ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

Novel Dynamic Fault Localization for Server side Vulnerabilities

C.P.Shabariram[1], V.Sharmila[2], J.Francy[3], R.Anandhi[4]

PG Scholar, Department of CSE, Kathir College of Engineering, Coimbatore, Tamil Nadu, India[1, 2, 3, 4]

ABSTRACT: Pin down is a framework for root cause analysis on dynamic web application. Fault localization in dynamic web application is the problem of decisive where in the source code modifies has to be completed in order to fix the perceived failures. The cause of the failure is called as execution bug that also called as fault. The dynamic execution nature of the web application isolate the source cause of execution bug by various fault localization techniques. To identify execution bugs proficiently in web applications, some algorithms can be improved by using a comprehensive domain for conditional and function-call statements and using a source mapping but did not focus on server side vulnerability. This study use randomized input generation technique for dynamic web application to check whether the web page has vulnerable to SQL injection. An automated random input generation is constructed for each executable statement and to determine the execution failure such as a missing included file, an incorrect SQL query, or by an uncaught exception of the corresponding statement. In addition, determine HTML failures involve situations in which the generated HTML page is not syntactically correct according to an HTML validator to find HTML failures through checking appropriate tags with closing by parsing DOM tree and Less serious execution failures, like those caused by the employment of deprecated language constructs (like include & require function), produce obtrusive error messages but do not halt execution. In this study the result shows that code coverage improved from 90% to 100%. However the result indicates 100% coverage is a reliable indicator of the effectiveness of a test set

KEYWORDS: Pin down, Fault Localization, Execution bug, Random input generation, dynamic web application, SQL Injection, Execution failure, HTML failure, HTML validator, DOM tree.

I. INTRODUCTION

A specious declaration of data and functional steps in a program causes an unexpected behavior to execution. It is an intrinsic weakness of the design or implementation which might result in a failure. In program debugging, Localization is major method. It can be divided into two main components. The initial half is to spot apprehensive code by using various techniques. It may contain program bugs. The next part is for programmers to actually examine the identified code to decide whether it certainly contains bugs. In first part apprehensive code is prioritized based on its probability of containing bugs for reference all the Statistical localization techniques. Code have a lower precedence must be examined after code have a higher precedence. The next part, we assume that bug detection is perfect. So the programmers can forever correctly classify faulty code as faulty and non-faulty code like non-faulty. The amount of code desires to be inspected may increase when perfect bug discovery does not hold. There is a high insist for mechanical Execution bug identification techniques which can direct programmers to the locations of bugs with least human involvement. This insists has led to the suggestion and development of a variety of techniques over current years. While these techniques split similar goals, they can be moderately diverse from one another, and often stalk from ideas which themselves initiate from some diverse disciplines.

II. FAULT LOCALIZATION

The antenna Web applications are written in a mixture of some programming languages, like JavaScript in client side, PHP and Structure Query Language (SQL) in server side. In web application domain, pages are not displayed properly due to the deformed HTML or any embedded language errors. Such HTML and execution failures may be difficult to find because theses codes are generated dynamically. In this paper, execution fault locations are identified by using automated random input generation technique. Random input generation technique is constructed for each

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

executable statement and to determine the execution failure such as a missing included file, an incorrect SQL query, or by an uncaught exception of the corresponding statement. In previous work, determined the failures based on the identifying inputs which cause an application hurtle. It did not address the problem. Statistical analysis between passing and failing tests for determine the faulty location. Further many statistical localization algorithms are used to find the locations. Using Tarantula [11], [12], Ochiai [13], Jaccard algorithms for finding the proportion of passing and failing tests in the execution of statements. Suspiciousness rating is calculated for each executed statement for forecast the location of the bug. The enhancements are presented in the statistical error identification techniques for improving efficiency of execution bug identification. Source mapping method and extended domain are enhanced in previous work [14]. Extended domain technique applies to conditional statements helps execution bug identification. Suppose any statements are missing in HTML code or any default case not mention in switch case that time suspiciousness rating cannot be calculate. Condition modeling technique is used in this situation.

