A Survey on Automated Test Data Generations By Using Hybrid Approach

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Abstract

In the software development life cycle software testing plays a very important role. Software Testing is a process which is aimed at evaluating the attribute or capability of program or products/system & determining that meets its quality. Software testing is an important technique for assessing the quality & reliability of software product. There is two method for the testing, that is   manual testing & automated testing. One of the major difficulties faced in the automated software testing is the generation of test data that is used as input to the component under test. In this, two techniques of generating data that can be used for automated software robustness testing. In this a novel approach is proposed based on the hybrid algorithm Intelligent Water drop algorithm & Ant Colony optimization to generate the test data for a program which combine the best aspects for structural test data generation.

Keywords: *Test data generation, Intelligent water Drop (IWD), Ant colony optimization (ACO), Control flow graph (CFG), software Testing*

1. Introduction

In the present scenario there is need for accelerated software development. Automated testing is process through which thorough & fast testing can be done become this quality of automated testing has made it an essential part of software development. This has become more important than ever before given the need to accelerate software development & reduce the time to market in the fast changing business environment [1]. Software testing is both discipline & a process. It is a separate discipline from software development. software development is the process of coding & functionality to meet defined end user needs .while software testing tends to be considered a part of development it is really its own discipline &should be tracked as its own project[2]. Software Testing is an integral part of software development process. Software testing is analyzing a system or a component by providing defined inputs & comparing them with the desired outputs to check the discrepancies between the desired & actual output & correct them. Software testing is a process of executing software with the aim of detecting as many defects as possible so as to assess the quality of the developed software [3]. The purpose of software testing can be quality assurance, verification, & validation or reliability estimation. It is tradeoff between budget, time & quality [4]. The process of automatic generation of test data plays a major role in software testing. Test data generation in program testing is the process of identifying a set of test data, which satisfies the given testing criterion. A test data generator is a tool which helps a tester in generation of test data for a given program. Most of the existing test data generators have been classified into three types viz., path wise test data generators, Data specification generators & random test generator [5]. One of the difficulties of automated software testing is the generation of data as input to the component under test. This paper explores two techniques of generating data that can be used for automated software robustness testing [6]. Automation test data generation is required to generate test cases dynamically for a specific software program.
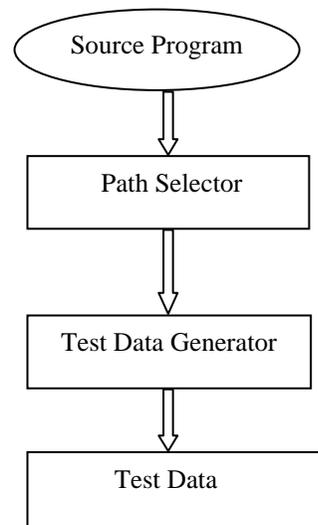
Fig.1: Architecture for Test data generations

In this we proposed a new approach based on the hybrid techniques Intelligent water Drop & Ant colony optimization to automatically generate the test data using data flow dependencies of a program. Intelligent water drop is applied over the control flow graph (CFG) to obtain the number of paths available in the program. The CFG depicts logical control flow of the program [7] & Ant colony optimization is used to find the optimal path in the program. The main principle behind these interactions is called stigmergy, or communication through the environment.

 Software testing typically represents 40% of a software development budget. There are four main objectives of testing [2].

Demonstration:- In this system are ready to accepts the risk to demonstrate the functions under the special conditions & show that products are ready for the integration or for the use.

Detection:-It identifies the defects, error & deficiencies in the software. It also determines the capability of the system & limitations, quality of components, work product of the system.
 Preventions:- It identify the risk & & what are the problems occurs in the future because it provides information to prevent & minimize the numbers of errors to clarify system specifications & performance.

Improving Quality:- Errors can be minimized & software quality can be improved by doing the testing effectively .

2. Literature Review

Yeresime Suresh & Santanu Ku Rath (2013) made a review of A genetic algorithm based approach for test data generations basis path testing in which use the methodology Genetic Algorithm which gives the result on the basis of fitness value range of test data & classification of individual chromosome into their respective classes based on fitness value in terms of percentage 38% of test data have the highest fitness value 'f(x)' and lie in the range between 1.0 & 0.7 [5]

Hitesh Tahbildar & Bichitra Kalitra introduce the Automated Software Test data generation by using Static & dynamic method using the symbolic & Actual value. The implementation is based on the hybrid in which it describe the architecture of test data generations.[8]

Ruchika Malhotra & Mohit Garg present an Adequacy based on test data generations technique by using two

methods Genetic Algorithm & Mutation Analysis which show the result that there was30.76% - 88.33% reduction in number of test cases & achieved 20%-60% saving in time (taken to generate test cases) in this technique compare to path testing technique. [9]

Sapna Varshney & Monica Mehrotra presents an Automated software test data generations for data flow dependencies using genetic algorithm by metaheuristic search algorithm, Evolutionary algorithm & Genetic algorithm. It applied to a number of classical C programs such as quadratic equation problem , triangle classification problem, date problem etc [3].

