of failure and time interval as input data. The reliability prediction has been calculated using various models like Okumot model, Yamadha model and so on. None of the work has been done on the specified parameter estimation method with Gompertz model.
The main aim of this work is to propose an improved method for estimation of parameters in Gompertz software reliability model. As the parameters used in this model are unknown, it is estimated by using an alternative approach of Least Mean Square estimation method. To effectively use the reliability models and defect data during software testing process we propose to additionally apply the strategy called number of test cases for the particular module so that the number of defects are considered with respect to number of test cases. We consider the number of failures, time interval and number of test cases for the specified module as the input data. We expect that the predicting capability of Gompertz model with proposed approach of parameter estimation would bring out the efficiency of this model over other models. We empirically conclude that this new parameter estimation approach may function better than the existing methods and is attractive in terms of goodness of fit test based on information criteria and mean square error.

Software undergoes several stages of testing before it is put into operation. In every stage of testing, modification and correction are made with the hope of increasing reliability. All existing software reliability models are developed for the software products that are statically constructed normally by a company or institution that has the full control of the development process. The evolitional shift from the product-oriented software architecture to the Service Oriented Architecture (SOA) and Web Services (WS) invalids many techniques developed for traditional software.
Hence in this work web based application is considered with alternative approach for parameter estimation in Gompertz software reliability mode.

The proposed parameter estimation method is applied on two parameter models such as G-O model and Delayed S-shaped model and compared the result with existing LMS parameter estimation method. The implementation is done on 50 real time projects which are collected from heterogeneous group of companies by using dot Net. We observed that the modified approach of parameter estimation in Gompertz model accurately predict the reliability of the software. In this work we have also made a comparative study of existing methods of parameter estimation with proposed method, also made a comparative study with other two software reliability models and analyzed goodness of fit for the proposed method.