

REVIEW ON SOFTWARE COMPONENT SELECTION IN CBSE USING SOFT COMPUTING TECHNIQUES

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Abstract- Optimization of Software Component Selection which is considered intricate chore during Component Based Software Engineering is considered in this paper. Subset of components is supposed to be chosen in order to confirm whether components are gratifying the prerequisite of system where these components would be integrated during software selection. Selected components are supposed to be attuned and accommodating according to assumption of Engineer. Soft computing techniques for instance Genetic Algorithm, Neural-Network, Support Vector Machine, and Artificial Bee Colony are recurrently used to optimize the software component selection system. Presentation of PSO, ALO, MVO, ACO and Neuro fuzzy logic integrated module is made in this paper considering inadequacy of existing research and extent of incorporation of these techniques to soft computing mechanism in CBSE.

Index Terms- Component-based Software Engineering, Particle Swarm Optimization, ALO, MVO, Ant Colony Optimization, Neuro Fuzzy Logic, Optimization

I. INTRODUCTION

Software engineering can be understood as a process to develop various software projects with multiple categories. For this purpose, applications of computer engineering are used, but it is becoming a challenging task to predict the software system reliability. Component-based software engineering is mechanism that is capable to tackle the issue of reliability. Component-based software engineering is a broad approach that supports the building of various components based contemporary software researches. It is not easy for a beginner to develop new software but Component-Based Software Engineering (CBSE) allows him to minimize his efforts in developing of new software. In CBSE, different factors like reusability, dependency of component, and interaction between components are considerable. These factors help in developing new software and reduce the system complexity. There is different soft computing mechanism that has been utilized for predicting reliability of system. Selection of Component in Software is considerable step in component dependent software engineering patterns that is required to retrieve the components for adaptation and to assemble them. Previous researches on component based selection did limited discussion regarding attributes of a component. Revealing process of influencing factors that are affecting industry practitioners at the time of component selection is continued in this review paper. Optimized component dependent development of software is supposed to make selection of component easy in reusable software. In order to perform optimization PSO, MVO, ALO, ACO and several other optimization mechanisms are frequently used. In addition, this methodology efficiently decreases the development cost of software projects.

II. OPTIMIZATION MECHANISM

Various optimization mechanisms that could be used in component selection in CBSE explained in this section

2.1 PSO

It is meant for Particle Swarm Optimization that is an AI based computational technique. Now, it has become easy to optimize the problems that are nonlinear and multidimensional. This technique has strong union with evolutionary algorithms for example GA. It has been known as an evolutionary algorithm. It has a relation to category of swarm intelligence mechanisms. Such mechanisms have been affected from dynamical along with emergent social behavior. Such variant behaviors emerged within socially situated colonies such as behavior of fish during schooling or flocking of bird. It is chief advantage of this algorithm to perform fast convergence than other global optimization algorithms. Within this algorithm, each and every particle put effort to get best result. For this purpose, they updates their position and speed as per their past. Therefore, this search process is not a random process completely. Some influencing factors are there that effects to this process. First influencing factor is the best position visited by a particle on the base of its own best experience. Second influencing factor is position related to neighborhood best particle which stands for the social experience. Third influencing factor is its current velocity. In the situation where particle is considering complete population as neighbors, in such situation best value would be global best. This global best value is known as Gbest. On other case if a particle considers smaller group as its neighbors, best value has been considered as local best also known as Pbest. A

predefined fitness function is used to measure the performance of each particle.

2.2 Multi-verse optimizer (MVO)

MVO is a new type of invention that effective maximization method to get encouragement from environment. Mirjalili et al invented this by using three ideology of cosmology. MVO is based on multiverse theory that is depicting existence of more than one universe. In addition to this form, it also becomes famous in the new form of meta-heuristic optimization method and it is found faster as compare to other algorithms.

2.3 Antlion optimizer (ALO)

ALO is nature inspired and population-based mechanism and that is mimicing hunting behavior of antlions in nature. It also considered as swarm-based metaheuristic algorithm aiming at complex optimization problems. The new up gradations in ALO are influenced by PSO. Here modified position of ant lions in elitism operator of Ant lion optimizer has been enhanced.