A. Source mapping and Extended Domain

Each statements of web application and output of every part are recorded. HTML Validator analyses these report and indicate which ingredient of the HTML output are improper. Present localization methodologies assume the existence of a test case. However, developers are often attempted with state of affairs where a failure takes place, but where no test suite is accessible that can be used for bug identification. To address such situations, we present an approach for generating test suites that can be used to localize bugs effectively. This approach is a variation on combined concrete and symbolic execution [9], [10] that is parameterized by a similarity criterion. Path constraint similarity and input similarity are increased statement coverage and path coverage. The quantity of similarity among the path constraints related with two executions. Based on the number of inputs the similarity among two execution is figured and it identical for both execution. Automated tool Apollo used for implementing these techniques. It increases the effectiveness of fault localization by direct test suites generation.

III. RANDOMIZED INPUT GENERATION

A. Objective

The Fault localization algorithms explored in this paper attempt to predict the location of a bug based on randomized input values for server side execution in case of validation with empty inputs.

B. Overview of pin down framework

In pin down framework architecture execution failures may be caused by a missing included file, an incorrect MySQL query, or by an uncaught exception. Such failures are easily identified as the PHP interpreter generates an error message and halts execution. The less serious execution failures, like those caused by the employment of deprecated language constructs, create prominent error messages but do not halt execution.HTML failures involve situations in which the generated HTML page is not syntactically correct according to an HTML validator to find HTML failures through checking appropriate tags with closing by parsing DOM tree. In addition, check whether the web page has vulnerable to SQL Injection. If it has vulnerable give some suggestion. Finally fix htmlentities (), magic_quotes_gpc (), stripslashes (), addslashes(), autoload() problems. Pin down framework include limited tracking in native methods, tracking of input parameter through the database Fixing Malformed SQL queries, missing reference (function, class), incorrect buffer cleaning. The final result shows that code coverage improved from 90% to 100%. (i.e.) 100% coverage alone is not a reliable indicator of the effectiveness of a test set.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

C. System Architecture

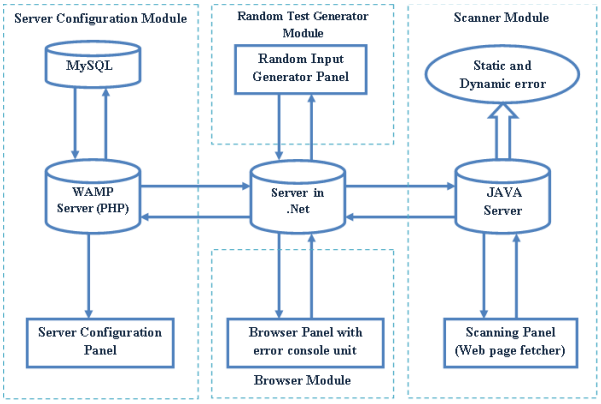


Fig. 1. Pin down framework Architecture

Figure 1 shows the proposed system architecture in which the function of fault localization process. PHP web application taken as input for fault identification process that produce what are the possible locations for occurring bug. Fault localization process using some algorithms such as Ochiai, Tarantula that determine the suspiciousness ratings for executed statement. Executed statements are arranged in the order which one having high suspiciousness rating placed in the top of order. Generate direct test case based on combined concrete and symbolic execution and similarity criteria. Finally compare the coverage of different algorithms.

IV. IMPLEMENTATION

We have implemented Randomized input generation for server side and client side input fields. Dynamic web application is combination of various scripting language. In this paper, pin down framework implements server side scripting language and predict the fault. Then compare the performance of the fault localization. To increase the efficiency of fault localization process, use CREST tool. Create a web application as an input for determine the bug identification. Finally implement pin down framework and execution bug identification algorithms such as Ochiai and Tarantula for compare results derived from this system.

