

## **Homework #5**

**CSE 565: Software Verification/ Validation/ Test**

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**Submitted By:**

**Madhu Meghana Talasila (1207740881)**

## **1. Compare M-SRAT and FRESTIMATE**

**M-SRAT** known as Metric based Software Reliability Assessment Tool is a software reliability assessment tool, used to estimate the software reliability models, how good tests are and prediction of performance in the testing phase by taking testing metrics as inputs. This supports Graphical User Interface and provides output as graphs for usability.

**FRESTIMATE** is a prediction tool which can automate predictive models and reliability growth models. For early sensitivity analysis and planning predictive models are useful, where as to determine when to stop testing growth models are useful. This tool is used in three different phases of product development. 1. Early development prediction 2. Systems testing estimation and 3. Operational measurement.

**1.1 Inputs for M-SRAT and FRESTIMATE:** Inputs to the M-SRAT tool are “several testing metrics data as well as software fault data observed in the testing phase” [1]. Frestimate takes series of inputs depending on which phase user is in development life cycle. For early development prediction user needs to complete questionnaire which can have 15 – 80 questions, surveys (also can import surveys), size, Growth rate, Growth period, Duty cycle, impact on availability, Objectives and all general inputs. Other inputs to Frestimate tool are “actual executable lines of code from previous version” [2], Complexity (Which is used to find code that requires more attention), “depth of nesting” [2] and “percentage and number of comment statements” [2].

**1.2 Outputs for M-SRAT and FRESTIMATE:** Outputs of the M-SRAT are “parameter estimation of software reliability models via maximum likelihood method” [1], under several optimization criteria goodness-of-fit test and in “assessment of quantitative software reliability and prediction performance” [1]. Frestimate displays results, profiles and trends. Frestimate also predicts software defects after deployment and during testing, also predicts how much of testing effort is required to meet the objective and also includes software predicted and critical failure rate, availability and reliability [3].

**1.3 Assumptions for M-SRAT and FRESTIMATE:** M-SRAT is based on the assumption that “number of testing metrics used for analysis is 5 or 6” [1]. Frestimate is based on the assumption that “process in the assessed project is compatible with the projects already in the knowledge base” [2].

## **2. For each of the assumptions explain how reasonable the assumption is**

M-SRAT assumes that number of testing metric required for analysis is 5 or 6. This assumption is quite reasonable because “Nelder-Mead simplex method” algorithm despite of its computation efficiency it does not guarantee global convergence property. Also, as the number of testing metrics extremely increases, estimating parameters will become difficult from the real time computation view. Moreover less number might affect the predictability. So I believe it is reasonable to have limited number of testing metrics for analysis. Always there will be tradeoff between computational efficiency and accuracy. To balance both of them limiting the number of metric is a good choice.

Frestimate assumes that knowledge base that is compatible to the process in the assessed project is required. I believe this is reasonable assumption, as without proper test data, it is always difficult for a predicting algorithm to generate accurate results. In Frestimate if input questionnaire is not answered completely, the unanswered questions are given default value of 0 and there by reduces the prediction efficiency. Therefore I think constructing the tool with an assumption that relative knowledge base will be available is valid.

## **3. How early in the development cycle can each tool be used?**

M-SRAT can be used in testing phase as it takes input testing metric and gives relative predictions. It depends on how early testing is required in the project. For Test driven development M-SRAT can used in the early phases where as in water fall model it used in after tool development. Frestimate predictive models “can be used in the concept phase or proposal phase” [2]. Frestimate growth models can be used after integration [2].

## **References**

1. <http://www.ijpe-online.com/attachments/article/889/pp.369-379-Paper-7-IJPE-594.14--p.11.pdf>
2. [http://www.softrel.com/1About\\_Frestimate.html](http://www.softrel.com/1About_Frestimate.html)
3. D.-Ing, Nikola Milanovic, Models, Methods and Tools for Availability Assessment of IT-Services and Business Processes, Berlin, 2010, D 83 <urn:nbn:de:kobv:83-opus-26787>