

Software Effort Estimation Using Fuzzy Approach

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ABSTRACT- From the very beginning COCOMO model was used for estimation process, at that era fuzzy logic or perhaps artificial intelligence wasn't grounded into solid. In present scenario projects are very large and are generally globally distributed as well as in software improvement, software effort estimation is one of the crucial steps particularly for offshore projects. The principle aim of this paper is always to emphasize all the uncertainties that had been faced in earlier time, but by means of fuzzy logic precision of estimation was improved. Fuzzy-logic technique primarily based software effort estimation models will be more reliable and agreeable, especially for significant and complex initiatives

Keywords- Effort Estimation, Fuzzy logic, Constructive Cost model (COCOMO), Fuzzification, Dfuzzyfication.

I. INTRODUCTION

Inside software development things to do software effort estimation is probably the critical step. Effort estimation includes all sorts of effort required in the act of development and owning a project. Due towards the worldwide development every industry demands high quality project within appropriate time and inside accurate budget. This globalization has triggered high competition between software industries. And so, estimation of task has become one of the most important tasks inside software development course of action. Due to different issues in computer software development global computer software estimates are wrong, which leads to your great loss.

.Estimation of software sometime causes overestimation or underestimation. In both the cases estimation carried out is inaccurate, so industries have grown more determined in calculating accurate computer software estimation. This ensures that software cost estimation is often a complex job. Estimation models may be introduced for dealing with such problems, it is available in three categories [8] [9]: - algorithmic model consisting of COCOMO model, perform points etc., non-algorithmic style expert and machine learning. Number of estimation models may be developed but none has proved effective. By this document, I have dedicated to the fuzzy- logic model useful for estimation process, which provides much more accurate and sensitive results as compared with other estimation style. Fuzzy logic centered COCOMO model are highly made for software effort estimation specially when there are uncertain or vague data. Fuzzy logic will come under machine studying estimation model. Some researchers used fuzzy approach regarding estimation process possesses compared with

additional approach. In all the particular cases fuzzy reasoning has proved very adaptive with respect to inputs and outputs generated.

Hence, summarizing introduction we can say that estimation of time and cost is one of the critical step in software project management. By utilizing the advantage of fuzzy logic and fuzzy sets produces more accurate software estimates.

A. Software Effort Estimation

Software program effort estimation is among the most important actions in software undertaking management. Software work estimation comes beneath project planning. It's impossible to calculate accurate effort, and there is absolutely no specific mathematical formulation to compute precise time and cost with the software project.

Software estimation includes volume of different other [10][11] opinion first is size estimation which is first effective opinion. This is performed by knowing the size of similar projects performed before or by means of calculating through algorithmic method. Second is effort estimation which is done by transforming estimated size directly into effort. Size is become effort either making use of similar data involving previous project or by employing algorithmic approach (e. h. COCOMO model). Third estimation move is estimating timetable once effort has been calculated. This estimation decides that after the project will start and will be completed, how many members are going to be working on in which projects etc. another estimation is the cost estimation. This calculates the costs (e. h. hardware cost, computer software cost, resources price, communication cost, traveling cost etc.) dedicated to the project.

II. FUZZY LOGIC

Lotif Zadeh involving university of Colorado developed fuzzy judgement in 1965 for the people problems where data cant be found exact i. age. imprecise and hazy. This is one of several important reasons involving using fuzzy judgement for software evaluation. [12] Fuzzy logic doesn't require learning algorithm as in the case of neural network, so less is needed in fuzzy community. So, we can point out that using fuzzy logic is usually a far better compared to neural network. Fuzzy logic can be quite popular and successful, and are also used for all consumer items especially in Japan.

[13] It shows various products as well as their functions that have been developed using fuzzy logic. Some examples are

camcorder which adjusts super and focus, microwave stove adjusts the heating power while cooking, refrigerator helps within cooling, auto serp, chemical mixer, air conditioning unit, dish washer for example. The fuzzy devices implemented has lot of advantages as software implementation can be quite easy, CPU used for fuzzy systems have high speed, fuzzy logic microcode are easy in encoding, software implementation costs can also be low etc.

Fuzzy logic account functions include those people functions that relates to the member involving objects. Fuzzy logic allocates various to each item which defines their education to which the article relates to the class of physical objects or not. the actual membership function involving fuzzy logic may possibly be triangular, parabolic, trapezoidal for example.

