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Effort Estimation Using Hybrid Technique

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Abstract-In software development, effort estimation is the process of predicting the most realistic amount of effort (expressed in terms of person-hours or money) required to develop or maintain software based on incomplete, uncertain and noisy input.The various effort estimation models have been proposed in the recent times for effort estimation. Among various proposed techniques are neural network, use case diagrams are the popular techniques to estimate KLOC value. In this work, a novel technique is proposed for effort estimation, which is based on fusion of function point analysis and SLIM to estimate KLOC value. The simulation is performed to calculate MRE value of proposed and existing algorithms using NASA 93 dataset. It has been found that proposed technique performs well as compared to existing technique in terms of MRE value.

Keywords*: Effort estimation, SILM, COCOMO, COCOMO-II, Function Point (FP).*

I. INTRODUCTION

Software engineering is defined as a process to analyze user requirements and then design, build and test software applications to meet those requirements.In order to develop good quality software, the developer needs to adopt the principles, techniques and procedures of software engineering to avoid conflicts that arise during the process of development. The compilation of requirements and customer needs is the most common thing in the development process.If a developer fails to fulfill the customer's needs, then the goal of creating good quality software cannot be achieved by the software developer [1].

In software engineering, the process of splitting software development work into different phases to enhance design, product management, and project management is called software development process[2].

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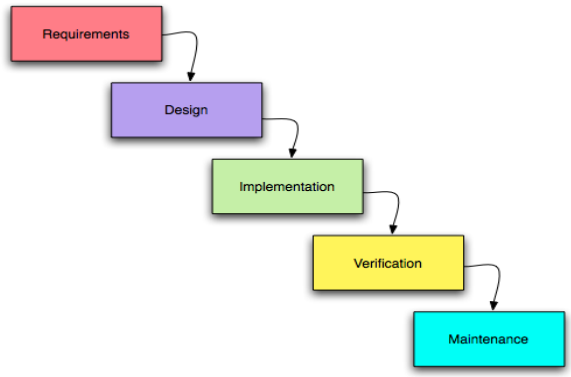

Figure1. Software development process

II. RELATED WORK

Estimation of software costs is the method of calculating the effort needed to develop a software system. No two projects are the same each is unique in what it sets out to achieve. Many estimation models have been proposed over the last 30 years[3].

COCOMO Model:

COCOMO is Constructive Cost Model. It is the most effective and oldest cost estimation method. It is an independent model that is well established and cannot be relied on any vendor of software [4]. Code row is calculated in COCOMO model line. Because of its open nature, we will understand the complexity of the process in this model. This model is designed to determine technology development expenditure.The improved version of it is known as COCOMO 2[5], which by reducing the number of parameters from 15 to 7, simplified cost estimation.

Function Point Based Estimation:

FP is a method for quantifying the deliverable software based on the client's view. It is also important to remember that function points only consider the logical point of view, not the physical point of view. Therefore it does not count things like coding algorithms, database design, and transaction screenshots. It has five parameters [6] from which, three parameters come under data functionality and other two parameters come under transaction functionality.

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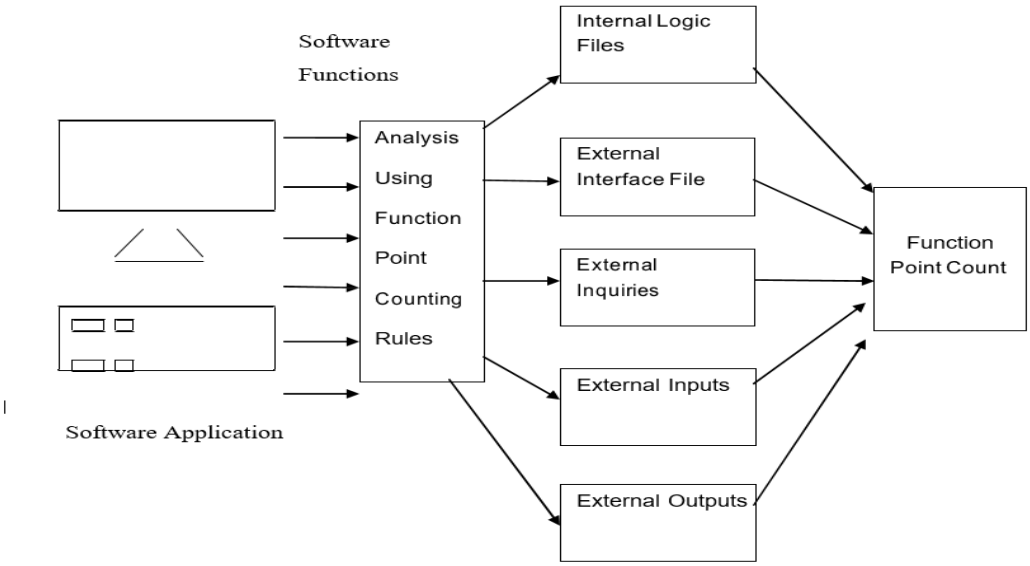