2.4 ANT COLONY OPTIMIZATION (ACO)

Ant Colony Optimization has been known as adaptive metaheuristic optimization technique. In 1992, M. Dorigo proposes this optimization technique. This technique is influenced by the ants behavior naturally. Ants put an amount of pheromone over

their travelled paths when they searched food. The pheromone dissolves on path within a time that is spread by Ants. After a time, when other ants come to this path, they follow this path along with pheromone. The pheromone indicates them that other ants also select this path to search food. In addition to this, ants use the short paths in order to search source of food. ACO technique is efficiently used to solve different combinatorial optimization for example travelling salesman problem, vehicle routing, target assignment, multi-objective resource allocation, test data generation etc. There are different issues and challenges which can be solve with the use of this technique. It can be used to predict quality, reliability, applicability etc of software programs.

III. LITERATURE REVIEW

There are different techniques and modules which are presented to make component selection in CBSE. Existing Research are making use of different Soft computing techniques. These techniques are Genetic Algorithm, Support Vector Machine, Neural-Network, Fuzzy Logic, PSO, ACO, and Artificial Bee Colony, MVO. Some of researchers also considered the reliability, Quality, Complexity and Compatibility. A review of the existing researches is proposed here:

Table 1 Literature Review in Tabular Form

Author Name/Year	Objective	Technique used	Data set	Findings	Advantage	Limitation
M. H. A. Banu et al/2013	To study of software reusability in software components[11]	Hybrid genetic algorithm and fuzzy logic.	Modules consisting of classes and services are acting as dataset	Techniques saves maintenance time of Software. Approach has been found flexible.	This research work has provided a review of techniques which are used for Software Reusability.	It is not sufficient to propose review on techniques used for Software Reusability.
Dr. V. Subedha et al/2013	Developing software reuse metrics for qualification of component [12]	Experimental approach	Combination of metrics is taken as data set for classifying the components	Finding consists of Dynamic object (Matric library) where re-users can retrieve measures on time of reusability as per specification.	They predicted the quality of software components and also classified the components to reuse.	Only focus on Reusability of a software
C. Mueller et al/2014	Implementing MVO in architectures related to software [13]	ACO	Weakly dominate, non dominate, strongly dominate solutions are considered as dataset	Finding consists of searching the design space for optimal solutions	This work presented an ANN based optimization model.	Ignore the limitation of ANN technique.
C. Singh et al/2014	Predicting reusability of software CBS[14]	Mechanism for Soft computing	They considered values for Complexity and Maintainability. The adaptability and flexibility is also	Reusability of a component. Five values have been checked for inputs parameters at time of various	In this research work, soft computing based reusability	They did not consider other different influencing factors related to a software such

