INTRODUCTION

CHAPTER-1

Software Testing is a costly and time consuming phase in software development process. It approximately consumes 50% of the cost of a software system development [1]. It consumes resources and adds nothing to the product in terms of functionality. Therefore, much effort has been spent in the development of automatic software testing tools in order to significantly reduce the cost of developing software [34].

Software test is the main approach to find errors and defects assuring the quality of software [29]. Therefore much efforts and time is required in order to generate test cases to test the software for reliability and other functionalities purposes. Manually, generation of test cases consumes a lot of time and it also depends on the skill of person. Therefore chances of errors at the time of designing of test cases are immense which leads to the inclusion of bugs in the system after testing also. On the other hand, some test cases are better than the others in terms of finding the errors. Therefore, a testing system is required to differentiate good (suitable) test data from bad test (unsuitable) data, and so it should be able to detect good test data if they are generated. To overcome this, it is essential to automate test data generation.

Software testing tools must ensure that the test cases generated by it is falling under the corresponding testing criteria and are of good quality. Testing tool must generate test cases with diversified nature and it should not fall in local optima. Tool must be robust, reliable, general and adaptive. Test data which is generated for one program may or may not be necessary good for another program. Therefore tools must be of adaptive in nature for generating test cases for the software under test consideration.

The thesis presents the result of the research done in the area of software testing using the soft computing approach which gives adequate picture of the research project with special reference to software testing using soft computing approach. Different soft computing approaches such as Genetic Algorithm (GA), Particle Swarm Optimization (PSO) and hybrid of GA and PSO are used. These are used to compare and find the minimum software test cases for testing the software.
Hence, the effort, time and ultimately cost of testing the software is considerably reduced.

1.1 AIM OF THE RESEARCH

Aim of the research is to develop a system that can generate software test cases automatically using soft computing which can be applied to exercise every branch of the software under test with minimum number of test cases.

1.2 OBJECTIVES OF THE RESEARCH

To achieve the overall purposes of the thesis following are the objectives.

- To identify, characterize and to automatic prioritization of test cases in software testing using techniques like control flow analysis etc.
- To propose a new approach for software testing process, optimizing testing efforts, testing complexity, quality and reliability issues.
- To assess the feasibility of proposed soft computing technique to automatically generate test data for software testing.
- To compare the results obtained with existing methods such as GA and PSO.

1.3 HYPOTHESES

To achieve the goal and aim of research following hypotheses are taken into consideration which are justified in the experiment and result chapter.

a) Genetic Algorithms (GAs) are efficient in generating the test cases for the software/ program under test.
b) Particle Swarm Optimization (PSO) is more powerful and efficient as compare to Genetic Algorithm (GA) in order to achieve the goal or generating test cases.
c) Genetic-Particle Swarm Combined Algorithm (GPSCA) is more powerful and efficient as compare to PSO and GA in order to achieve the goal or generating test cases.
d) Change in size of population give best results in case of GA and GPSCA.
e) Change in crossover probability give best results in case of GA and GPSCA.
f) Change in mutation probability give best results in case of GA and GPSCA.
g) Change in number of agents give best results in case of PSO and GPSCA.

1.4 ORGANIZATION OF THE THESIS

The entire study is divided into eight chapters which are described as below:
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The first chapter is introductory chapter which describe introduction of whole thesis, aim and objective of research work, the hypothesis used for research work and organization of thesis.

The second chapter gives the background substance for the software testing, testing significances, different classification of testing, problem faced in testing, description of test automation, advantages of test automation and problems in test automation.

The third chapter describes about the soft computing. It gives brief about optimization and different optimization techniques likes Neural Network, Genetic Algorithms, Particle Swarm Optimization and Ant Colony Optimization.

The fourth chapter is based on the Literature review in which research done by different researchers from time to time is presented then finally gap in the existing work is presented.

The fifth chapter describes about the research problem or problem statement and finally chapter describes the proposed technique, fitness function to handle the problem. It covers hybrid of Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) for software testing.

The sixth chapter describes the research methodology used for implementation purpose.

The seventh chapter focuses on results and analysis. It is based on the experiments/ programming done in C language and compares the results with the existing methods. It shows the results and discussions for the proposed GPSCA for software testing. Results obtained by GPSCA have been compared with Genetic Algorithm (GA) and Particle Swarm Optimization (PSO).

The eighth chapter based on conclusion which is based on the experiments results. This chapter focuses on the effectiveness of proposed algorithm as compare to GA and PSO. It suggests some further extension of research work so that it may be more efficient.

In the last appendix is there that consists of Appendix A, B, C containing references, list of publications, list of conferences/seminars attended and list of workshop/ training program attended respectively.