Cost Estimation Using Hybrid Algorithm

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Abstract: Cost estimation is very essential and important in the software industry. The more accurate the cost is the more efficient the project is. Cost estimation has become challenging in the software industry to get accurate results. The prevailing software system reliability models are non-linear, and so the parameter estimation of those models is complex. The software system reliability is especially obtained through modeling and estimating. There are several methods to solve this problem. COCOMO model is a more common method to solve such a problem. This COCOMO model was published in the year 1981 using sixty-three types of project data. This model uses the size of the code to estimate the cost. COCOMO model has two parameters A and B. However, using these parameters may not guarantee effective results. There are several optimization strategies for finding the nonlinear perform issues, like artificial bee colony (ABC) and Particle Swarm Optimization (PSO). It has the characteristics of fewer management parameters, robust exploration ability, and therefore the high accuracy of the answer. The PSO formula has the characteristics of the comparatively bit of computation and quick search speed however it's premature convergence, particularly in managing complicated multi-peak search issues, and therefore the downside of poor native search ability. This paper proposed a hybrid model to calibrate the COCOMO model parameters to be more accurate for estimation. This algorithm is a hybrid of two algorithms namely ABC and PSO (ABC-PSO). This hybrid algorithm is applied to five datasets to estimate the cost. The experimental results show that the new estimation is best estimate of parameters and therefore the hybrid PSO-ABC encompasses a nice advantage in generalization and particularly on restricted information.

Index Terms: PSO, software reliability, parameter estimation, ABC, cost estimation.

1. INTRODUCTION

Today, increasing wants of code production and development makes the software the foremost parts of the computer. The success rate of code developer organizations depends on the management and coming up with the utilization of resources, supported calculable value and time. Managers of the code developers ought to have the ability to manage their resources within the best manner so as to decrease project failure. Project managers ought to be ready to confirm the wants like the labor work (analyst, programmer, designer, etc.), facilities and needed instrumentality, the code options (reliability, reuse, got to document and then on) and project characteristics (size, complexity, management, etc.) for a project. Once estimating the wants of the project, the desired time or variety of every supply should be evaluated. for instance, what percentage analysts or developers are required and for a way long should be evaluated. In fact, the project manager will estimate the value needed to complete the project by determining these factors. If the calculable value is a smaller amount than the particular cost, the organization can suffer monetary losses. If project managers are ready to estimate prices accurately, they will access the subsequent objectives:

- Rising the performance of code manufacturer with the correct organization of the required resources for every project.
- Increasing the profit of organizations with comes classification supported business and choice of the most effective projects.
- Increasing client satisfaction with the equilibrium of real prices with calculable value increasing the satisfaction of project stakeholders with an applicable profit of the project. Despite the numerous planned solutions, none of those solutions are totally ready to estimate with exactness, similarly as this issue exists as a raised issue within the field of code engineering that challenges students winsomely.

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2 LITERATURE SURVEY

Krishna Mohan,et al. (2016) the performance of SRGM is judged by its ability to suit the software system failure data. How sensible will a mathematical model fit the information and reliability of the software system is illustrated. Zhen Li, Miaomiao Yu, et al. (2019) initially looked at the PSO-based programming unwavering quality model parameter estimation technique proposed by past analysts with a proposed strategy utilizing another wellness work. Shivani Sharma, et al. (2016) proposed the precise estimation of programming advancement expenses and endeavors is a genuine liable to take great administration choices. The cost evaluation issue Fluctuates largely between organizations that do their estimation under altogether different imperatives. Eberhant and Yuhuishi (2017) concluded that particle swarm optimization is alluring is that there are not very many parameters to alter. A rendition, with exceptionally slight variety of functions admirably in a wide assortment of uses. PSO has been utilized for approaches that can be utilized over a wide scope of applications, just as for explicit applications concentrated on a particular necessity. DervisKaraboga and BahriyeAkay (2010) the presentation of ABC calculation was contrasted and those of GA, PSO, DE and ES improvement calculations. ABC calculation can be improved by incorporating valuable heuristics, in this work our motivation was to think about the exhibition of standard rendition of ABC with those of other surely understood populace based calculations.

3 ARTIFICIAL BEE COLONY

It is an optimizing technique that specifies the character of honeybees and has successfully applied to the various real time problems.

In this algorithm there are 3 types of bees. They are:

1) Honey bees
2) Observation bees and
3) Detection bees.

ABC generates the solutions for randomly generated solutions where this is termed as swarm size.

Let us consider Y(i)={y(i,1),y(i,2),…y(i,n)} represents the i^{th} solution of swarm where n is size.

Employed bee generates a new candidate in the following position

$$z(I,k)=y(I,k)+R(I,k)* (y(I,k)-y(j,k))…….. (1)$$

From the above equation we will get parameters that are required for estimating cost..

4 PARTICLE SWARM OPTIMIZATION

It was a computational method used to find the optimum solution by iterating the problem.PSO improvement was proposed by eberhart and kennedy in 1995. The PSO algorithm could be based on swarm intelligence random improvement of algorithm that show case the forage behavior of bird populations. In PSO algorithm the rate and position of a particle is calculated as follow:

k(v+1) id = wkvid+c1rand1()(pvbid−xvid)+c2rand2()(gtbd−xvid) ……..(2)

x(v+1) id = xkid +k(v+1) id…….(3)

from 2,3 we will get the parameters required for cost estimation using cocomo model.