III. ESTIMATION USING FUZZY TECHNIQUES

Table 1. Various techniques of fuzzy for software effort estimation

Fuzzy Techniques	Description
Fuzzy techniques with intermediate COCOMO model [1]	Using fuzzy techniques the cost drivers of COCOMO model belongs to a class. The class is determined from the six linguistic values of intermediate COCOMO mode which are very low, low, nominal, high, and very high. After that evaluation is done based on the formula.
Estimation using triangular fuzzy number [3]	Cost estimation is done based on various criteria using fuzzy logic. Different criteria used are VAF (variance accounted for), mean absolute error and mean relative error, variance absolute relative error and prediction [3].
Estimation using Gaussian membership function [15]	Data cost drivers are determined to any of the linguistic values using fuzzy Gaussian membership function. COCOMO model was evaluated using membership function on different criteria.
FL-COCOMO II model [16] using polynomial regression and Firing interval	FL-COCOMO II is based on FL and COCOMO II which includes three membership functions. Membership function includes effort multiplier, scale factor and size KLOC. Fuzzification is done using FIS and then output is converted into crisp output using defuzzification process.
Fuzzy techniques with COCOMO II model [17]	The input attributes to COCOMO II are size KLOC, scale factor and effort multiplier. Crisp data are applied as inputs for Fuzzification process and fuzzy variables are produced as output.

Defuzzification process is applied in the end to convert the data back to crisp data as final output.

IV. RELATED WORK

Various researchers do using decision tree, genetic algorithm, manufactured intelligence, neural community etc. for processing software effort appraisal.

The paper proposed by Ali Idri as well as Alain Abran [1], defines an boosted COCOMO model along with it with fuzzy logic. The results obtained by intermediate COCOMO style [2] was not the same as intermediate COCOMO using fuzzy logic which usually produces better benefits and better accuracy when compared with intermediate COCOMO style. Using fuzzy using COCOMO gives a lot more accurate result (cost) which is eventually less sensitive towards the changes in inputs thus increases the exactness.

The paper proposed by Harish Mittal as well as Pradeep Bhatia [3], has proposed 2 new software work estimation models based on fuzzy logic. By adjusting charge drivers results was optimized thus these two models may be used with any some other software effort appraisal model.

The Cardstock by Zhiwei Xu as well as Taghi. M. Khoshgoftaar [4], has evaluated COCOMO style (all the three) next to fuzzy identification also it was concluded that will fuzzy provides better optimized results. It is pointed out that fuzzy versions for software effort estimation tend to be suitable for realtime software for the expert knowledge as well as membership functions.

Cardstock by Andreou as well as Papatheocharous [5], has used fuzzy decision tree way of evaluate software work estimation. Various jobs and their data records were analyzed using fuzzy selection tree. Hence it was concluded that fuzzy techniques increases exactness and fuzzy adaptability to inputs (cost drivers) results in a better appraisal method.

Paper proposed by Petr Musilek [6], possesses proposed a f-COCOMO style for calculating work estimation of task using fuzzy models. Inputs were also resulting from fuzzy sets as well as output was also generated, belonging to fuzzy sets. Experiments were executed using various regular membership functions (such since parabolic and triangular fuzzy sets).

Paper by employing fuzzy system, which gives a new boosted effort Martin [7], has defined a brand new method of price effort estimation appraisal model.

Paper by means of Ziauddin and Shahid Kamal [17] possesses proposed fuzzy logic and fuzzy suggestions parameters using COCOMO II style. Which consist involving three important methods Fuzzification, evaluation as well as Dfuzzyfication. It delivers better accuracy as well as fast computation.

The particular paper proposed by means of Ravishankar and R. Lata a FL-COCOMO II model that will be based upon COCOMO II as well as fuzzy logic. This model ended up being more reliable to estimation techniques when compared with any other methods.

V. ESTIMATION CRITERIA

Mostly Software cost estimation using fuzzy logic is done by using membership function. Membership functions defines the class to which the cost drivers belong. COCOMO I model or COCOMO II model is used to determine the cost drivers. COCOMO I [17] is the traditional model that does not satisfy the current industrial environment. It is a stable model. COCOMO II model includes number of input attributes (cost drivers) which is compatible to the current scenario. When fuzzy logic is applied to COCOMO model it basically includes three important steps: Fuzzification, evaluation based on estimation criteria and defuzzification. Crisp data are inputted in the Fuzzification process which gives fuzzy variables. Evaluations are done based on estimation criteria. At last defuzzification process is done to convert the data back to crisp data.

Estimation criteria used for software estimation assessment are [3]: Mean absolute relative error and mean relative error (%), VAF (variance accounted for), VAF (%), variance absolute relative error, and variance absolute relative error (%).

VI. CONCLUSION

Software cost estimation is one of the significant step in software project management. It is required to get the software effort estimation result in early phase of software development. There is lot of undefined or indefinite inputs in the estimation process which results in inaccurate estimation. Various other techniques and algorithms are used but is still a challenging task in industrial area. Fuzzy model was essentially developed for vague and imprecise data i.e. when less information about input variables are available. This feature of fuzzy logic makes it notable in software industries. Fuzzy logic serves in providing more reliable and sensitive estimation result even in case of imprecise data.

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