Figure2. Function Point Analysis Estimation

Function Point Analysis basically is a skill or technique for the measurement of size of a system from a user's standpoint. It is varied according to the programming language used by it. We cannot use it at the initial stage of development cycle.

SLIM Model:

SLIM model stands for Software Life Cycle Management [7]. It is one of the cost model focuses on algorithm cost model. It is also known as macro estimation model. It is based upon Norden/Rayleigh functions. It contributes for the best performance of the estimator. It performs various functions like:

- It builds an in order model of the software model and collecting software properties, personal computer attributes etc.
- It is fine model that represent historical databases by interpreting it and fine model to represent local software development model.
- SLIM model make use of an automated version of the line of code for costing technique.

III. PROBLEM FORMULATION

Effort estimation is a process of making estimate the efforts according to the expectations of stakeholders before implementation of the project. There are number of approaches are

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present to estimate the efforts, but for better performance and accuracy it is recommended that the models should be used in pair.

SLIM model is one of software cost estimation model which use regression formula to estimation cost using historical data with present and future characteristics. SLIM starts estimate from the design phase to integration phase of cost and schedule of the project. But separate estimation model should be required for remaining phase. It is not a realistic perfect model because assumptions are made at early phase, which may vary with the progress of time. A revised estimate may show over budget or under budget for the project when re-calculated in latter stages of the project. So,we can say that SLIM model is not accurate.

For estimate the project size and team size, a simplified function point can also be used. Estimation of the function point is carried out after development of designs. Many efforts and cost models based on LOC are required to convert function points. Compared to LOC, it needed less research data. So it's more accurate than SLIM.

This proposed work, the merge of SLIM and function point estimation models is proposed to enhance the accuracy of the estimation model. The implementation work shows that the new hybrid model produced better results.

IV. PROPOSED METHODOLOGY

The overall performance and accuracy will degrades with the increase in lines of code. So it become difficult to estimate the effort with more complexity. Function point estimation model is based upon functional size to estimate efforts. So to reduce complexity of SLIM model in this proposed work, combination of SLIM and function point model is implemented.

