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Application of Fuzzy Logic in Early Stage Software Reliability Prediction

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Today, the influence of information technology has been spreading exponentially, from high level research going on in top labs of the world to the home appliances. Such a huge demand is compelling developers to develop more software to meet the user expectations. As a result reliability has come up as a critical quality factor that cannot be compromised. Generally in the early phases of software development, failure data is not available, and to quantify or predict the reliability researchers used to rely on software metrics. As most of the early stage software metrics are subjective in nature, incomprehensible and based on expert opinions. Because of it researchers have been relying on Fuzzy Techniques to capture and process subjective values of early stage metrics. With this spirit, authors of the paper have proposed a highly structured framework that guides the process of quantifying software reliability, before the coding of the software start. Before proposing the framework, to realize its need and significance, the paper has presented the state-of-the-art on software reliability quantification. Besides this the paper also justifies fuzzy logic as a better alternative to formal methods in early stages of software development lifecycle.

Keywords : Fuzzy Logic, Reliability Quantification Framework, Software Defects, Software Metrics, Software Reliability.

1. INTRODUCTION

The role of software has been increasing in our life day by day. Earlier it was limited to desktops only, but now has reached to the devices that can easily accommodate in our pockets. Nobody can think about a life without the devices controlled by software [1]. Such dependence as well as trust on software compels the software industry to be more conscious and attentive while developing software, so that delivered software became successful in their operational life [2]. On the other hand, it has also been noticed that, in industry most of the development activity is carried out in labor-intensive manner [3]. System developers are also struggling to deliver software with acceptable level of quality, within given resources and time. Such a pressure on the software professionals cannot be ignored as one of the key factor for software whose reliability is not up to mark [4].

A lot of unfortunate events had already occurred in the defense and health sectors due to the unreliability of corresponding software applications [5]. After realizing reliability as one the key quality attribute, its prediction cannot be delayed or ignored. Therefore, there is an emergent need to ensure reliability of developing software as early as possible. So that developers can take suitable corrective measure before they start writing the actual code. In the last two decades, a significant number of models for predicting the reliability have been proposed. But still, this domain of software engineering has been attracting more researchers to contribute further. It is evident from the review of the literature that reliability has been

9. Beside this, as far as further research is concern, the framework may open fresh avenues for the researchers, doing research on reliability estimation.

8. CONCLUSIONS

In this paper, authors have presented the application of fuzzy logic in early stage software reliability prediction. The paper describes various categories of reliability prediction models followed by an overview of fuzzy inference system. The study has also justifies fuzzy logic as a better alternative for formal methods in early stage of development lifecycle. Further, authors has highlighted the weaknesses of earlier software reliability prediction efforts, and subsequently proposed a structured framework that may overcome the inadequacies of earlier studies and quantifies the reliability, on the basis of the requirement and design phase measures, before the coding starts. Salient characteristics of the framework have also listed just before this section.

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