Major components of pin down framework:

- Scanner panel
- Server Configuration panel
- Application Browser panel
- Random Input Generator panel;
- Setting panel

A. Scanner Panel

Either html or PHP files can be scanned when it is placed in the scanner module and error will also be detected. This panel will detect browser compatibility issue (blink tag work only in internet explorer browser) resource missing, syntax errors. Pin down framework includes the scanner tool which provides static analyzer that checks the static bugs on given Input files like HTML as well as PHP. And also many files can be added or removed to scanning for detecting errors. And also it will display how many files selected.

B. Server Configuration Panel

Server Configuration shows the configuration details that present in the server. Current tools for webpage validation cannot handle the dynamically generated pages that are global web applications.

C. Application Browser Panel

Application Browser panel can show the web page for the given URL. If the user present in online the requested webpage of the URL is showed on the screen. Otherwise default webpage is showed on the screen.

D. Random Input Generator Panel

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

Random Input Generator is the most important tool in pin down framework which provides different number of forms, image content and hyperlinks of web page. And also shows the bugs present in the web page for random input generated by the Random Input Generator. The results show that pin down architecture could effectively optimize the time and cost involved when compared to the previous systems. However it will shows the number of iteration to detect bugs in random input generation screen.

E. Setting Panel

From the server settings many options should be appeared. The option of the local host address must set to http://localhost and the option host root directory must set to c: /xampp/htdocs and the option PHP root directory must be set to c: /xampp/php and the option PHP configuration file must be set to c:xampp/php/php.ini and the option MySQL root directory must be set to c: /xampp/Mysql and the option MySQL configuration file must be set to c: /xampp/Mysqlbinimy.ini.

F. Implementation Procedure

After suitable testing and justification, the system can be implemented. Implementation includes all those activities that take place to convert from old to new system. The new system may be totally replacing manual operation of existing system (i.e.) automated system, and it may be a major modification to an existing system. In other case, correct implementation is crucial to provide a reliable system to meet organization requirements.

Following sequence of steps summarize the process of debugging using pin down framework.

Step1: Add the input HTML or PHP document one by one which has to be scanned statically.

Step2: Give an URL to Random Input Generator

Step3: If any errors in the given web page then the errors will be displayed along with the error type and its line. Also displays number of hyperlink, image content, and forms.

Step4: If no input field is found in the web page then it simply displays different number of forms, image content and hyperlinks of web page.

Step5: Select the application browser option, then it will ask the URL. After URL given, it automatically displays web page of the corresponding URL.

G. Data Flow Diagram

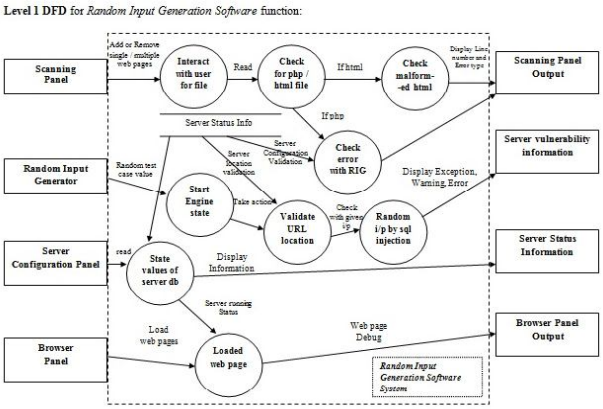


Fig. 2. Level 1 DFD for pin down framework

Figure 2 shows the DFD level 1 for suggested framework in which the function of fault localization process.

V. RESULTS AND DISCUSSION

In this section, discuses about the evaluation result of our concepts. In general the number of statement examined increase the statement coverage of the application also increased. Compare three algorithms, method having high coverage rate that is total number of statement examined high so that finding location of fault also increased. Ochiai having next high coverage represent in graph. Tarantula having minimum error finding rate that is examine minimum