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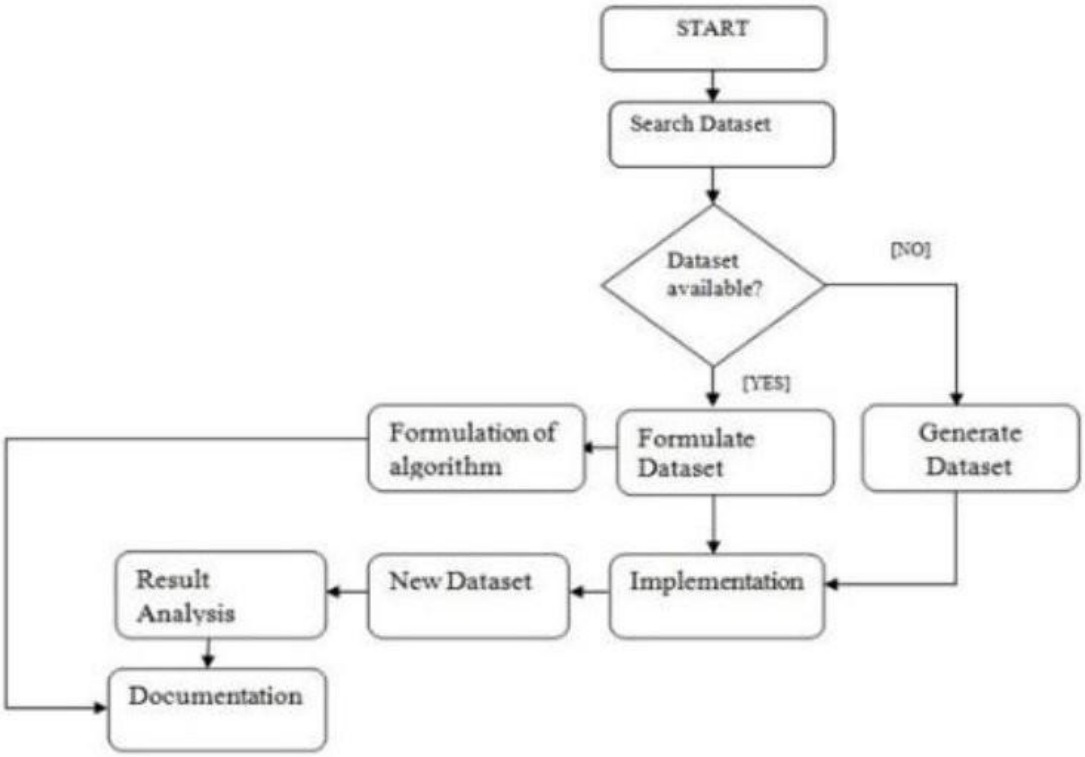
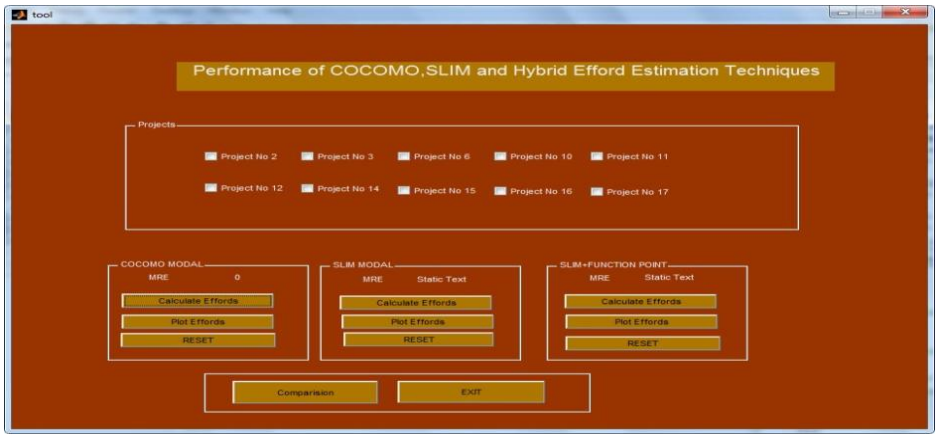


Figure 3. Steps of implementation

V. RESULTS AND DISCUSSION

The tool that is used to implement the proposed work is MATLAB[8]. MATLAB is a numerical tool for manipulating matrix, implementing algorithms etc. It is the most widely used tool by the programmers in software industry as it can interface with any other language.



ISSN: 0971-1260
Vol-22-Issue-16-August-2019

Figure 4 Tool default view

As illustrated in figure 4, the tool is developed to compare the performance of various cost estimation models. These models are COCOMO model, SLIM model and hybrid model which is the combination of SLIM and Function point.

First the COCOMO model was tested on project 1, it produced MRE value 0.22586. On same setup next SLIM models was tested and got MRE value 0.99987.

In final step as per the proposed methodology the hybrid model (SLIM+FUNCTION POINT) model was tested on same data set and achieved MRE value 0.14805, which better than the other two approaches.

