

A Survey of Test Framework

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ABSTRACT

Software Framework is a universal software platform in software application. A framework proposes to provide generic functionality of software. Best practice of framework will be used in very software application. A specific software application changes a framework and reuses it. With test framework improves the reusability of test environment. This paper reports a survey of recent research to test framework. These present in tow category: functional testing and non-functional testing. Functional testing is in unit testing frameworks, integration testing, regression testing and system testing. Some of researches present categorize to automatically test framework, these will be needed to research will report.

General Terms

Software Testing, Test Framework, Survey

Keywords

Software Testing, Test Framework, Survey, Framework

1. INTRODUCTION

Software applications have been expanded in many of our life such as health, transportation and media. Software testing is expensive and time consuming in development software.

Test frameworks aim of facilitate software testing. In the Rapid Application Development (RAD), Framework Oriented Design (FOD) provides the patterns for understanding development systems.

This paper is reviewed of test framework in software testing. The paper structure as follow. Section 2 challenges are expressed in test framework. Section 3 is reviewed of researches in test framework. Section 4 is shown automatically test framework. Section 5 summarizes the paper and outline suggests future research steps.

2. TEST FRAMEWORK CHALLENGES

Framework uses very tools and algorithms to provide software platform. The test uses in the way of verification and validation software application. Test framework is a software platform to testing. The test facilitates and abilities at the software testing should be recognized and solution(s) should be presented for testing challenges.

In this section of paper focus on challenges are expressed in test framework. Then shown existing solutions in test framework challenges.

2.1 Challenges

Test oracles in software testing have challenges include output domain generation, input domain to output domain mapping and comparator in decide on the accuracy of output [1].

Some testing like service oriented architected has different nature and the specific characteristics. The challenges in testability SOA systems include: dynamicity and adaptiveness, lack of observability of the service code and structure, lack of control, lack of trust, new aspects of testing,

test cost, different stakeholders [2]. Specific systems have challenges for specific area of software and need solve those challenges.

2.2 Solutions

To solve test oracles challenges is available solution but these solution everywhere is not good. In selection solution to test best guidelines are selecting solution for specific test [1].

The proposed solutions for problems and challenges in the research include the functional testing procedures are updated at Systems, and the existing methods are automated. The tools is used to performing complex actions and the integrity of system is able to management are produced, or to improve the new implementations of system at the test [2].

3. TEST FRAMEWORK

Many of researches in testing provided test framework for facilities test and best practice of testing.

In this section reviews of papers proposed a test framework and categorize those based in unit testing, integration testing, system testing, regression testing, and non-functional testing.

3.1 Unit Testing

Unit testing is validating an evaluating of units software. Numbers of researches have been work in the unit testing to test framework. In the follow present those.

In the article [3] is proposed a method to unit testing code with Junit. The research [4] is proposed a framework to automatic unit testing. It can be solve the redundancy problem with separating test codes and test data. This method is MDA based to automate generation of unit testing in i-Unit framework.

3.2 Integration Testing

Integration testing is the phase of software testing in which individual software modules are combined and tested as a group. Integration testing have different approaches. Those approaches are Top-down approach, Bottom-up approach, Sandwich approach, Umbrella approach and etc. Numbers of existing researches created test frameworks to integrating testing. In the follow those are shown.

The research [5] is proposed a framework to improve plan do check action (PDCA) based software testing.

Decision support system (DSS) is computer based information systems to support business. One article is proposed a decision support framework to integrate complementary features into a single automated test environment or multi-platform applications [6].

Aspect oriented programming (AOP) is a programming paradigm that aims to increase modularity. The paper [7] is proposed a framework to aspect oriented programming at testing and debugging. This framework works java byte codes instrumentation technique to inject the crosscutting concerns.

The paper [8] is proposed a framework to test for unit component in distributed component based system. It built upon component technologies like CORBA, COM/.NET, J2EE/RMI.

The paper [9] is proposed a framework for abstract modeling to formal and compositional conformance testing to integrate components.

The paper [10] is proposed a conceptual model to define and relate three dimensions the question item, the test and the activity for advancing at computing based testing (CBT).