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

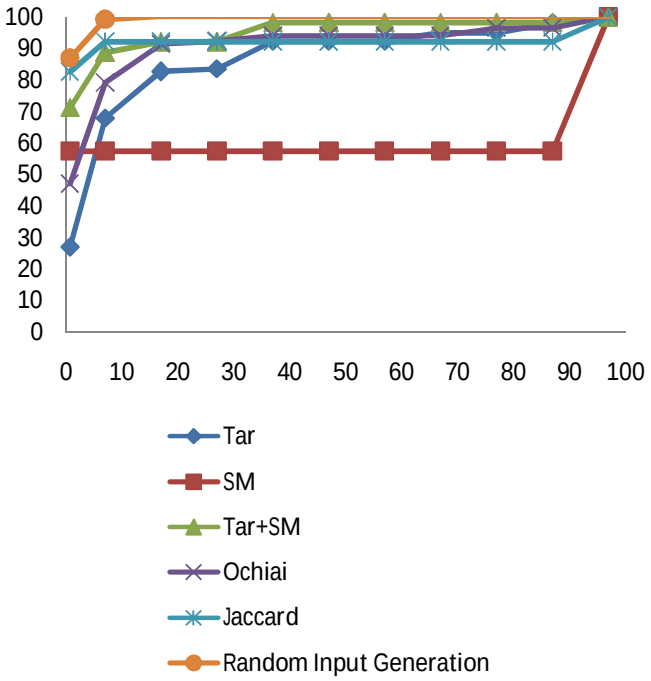
(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

statements examine. X axis represents number of execution of each algorithm and Y axis mentions statement coverage of these three algorithms. The top most increment represents the efficiency of fault localization of the application. So, automated pin down framework for testing increasing the efficiency of fault localization process. Speed of the process is increased so reduced the time period. X axis mention three algorithms and Y axis represent time period of the process. Compared to the manual bug identification process, it reduced the time period of identification process. It also reduced finding wrong locations. Pin down framework shows better performance when compared to that of the existing system, the analysis is carried out in PHP web application and the results are such as error ratio, statement coverage, time and speed. Error rate measure how the algorithm find the wrong location. Compare three algorithms our method having minimum error rate. Using this method create test suites dynamically, this process reduce testing time and increase speed of the process.



VI. Related Work

Literature survey has been done in the area of Software Engineering and its testing process. The research done by various authors are studied and some of them are discussed in the following section.

A. Static, Dynamic, and Execution Slice-Based Techniques

Program slicing is a generally used method for debugging. The debugging search domain is reduced using slice method [4]. Suppose a statement variable has in accurate value then a test case will fail. So the bug must be found in the static slice associated with that variable-statement duo. It might produce a dice with convinced statements which should not be included that is a drawback of this method. An alternative is to use execution slicing and dicing to locate program bugs, where an execution slice with respect to a known test case contains the set of code executed by this test [7]. There are two principles

- Execute a segment of code with less possible of having some fault that is more successful.
- A piece of code is executed that gives failed test and it contains fault.

The problem of using a static slice is that it discovers statements that could possibly contain a shock on the variables of attention for any inputs in its place of statements that certainly affect those variables for a particular input [8]. It is also stated in a different way, such as a static slice does not build any use of the input values that representation of the fault. The most important drawback of this approach is takes extra time and file space for collecting data from various resources. So we recognize the coverage of the test then only easily construct execution slice for a given test.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

B. Program Spectral-based Techniques

A program spectrum records the execution information of a program in certain aspects such as how statements and conditional branches are executed with respect to each test [3]. When the execution fails, such information can be used to identify apprehensive code that is answerable for the error. The total involvement of the failed tests is larger than the successful tests. This execution of a test is represented as a sequence of basic blocks that are sorted by their execution counts. If an insect is in the distinction set between the failed execution and its most similar passed execution, it is mentioned. An insect that is not contained in the distinction set, the technique continues by first constructing a program dependence-graph, then checking adjacent un-checked nodes in the graph step by step until the bug is located. The set union, and set intersection techniques are reported. By the quality and quantity of the observations on which the fault localization is based, much wider context has been established.

C. Statistics-based Techniques

Several statistical fault localization methods are available in advanced fault localization techniques [1]. It does not confine itself to faults located only in predicates. The exact suspiciousness rating of each statement depends on the degree of association between its coverage (number of tests that cover it) and the execution results. More number of approaches is available for fault localization process. Statistics based method is important fault localization method.