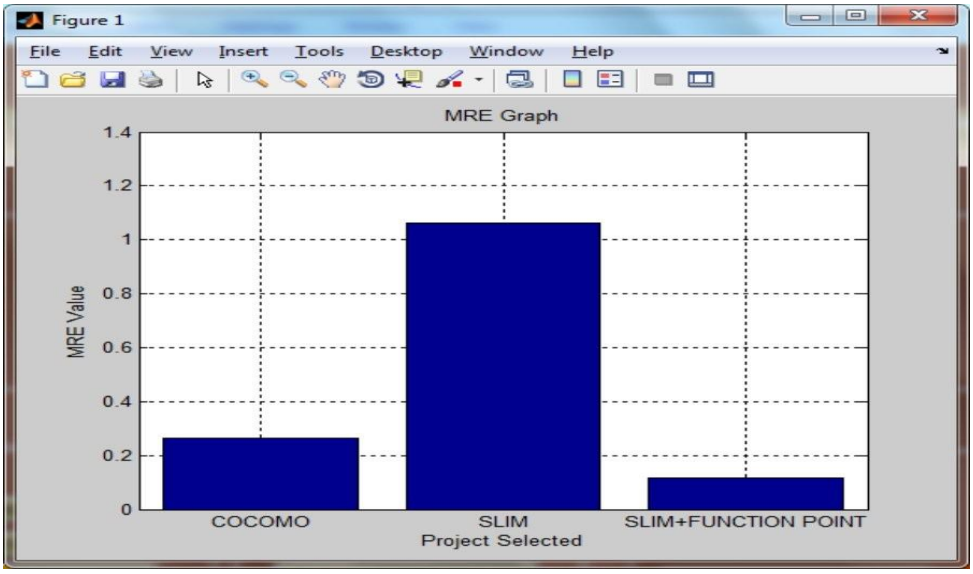


Figure 11 Comparison of three models

As illustrated in figure 11, the three models are compared on project 16, the comparison shows that higher MRE value is of SLIM model, the second higher is of COCOMO model and third higher value of MRE is of SLIM+FUNCTION POINT model. This graph proves the efficiency of the developed model.

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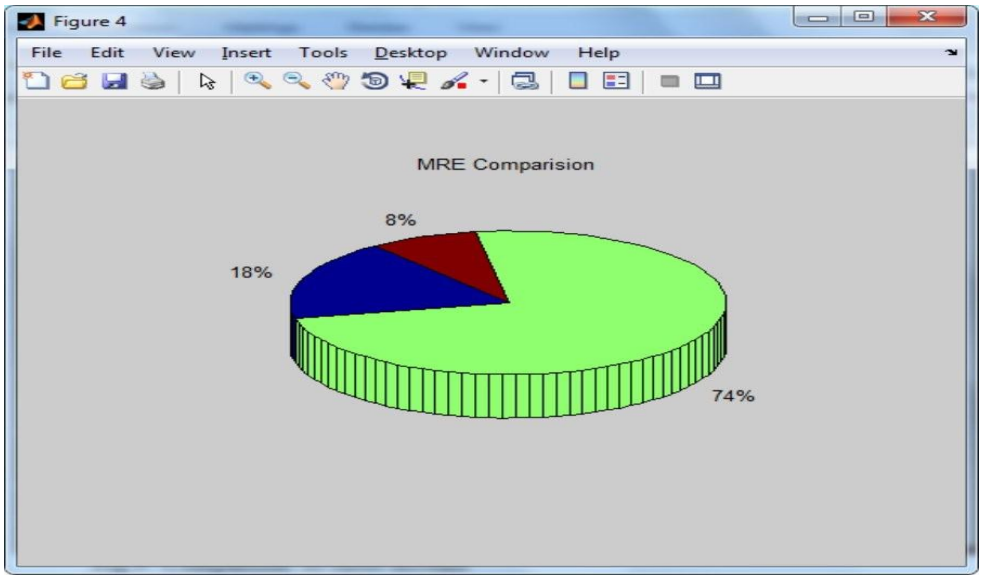

Figure 12 Pie chart comparison

As shown in figure 12, the three compared in terms of their error rate on project 16. The SLIM model had higher error rate i.e. 74%. The COCOMO model is of 18%. The SLIM+FUNCTION POINT model had least error rate i.e. 8% only.

VI. CONCLUSION AND FUTURE WORK

In this work, it is been concluded that COCOMO is the best model for effort estimation as compared to other models. The efforts of COCOMO are directly proportional to cost driver values and KLOC value. In the large project it is difficult to estimate extract KLOC value of the project. The incorrect estimation of KLOC value leads to incorrect estimation of MRE value. The values techniques has been proposed which will calculate exact KLOC value and these techniques are neural networks, use case diagrams etc. In this work, improvement in COCOMO model will proposed for effort estimation and that improvement will be based on function point analysis. In this work, it is concluded that proposed technique performs well in terms of MRE value estimation on NASA 93 dataset. In future improvement can be done in the proposed work; the further improvement will be based on back propagation algorithm of neural network.

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ISSN: 0971-1260
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