 Laheeb M.Alzubaidy, Baraa s. Allafid (2013) present an software testing using Intelligent Techniques (Intelligent water drop) & Ant colony optimization Algorithm Which generate the independent paths & test data in order to test all independent paths in program & make sure its have passed them & covered efficiently [7].

Praveen Ranjan srivastava, Amit Kumar Patel & Kiran Patel in (2012) Introduced on the test data generations based on test path discovery by using the techniques intelligent water drop ,control flow graph & test path discovery which identify all the possible paths & execute it It provided the solutions for the test data generation taking into the consideration only the numeric & character type[10].

Praveen Ranjan Srivastav & Km Baby (2010) is make approach on the Automated software testing by using metaheuristics technique based on the Ant colony optimization & metaheuritics which demonstrate the generation of the optimal test sequence. By using the strength of the ACO approach in this paper demonstrate the generation of the optimal test sequence for the state transition based software testing. This approach enhances the tool used in it limits the repeated number of transition in the test sequence & also provides the full coverage [11].

D.C. INCE (2012) Introduced the Automatic generation of test data by using the techniques Regression testing which is easy to generate large volumes of test data automatically with a restricted format & no complicated relation between data items. It involves minimising an objective function subject to a series of constraint. The constraint are built up by relating each test run to the segments executed by the run [12].

C Doungsa-ard, K Dahal & A Hossain (2012) Presents an AI based frame work for automatic test data generation by using the the technique UML & GA which is flexible for the   change   generation.   In

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this paper the framework for automatic test data generating mechanism using gray box approach has been proposed. The proposed design framework is flexible enough to change the generation method easily. The first selected techniques for generating test data are randomize generation & genetic algorithm [13].

Sanjay Singla , Dharminder Kumar ,H.M Rai & Priti Singla presents a technique that based on a combination of genetic algorithm (GA) and particle swarm optimization (PSO) & thus is called GPSA (Genetic Particle Swarm Combined Algorithm) which is used to generate automatic test data flow coverage with using dominance concept between two nodes . the performance of the proposed approach is analyzed on a number of programs having different size & complexity. Finally , the performance of GPSCA is compared to both GA & PSO for generation of automatic test cases to demonstrate superiority [14].

3. Limitations Of Existing System

In the existing system the program does not created the parser. So the CFG will not be created. In that case it will not execute all the path it cannot identify errors & bugs in the program . It is difficult to identify all the errors & the path that the program consist. It will not work for the string data type & large & complex program. The above test data generation method was on basic data type such as integer, float, character & real. One of the major problems was how to handle the problem of infeasible paths & complex large amount of data. This method is costly in terms of computation specially in presence of infeasible paths3.1 Tables and Figure.

4. Proposed Methodology

In the proposed methodology a Hybrid technique is used for generating the test data that is Ant colony optimization & Intelligent Water Drop Algorithm. In the source program the parser will be created by using the parsing tools which is used to convert source program into the control flow graph (CFG) for the program. In which all the nodes & paths are executed at least once in the source program. ACO algorithm is used to generate the test data & find optimal path for the program. This approach can be used in test data generations for programs with loops, without loops & procedures. This method is explained on triangle classification problem & output performed in the random testing in terms of the number of generations

needed to achieve the desired coverage & the size of the final test suite.

4. Conclusions

For Generating the test data using the Hybrid approach that is intelligent water drop Algorithm & Ant colony optimization. Software testing is a process to avoid the large amount of numbers of duplicates data & their ability to reach solutions in ideal & efficient manner. Intelligent water Drop algorithm is used for creating the independent paths. IWD is applied over the control flow graph (CFG) which is created by the parsing tool to find out the numbers of paths available in the program. It defines minimum one new edge in the graph. Number of available paths can be retrieved by finding the cyclomatic complexity of the graph & with the help of ACO best path will be chosen for each iterations which is based on the maximum fault coverage & minimum execution time. It determines the final path or best optimal solutions for generating the test data for all independent paths.

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