5 COCOMO MODEL

It was a constructive model based on kilo lines of code(KLOC). Effort and time are the important parameters in cocomo model. For estimating cost it is necessary to find the effort utilized. Formula used for calculating effort in cocomo model is:

effort =a(kloc) ^b……(4)

Where a and b are the parameters that are generated in ABC and PSO(ABC-PSO) algorithms.

cost=effort*time……(5)

From the above formula we have calculated the effort for ABC, PSO, and ABC-PSO algorithm and using the effort we calculate the cost using (5).

6 METHODOLOGY

6.1 Figures and Tables

Particle Swarm Optimization - Artificial Bee Colony hybrid algorithm, the new algorithm planned during the paper is termed PSO-ABC hybrid algorithm. Once change the effort and position of every particle supported the Particle Swarm Optimization calculation method, the operator within the Artificial Bee Colony algorithm is applied to the particle swarm method, once every particle's position was updated, the artificial bee colony search operator is to look once more around the new location to see the new location. The benefits and downsides of the two algorithms, Particle Swarm Optimization and artificial bee colony, are used well to get higher results.

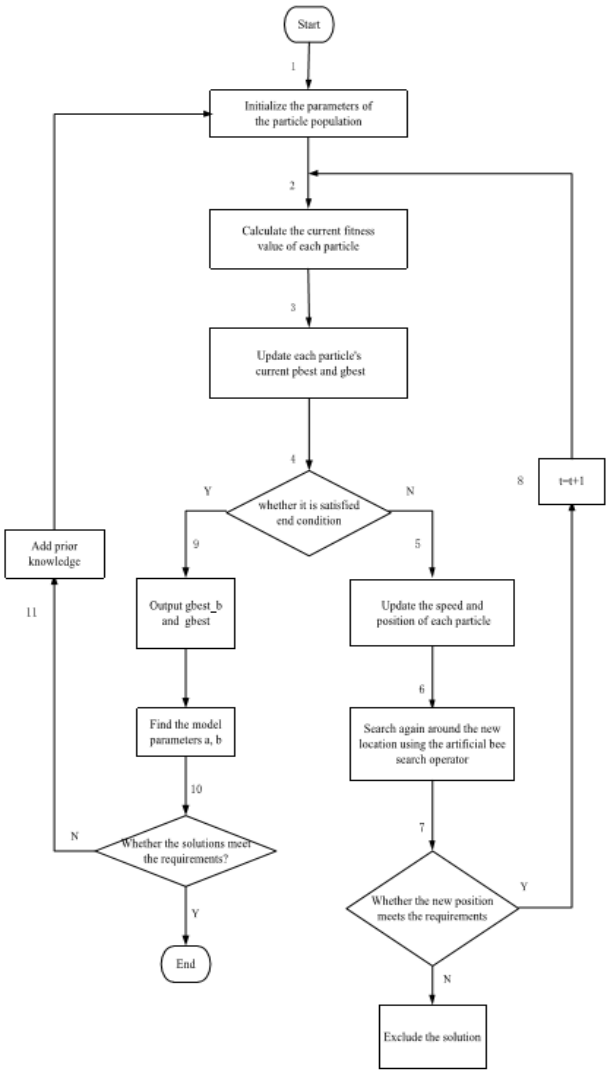

***Fig. 1**. ABC-PSO hybrid algorithm.*

7 RESULTS

7.1 Appendices

***TABLE. 1.** PSO estimation results using COCOMO model*

DS	a	b	Effort
SYS1	136.0416	9.1260e-5	136.1026
SS3	27.2565	1.2466e-4	27.4518
CSR1	397.0031	1.0788e-5	397.2574
CSR2	129.0001	1.5039e-4	129.0944
CSR3	116.4310	1.4564e-4	116.5098

***TABLE. 2**. ABC estimation results using COCOMO model*

DS	a	b	Effort
SYS1	136.7724	3.2207e-5	136.794
SS3	278.0001	3.6415e-5	27.0571
CSR1	399.0705	4.318e-5	399.154
CSR2	129.0110	1.0535e-4	129.0771
CSR3	113.261	1.6291e-4	113.3618

***TABLE. 3**. PSO-ABC estimation results using COCOMO model*

DS	a	b	Effort
SYS1	136.0496	8.9268e-5	136.1093
SS3	27.1835	1.3063e-5	278.4518
CSR1	397.1000	7.0061e-5	397.2665
CSR2	129.0286	9.4567e-5	129.0879
CSR3	104.0008	7.6611e-4	104.3715

***TABLE. 4**. Comparison of PSO,ABC and PSO-ABC.*

DS	PSO	ABC	Effort
SYS1	136.1026	136.794	136.1093
SS3	27.4518	27.0571	278.4518
CSR1	397.2574	399.154	397.2665
CSR2	129.0944	129.0771	129.0879
CSR3	116.5098	113.3618	104.3715

8 CONCLUSION

Software development is a challenging task at the primary stage of the life cycle, due to incomplete raw material and dynamically changing the environment of technology in the development of the software industry. As a result inferiority software product delivered to the customer. Providing exact results on software estimation is a crucial and which is important to get accurate estimation. The proposed method is used to solve complex problems. We propose a hybrid approach for predicting accurate cost of the software development application.

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