The research [11] is proposed a framework to automatic testing with three tier data driven mechanism. The research [12] is proposed a framework OSGI based. This framework supports automated testing and keyword driven script and implementation management and distributed testing management. The research [13] is proposed a framework to test automation. It designed by IT module based automation framework (ITAF). The research [14] is proposed a comprehensive guideline to automation of software testing.

One research is proposed a framework to automate testing for distributed and cross platform with graphic user interface (GUI) [15].

The paper [16] is proposed a framework to functional testing for business workflow software system automatically.

The research [17] is proposed a framework to test in mobile application software and service oriented architected to this area.

3.3 Non-Functional Testing

The numbers of software requirements are non-functional properties of software like security, performance, response time and etc. All software requirements need a test. It reasoned number of researches worked on non-functional testing. In the follow presents those researches in the non-functional testing frameworks.

The research [18] is proposed a framework to automate the process of reliability testing in embedded software. The research [19] is proposed a framework to test the reliability of software with mutation testing. This framework creates a software fail dataset. The research [20] is proposed a framework to compare software testing tools and make the results more precise, reliable, and easy to compare.

Robustness in the software as a degree to which the software system can behave ordinarily and in conformance with requirements in extraordinary situations. The research [21] is proposed a framework to test of robustness properties. The research [22] is proposed an assessment methodology called FRASH. FRASH is a framework to test algorithms of similarity hashing. FRASH is split onto two categories efficiency and sensitivity & robustness. It can be used to identify exact duplicates.

The research [23] is proposed a framework to test automation on the web testing. It is improve the extensibility and reusability of the automated test.

The research [24] is proposed a framework of fuzz-test in software securing testing. Testing in the three phase are safety testing planning, concomitant testing and integration testing and tow area of conceptual and action. The research [25] is proposed a framework to model based on black box fuzz testing methods at systematic automated of a TCG trusted software stack implementation. The research [26] is proposed

a framework to performance testing for rest based web application. It provided software testers with an integrated process in test case design, test script, and test execution.

The research [27] is proposed an approach to automate mechanism for distributed web services security testing. The research [28] is proposed the SFERA framework to simulate restart in SOA systems. It simulated a SOA system with different scenarios and response times in component model. The paper [29] is proposed a framework to performance testing (Test-first Performance as a Service TFPaaS). The research [30] is proposed a framework to evaluate service oriented architecture for governance. In this paper the SOA maturity model and Inaganti and Aravamudan's SOA adoption model is used. The research [31] is proposed a framework to test at the I/O behavior level in a service oriented architecture system. It drives minimal testable I/O pairs from behavior specifications in a service component.

The research [32] is proposed a framework to software quality of mobile application development.

The research [33] is proposed a framework to security testing in distributed demand driven to detect security flaws efficiently. It increases the coverage of essential paths for security testing.

The paper [34] is proposed a framework to protect sensitive information at control flow graph with several privacy preserving and maintain the overall effectiveness in the approach.

3.4 Regression Testing

Regression testing is an approach to software testing and it proposes to find new software bugs or regressions in functional testing and non-functional testing after changes in the software. Numbers of existing researches created test frameworks to regression testing. In the follow of section shows these regression testing researches for test frameworks.

The paper [35] is proposed a framework to automatic regression testing. The research [36] is proposed a framework to trade off for determine selective regression testing or brute force regression testing and it based on classify tests as reusable, retestable, and obsolete. The paper [37] is proposed a framework to support research and practice in regression testing. The article [38] is proposed a framework to test and evaluation of a standard based, repeatable, and reusable for mobile biometric handled devices.

The research [39] is proposed a framework to regression testing with RTS techniques and control flow graph. It uses local information in each service and the publish/subscribe mechanism. The paper [40] is proposed a framework to regression testing for wireless sensor network (WSN).

3.5 System Testing

System testing is a type of testing conducted on a complete. Number of researches created to test in system testing or sub system testing and generated specified framework to test. In the follow in section shown these researches.

One paper is proposed a framework to GUI testing with heuristics based [41]. The research [42] is proposed a framework to introduce the construction of embedded software testing environment, and the micro core plugin is used to give the design of embedded software testing development environment framework (ESTDEF).