			considered.	membership functions	model is proposed.	as it length, complexity, compatibility etc
K. Tyagi et al/2014	Finding reliability of CBSS[15]	Adaptive neuro fuzzy mechanism	Data set consists of input factors namely, complexity, application component dependency, reusability, Operational profile.	ANFIS Model is providing accurate measurement of reliability as compare to FIS model	Researcher explained a neuro fuzzy model with its reliability.	They did not consider Quality, Reusability and Performance.
G. Kumar et al/2015	Estimating & optimizing quality with performance in CBSS[16]	Neuro-fuzzy mechanism	CK metric values to develop design patterns	Impact over reusability has been considered by modifying value of CK metric.	They estimated and optimized the quality and performance of CBSE.	Researchers have not considered the reusability factor.
S. Vodithala et al/2015	Dynamic approach for retrieval of using GA for CBSS [17]	Genetic algorithm	Dataset of the keyword search	GA restricts evolution, reaches convergence in several cases.	They used genetic algorithm to retrieve the software component.	This research work is not sufficient. It is required to make more research in this field.
D. Gao et al/ 2015	Test Case Prioritization during Regression Testing [18]	ACO	TEST CASES, FAULTS DETECTED AND ITS EXECUTION TIME	This mechanism is leading to optimized solution for minimizing the execution time during testing.	Author explained issues at on initial stage of regression testing.	Work has been is limited to faults detection time
A. T. Quadri et al/2015	Software quality assurance survey for CBSS development [19]	N/A	N/A	N/A	Their research highlighted the way that can be applied to enhance quality of a CBSS.	There is lack of technical implementation.
A. Verma et al/ 2016	Inconsistency finding during software component source code [21]	ACO / neural network	Java projects are considered as input	Outputs have been evaluated with the support of recall and precision.	Their proposed model is sufficient to find semantic, syntactic.	It is not sufficient to detect inconsistency only.
P. Gandhi et al/ 2016	To assess component generality to optimize software development cost[22]	Fuzzy Approach	Dataset of Generality as well as average component generality to assure reliability. Moreover Reusability, cost of development is also considered.	Low, medium, high, very high reusability and Actual Cost as per input is the result.	They provided an analysis on component Generality.	In this research, they neglected efforts, time and complexity.
C. Diwaker et al/2016	Assessment optimization mechanism using component based software engineering metrics[23]	Ant colony	The performance metrics is utilized for the assessment of ACO.	ACO has been utilized to check optimal path among components of CBS.	ACO has been utilized as mechanism to check more reusable components.	It is a partial work and has lack of completeness.

K. Li, L. Liu et al/2017	Evaluation of reliability for CBSS [24]	Complex Network Theory	The structure of terminating application system	Output of Cheung model is 0.8299, and evaluation obtained by mechanism applied Lo Junghua is 0.7715.	Reliable evaluation model has been proposed according to conclusion.	Only considered the reliability of CBSE systems and neglected quality, reusability, complexity of systems.
Preeti Gupta et al/2017	Software testing techniques for reusable software[25]	Nature inspired soft computing	Dataset of use of Various SC Techniques	Research paper show the current trend of nature inspired techniques in the field of software testing for component based development.	They provided a comparative study on soft computing concepts influenced by nature.	There is lack of a proposal which would be an efficient and reliable reusable module.
O. Bhardwaj et al/2018	To perform quality assurance in component based software[26]	Soft computing techniques	List of requirement is input dataset	Results are showing diverse techniques. Mechanism utilized to assure the CBSS reliability.	Quality assurance has been made using through soft computing mechanism	Only consider the quality of software which is not sufficient.
P. Tomar et al/2018	"Predicting the quality of Teaching Learning Optimization" [27]	Artificial neural network	Data set has been considered from research of Tobias et al. ANN is consisting four input neurons. These neurons are ISC, SCCP, BICM and SCCr.	Weight values of network have been adjusted as per TLBO mechanism. This is used to reduce error in network.	This work predicted quality of a software using ANN.	It is required to determine more than two factor of CBSE systems but in the research work, only quality of systems are considered.
C. Diwaker et al/2018	"Performing prediction for Software Reliability" [28]	Soft Computing mechanism inspired bio	technique used , aim and influencing factors of previous researches are considered as dataset	Research concludes PSO / fuzzy logic is makes the response fast and showing less error.	Reliability is predicted with the help of Bio Inspired Soft Computing Techniques	It is not enough to predict reliability. Quality, complexity, applicability etc are also must be considered.
L. Mu et al/2018	"MVO for component selection in " [29]	Multi-objective optimization	Dataset of info of available commercial components specific architecture plan, Info of legacy components.	Next simulation presents reduction of interactions in various components Final Experiment shows improvement in reusability.	They made customization in SPEA2 algorithm to solve the issues related to Component Selection.	There is lack of clarity in their work.
P. Chatzipetrou et al/2018	CBSS Which Attributes are significant in Decision Process [30]	N/A	N/A	It is found that some organizations have focused on various feature than bigger organizations. But mature	They investigated influencer of industry practitioners in component selection.	It is a comparative analysis. There is need of technical implementation.