D. Program Spectral-based Techniques

A program state contain of variables and their values at a meticulous point throughout the execution. The common approach for using program states in fault localization is to modify the values of a number of variables to determine which one is the cause of erroneous program execution. A program state-based debugging approach and the delta debugging are used to decrease the reasons of failures to a miniature set of variables by complementary program states between executions of a successful test and a failed test by way of their memory graphs. Based on delta debugging, the reason transition technique to identify the locations and times where the reason of failure alter from one variable to one more.A latent problem is that the cost is relatively high; there may exist thousands of states in a program execution, and delta debugging at every corresponding point need additional test runs to slight the reason. Another problem is that the recognized locations may not be where the bugs reside.

E. Machine Learning-based Techniques

Machine learning techniques are adaptive, and vigorous; and have the capability to make model based from data, with limited programmer interaction. Problem at offer can be uttered as trying to be taught or assume the location of a fault based on input data such as statement coverage, etc. The statement coverage of every test case and the equivalent result are used to train a neural network.

VII. CONCLUSION AND FUTURE ENHANCEMENT

In this paper, we introduce pin down framework for fault localization. This process is achieved by using Random Input generation technique. This method determined the situation of source code changes from the executed statement in the server side scripting language on web application. In future, the following methods are implemented with its increased code coverage.

- Support for PEAR packages
- Finding .htaccess vulnerabilities.
- Identify SQL injection vulnerabilities in PHP applications.
- Debugging against XSS attacks

REFERENCES

[1] S. Artzi, "Fault localization for dynamic web applications," J. Dolby, F.Tip, M. Pistoia., IEEE Transl, vol. 38, no 2, [March or April 2012], pp.314–335.

[2] R. Abreu, "An evaluation of Similarity Coefficient for software fault localization," P. Zoeteweij, A. J. C. Vangemund., International symposium on dependable computing[2006], pp.39–46.

[3] R. Abreu, "On the accuracy of spectrum based fault localization," P. Zoeteweij, A. J. C. Vangemund., Conference, [sept 2007], pp89–98.

[4] H.Agrawal, "Fault localization using execuion slice and dataflow tests," J. R. Horgan, S. London, W.E. Wong., International symposium on software reliability engineering[1995], pp.143–151.

[5] C. Cadar, "EXE: Automatically generating the inputs of death," V. Ganesh, P. M. Pawlowski, D. L. Dill, D. R. Engler., Conference on computer and communication[2006].

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

[6] P.Godefroid, "DART: Directed automated Random testing," N. Klarlund, K.Sen., Conference on programming language design and Implementation[2005].

[7] S.Horwitz, "Interprocedural slicing using dependence graph," T. Reps, D. Binkly., ACM Trans on programming languages and system [1990].

[8] J. Lyle, "Automated Bug localization by program slicing," M. Weiser., Second International conference on computer and applications[1987].

[9] S. Artzi, "Directed test generation for effective fault localization," J. Dolby, F.Tip, M. Pistoia., International symposium on software testing and analysis[2010].

[10] S. Artzi, "Practical fault localization for dynamic web applications," J. Dolby, F.Tip, M. Pistoia., International conference on software engineering[2010].

[11] S. Artzi, "Finding bugs in web application using dynamic test generation and explicit state model checking," J. Dolby, F.Tip, M. D. Ernst, A. Kiezun, D. Dig, A. Paradkar., IEEE Transl on software engineering, vol. 38, no 2, [march or april 2010], pp.274–294.

[12] P. Arumuga nainar, "Statistical debugging using compund boolean predicates," T. Chen, T. Rosin, B. Libit., International symposium on software testing and analysis[July 2007].

[13] S. Artzi, "A framework for automated testing java script web applications," J. Dolby, F.Tip, A. Mollor, S. Jensen., International conference on software engineering[2010].

[14] B. Baudry, " Improving test suites for efficient fault localization," International conference on software engineering[2006].

[15] Y. Yu, "An emprical study of the effects of test suite reduction on fault localization," International conference on software engineering[2008].