ABSTRACT

Success in software development is measured by the quality of the product delivered to the customer. Requirements engineering is a critical phase for the success of a project since this phase ensures that the software system reflects the customer needs. The requirements engineering phase focuses on deciding precisely what to build and this is the most difficult part of building a software system. The objective of the requirements engineering phase is to obtain a complete and clear software requirements specification (SRS), which captures the user's intent. However, if the requirements engineering process fails to generate quality requirements, the potential impact is substantial. Errors committed during the requirements phase often remain latent and are not detected until well after the stage in which they are made. The later in the development life cycle that a software error is detected, the more expensive it is to repair.

At first is an overview of requirements engineering with reference to various SDLC models and the scope and dimensions of Requirements Engineering. Over the past few years the real importance of requirements engineering has surfaced. Hence, much research is now being directed towards generating quality requirements. This section describes the necessity for research in the requirements engineering field. The importance and roles of requirements engineering and how it was recognized as a vital part in the software development process is discussed. The problems faced in requirements engineering and present current approaches to addressing them is then examined.

The next chapter gives an overview of Fuzzy Logic. Fuzzy Logic has long been used to trade-off and prioritize between conflicting, imprecise requirements. Although the fuzzy inference system has a structured knowledge representation in the form of fuzzy if then rules, it lacks the adaptability to deal with changing external environments. Hence, neural network learning concepts in fuzzy inference systems are incorporated resulting in neuro-fuzzy modeling. Fuzzy neural networks and neural fuzzy systems are powerful techniques for various computational and control applications. Artificial neural network is a computational modal designed to operate like the biological nervous system.

This is a novel approach for analyzing customer requirements and projecting them into the design, engineering and product attributes in order to guide downstream software development activities.

The proposed system incorporates the principles of fuzzy set theory to tackle the complex problems encountered in customer requirement management. It offers an intelligent method for decoding and prioritizing the vague and imprecise Voice of Customer. As a result, the appropriate product features can be mapped to their relevant requirements.

The human brain interprets imprecise and incomplete sensory information provided by perceptive organs. Fuzzy set theory provides a systematic calculus to deal with such information linguistically, and it performs numerical computation by using linguistic labels stipulated by membership functions. A selection of fuzzy if then rules forms the key component of a fuzzy information system that effectively model human expertise in specific applications.

Some of the recent developments in the area of a fuzzy approach to requirement analysis are reviewed. Some of the relevant basic concepts are given and a brief historical development of the subject matter is sketched.

The suggested Fuzzy method is validated by applying it to a problem in Environmental Pollution using two processes from Fuzzy Theory. In recent years, a limited numbers of studies have analyzed the seasonal variation in surface ozone and its precursors in urban areas across India. To the best of the author's knowledge, no measurements have been carried out over Chennai metropolitan area. In summer months, O_3 pollution is a concern because strong sunlight and hot weather results in harmful O_3 concentrations in the air. Hence, the surface O_3 concentration was observed at five different sites during summer 2005 in Chennai. The experimental data from these studies are taken to illustrate this approach to Requirements Analysis.

Digital Logic works on the basis of known and discovered formulae. So all new thinking has to be clouded by previous knowledge. Fuzzy Logic works on real world data acquired by sensors, actual interactions and rules formulated by involuntary behavior of the various experts. Traditional methods of requirements engineering have not been able to really capture the elasticity and all the information contained in requirements as expressed by clients who are domain experienced or even experts. The system analyst, which traditionally; is the first interface of requirements capture, recognizes the requirements from his perspective of possible computer aided solutions. From their digital background the decisions normally are to ignore or workaround requirements that seem imprecise or conflicting. A lot of information contained in the informal human communication is lost. Herein a novel process using Fuzzy Approximation Theorem is described. The current

methodology and why it has not been able to represent the information contained in the inexact, imprecise and conflicting human language of the client or domain expert is discussed. The problems faced in requirements engineering in Pollution (Ozone) forecasting and present a process using Fuzzy logic are then examined.

Neural net based adaptive systems for requirement analysis is the process used. Fuzzy systems can be dumb or smart. It depends on the fuzzy rules. The goal is to take our brains out of the loop and give fuzzy systems their own brains, their own way to grow their rules. We look at this new frontier of adaptive or learning fuzzy systems. We start with finding rules in data clouds in graphical representations and end with a new tool to help predict pollution patterns. In the experiments all data are taken from actual real life studies in the particular area concerned for a long period of time, even the other factors in nature which affect the pollutant; known and unknown are also affected in the readings and hence can be taken as accounted for.

In the normal digital methods, one first tries to devise a mathematical model and get to a formula relating the input-to-output. This further to being a complicated study with mathematical modeling, will need a very high order of mathematical resource as also very large computing resources. With time as more and more natural phenomena are considered relevant, they are studied and added to the mathematical model. This is a never ending process leading to much higher orders of formulae and definitely drop in reliability. Each of the SDLC processes have their own particular uses. The suggested method can be adopted at the Requirements Engineering phase of any of the standard processes adopted.