				organization focuses more on expenses.		
C. Diwaker <i>et al/ 2019</i>	Recent Model to predict Reliability of CBSS[31]	Soft Computing mechanism	Different parameters are indulged in FIS to perform calculation of reliability with the help of CBSRM.	Finding concludes that FIS is presenting better result In case of proposed CBSRM. It is showing more accuracy as compared to PSO.	In the work, soft computing technique is used to predict reliability of software.	Apart from reliability, it is essential to consider Quality, Complexity, Compatibility etc factors also.
G. Maheswari <i>et al/2019</i>	Enhancing Reusability and Performance testing Merits of CBSS [32]	Data mining	Dataset of Functions/Procedure Component	Output concludes that H-SOM mechanism has been found more time efficient as compare to Naive Bayes.	Fuzzy Logic as well as PSO has been utilized to improve reusability and Measure performance merits related to software.	It is required to make more work in this field.
S. Mohammad <i>et al/ 2019</i>	PCI-PSO : Preference-dependent identification of Component [33]	PSO	Case Study	PSO has played significant role in getting optimized value.	They discussed a preference-based method to identify logical components	They did not consider the limitation of PSO.
S. Gholamshahi <i>et al/ 2019</i>	A review on Software component identification and selection [34]	N/A	N/A	Software component identification and selection process requires several optimization techniques.	Author considered identification as well as selection of component used in software.	It is a only review work that is focusing on component identification and selection in software engineering
A. L. Imoize <i>et al/2019</i>	Review of Software Reuse and Metrics [35]	N/A	N/A	Software Reuse and Metrics is playing significant role in software engineering.	Research studied software reuse and Metrics	Research is not providing any optimum solution
S. Mirjalili /2016	MVO: Nature inspired mechanism to perform global optimization [36]	MVO	Design parameters of welded beam design issue	The convergence of research is guaranteed.	The performance of MVO is fast.	The model is not compared by ALO
HongpingHu <i>et al/2019</i>	Enhanced ACO and Artificial Neural Network for prediction of Chinese Influenza[37]	Antlion Optimizer	Dataset of influenza patients	Results show that proposed IALO is better than other optimization models.	Research is providing improved optimization for Chinese influenza prediction	The technical implementation is complex

Arnold Fertin/ 2006	Efficiency of antlion trap construction [38]	Antlion optimizer	Capture time correlated with off-centring is used as dataset.	Off-centring is leading to a deviation from better cone shape. It is helpful in reducing trap angle	The efficiency of trapping is high.	Other optimization techniques are ignored.
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IV. PROBLEM STATEMENT

Research paper explains various Soft computing mechanisms that have been utilized for Software Component Selection. It has been observed that existing Software Selection Modules have their own limitations. ACO based Software Component Selection modules do not support to Application Complexity whereas Neuro Fuzzy based module is enable to provide reliability in Software Component Selection. ACO based module can be used only to compute the length of shortest path. But PSO with MVO provides best solution in a small time. So, it has become essential to propose an optimized software selection module which can resolve the existing issues in this field. Moreover it has been observed that MVO based PSO is performing fast as compare to other optimization techniques. Time taken and accuracy of solution, need to be considered in order to perform comparative analysis of these optimization techniques.

V. CONCLUSION

This review paper presents lot of researches on Software Component Selection in which different optimization mechanism in existing Software Selection Modules are suffering from many issues. Thus optimized Software Selection System is supposed to resolve the issue of the existing researches. Paper explained that MVO and ALO is adaptive meta-heuristic optimization technique that is used to predict quality, reliability, applicability etc of software programs at high speed. This research work is beneficial to develop an efficient, fast and optimized Software Component Selection module.

VI. FUTURE SCOPE

This research paper would be beneficial for coming researchers to know the present status of Software Selection in CBSE. It is a theoretical work in which PSO, MVO and ALO techniques are integrated to propose an optimized Component Selection Module. Therefore it would be easy for future researchers to implement an efficient and optimized Software Selection Module. This paper is supposed to guide future research work in field of CBSE. Moreover this work is supposed to play significant role in getting present status of Software Selection in CBSE.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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