The research [43] is proposed an algorithm to test framework in generation and deploying online mobile based testing (MBT) on real time embedded software systems (RTESS).

One article is described a framework to testing and benchmarking at supporting the community of computer science [44].

The research [45] was studied three test process in open source softwares (Apache HTTP Server, Mozilla Web Browser, and NetBeans IDE) and three activities found similar to the activities of the Test process standard ISO/IEC. Then open source software test process framework OSS-TPF suggested.

The paper [46] is proposed a framework to test of system at systems on knowledge based. It is used to reduce the effort in validating system.

Some researchers are proposed a framework architecture to standard testing [47]. Other paper [47] is explained the key design features.

The paper [48] is proposed a framework to generate and execute acceptance tests from use case to explicate the system behaviors.

Some papers are proposed requirements for a specifically tailored framework to effective and precise testing of communications critical large scale systems (CCLSSs) [49].

One paper [1] is proposed a framework to automatic test oracle to solve challenges include output domain generation, input domain to output domain mapping and comparator in decide on the accuracy of output.

The research [50] is proposed a framework to automatic testing in interoperability Healthcare systems. The test framework is designed to automatic testing and extendibility to test configurations and test cases.

3.6 Summarizes

Explained methods in paper are shown in Table 1. This table shows test frameworks explained with different levels of test coverage.

4. AUTOMATIC TESTING

“Manual testing is hard and time consuming and it may be impossible for large systems or tester mistake in the test. The software testing is the rising cost of activities in development software” [2]. Hence some researches performed to automate software testing. Those have attempted to automate one or more level of test.

Test framework approaches automatically explained in paper are described in Table 2 with different levels of test coverage. Those approaches tried to create one or more level of software testing

5. CONCLUSION

To create framework at software testing is best proposed to many software testing, in those test is like other project. It can be save money and time. In this paper reviewed software frameworks testing and categorized those to unit testing, integration testing, regression testing, system testing, and non-functional testing. In the final of this paper shown described papers in table and separated automatic test frameworks.

Future works will propose to create test framework for general software or can be integration of available framework. Another create specific test framework for specific software in the software logic. In the final can be create a dynamic and automatic way to test framework.

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Table 1. Framework testing approaches at level testing

Approaches in frameworks testing	Level testing				
	Unit testing	Integration testing	Nonfunctional testing	Regression testing	System testing
[3, 4]	JUnit				
[5]		PDCA			
[6]		Decision support			Decision support
[7]		AOP			
[5, 8, 12, 13, 14, 15]	Unit Component	Decision support			
[9]		abstract modeling to formal and compositional			
[16]		Workflow			
[17]		Mobile & SOA			
[18, 19, 20]			Reliability		
[21, 22]			Efficiency & Sensitivity & Robustness		
[23]			Extensibility & Reusability		
[24, 25, 26, 32, 33, 34]			Securing		
[26, 29]			Performance		
[17, 29, 30, 31, 39, 40]			Service oriented architecture		
[28]			Response times		
[29]			Quality		
[35, 36, 37, 38, 39, 40]				Regression	
[15, 41]		GUI			GUI
[42]		ESTDEF			ESTDF
[43]		MBT on RTESS			MBT on RTESS
[44]				Benchmarking at supporting	Benchmarking at supporting
[45]		OSS-TPF			OSS-TPF
[46]		Knowledge based			Knowledge based
[47]		Standard Testing			Standard Testing
[48]		Acceptance test from Use case			Acceptance test from Use case
[49, 50]		Specified			Specified
[1]					Test Oracle

Table 2. Framework testing automatically at level testing

Automatic Testing	Level Testing				
	Unit testing	Integration testing	Regression testing	System testing	Nonfunctional testing
[1]				Test Oracle	
[11]		3 tier data driven			
[50]				Healthcare Automatic testing	
[4]	i-JUnit				
[19]					Reliability Embedded
[12, 15]				Distributed Testing	
[13]		Module Testing			
[17]					Robustness
[18]			Reusability	Web testing	
[14]		Comprehensive guideline automatic			
[27]				Web service	Securing
[15]		GUI			
[16]		Workflow			
[35]			Regression		