



**Special Issue**

**CRIMSTIC 2016**

**Current Research in Information Technology, Mathematical Sciences,  
Science and Technology International Conference 2016**

**April 13-14, 2016, Melaka, Malaysia**

## **Automated Heuristic Evaluator**

Survey Article

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**Abstract.** Website testing becomes more challenging nowadays as numbers of websites are growing rapidly. Currently, most websites testing are still being conducted manually. Also, website testing consumes substantial amount of time that leads to client frustration and loosen up the bond between two parties. Therefore, an automated website testing is vital for Information Technology projects in order to carry out large number of tests in shorter period of time. This paper presents a web based validation system for website testing called as an Automated Heuristic Evaluator (AHE). AHE entails the features of checking invalid hyperlinks, visual clarity checking, readability scores and mobile friendly test of webpages. AHE is developed using PHP, JScript and HTML language integrating four selected principles of 12 Heuristic Principles. A user acceptance study has also been conducted with 7 software testers. The results found promising result from AHE for an effective software testing in future.

**Keywords.** Heuristic evaluation; Testing; Website; Usability; Automated testing tool

**MSC.** MSC

**Received:** April 5, 2016

**Accepted:** August 14, 2016

## 1. Introduction

Automated software testing is important for software projects to automatically verify the functionalities, test regressions and assist members to carry a large number of tests in a short period of time. Nowadays, most of the website testing are being done manually such as broken link validation, visual clearness validation and mobile compatibility which are also being tested using an external paid tools by software testers [1]. However, these tools are very expensive due to the lack of experts in developing these tools, which cause the market to price to rise hugely. More than that, during the upgrading process of the tools, it will become more expensive than the actual price of the tools. Also, software testers are lack of fund to buy tools in order to improve the testing or validation process. Also, in today's fast moving world, it is a challenge for any organization to always try to keep up and improve the quality and skill of software system development. In most of the development process, testing is ignored in view of time and the high expenses it might cause [2]. These causes an absence of product quality copied by client disappointment and finally, high general quality expenses. The main reasons for these are mostly due to poor test success plans, delay in testing, later test maintenance and few other reasons [3].

Thus, the objective of this paper is to present an Automated Heuristic Evaluation (AHE), a web based validation system to assist in website testing. The AHE is developed by integrating four heuristic usability principles aims to be a cost-effective tool for website testing. User acceptance testing has also been conducted for the developed AHE and presented in this paper.

## 2. Related Works

A heuristic method is any approach to problem solving, learning, or discovery that employs a practical ways of doing things not promised that something will definitely happen to be best, but good enough for the instant goals. Where finding an ideal solution is too terrible to think about or unreasonable, heuristic techniques can be used to speed up the process of identifying an acceptable solution. According to [4] the most used heuristics for User Interface Design were the 10 Nielsen Heuristic principles. Heuristic evaluation has also been examined by evaluators on the interface and confirmed its compliance with recognized usability principles [5].

According to [6], "the software project team should focus on both functional and usability testing" during the software development life cycle. Heuristic Evaluation (HE) is a popular approach of usability assessment. HE allows product reviewed based on set of identified principles to find any usability issues of product design so that these issues can be addressed as part of an interactive design process [1, 7]. HE comprises of a few of assessors that examine the interface and confirm its compliance with recognized usability principles [8].

The heuristics principle of [9] have been aligned with the current Software Testing Standard (ISO/IEC/IEEE 29119) for optimum usability testing during an interactive design process [1]. Based on the comparison between the twelves and the ten original heuristics principles that

have been developed, it was found that it is significant to integrate the modified heuristics principles in the future. The modification involves the enhancement of testing procedures for complex level of heuristic problems identification as well as extracting a reliable test report. Consequently, the general ten heuristics are not readily applicable to many new domains with different goals usability issues [10].

Therefore, the need for modified heuristic principle is greater compared to earlier days. Also, [11] found the modified heuristics able to avoid new defects. Regardless of these benefits, some of the literatures showed the shortcomings of heuristic evaluation. The other HE techniques may not detect as many usability problems [8].

Therefore, the need for modified heuristic principle is greater compared to earlier days. Also, [11] found the modified heuristics did indeed capture new defects that could have been avoided. Regardless of these benefits, some of the literatures revealed the shortcomings of heuristic evaluation. The other HE techniques may not detect as many usability defects [8].

### 3. The Effectiveness of Automated Heuristic

Test automation enhances the development process of a software product in many cases [6]. The automation of tests is initially associated with increased effort, but the related benefits will quickly pay off. Automation tests can run quick and as often as possible, which is practical for programming items with a long up keeping life. At the point when testing in a spry environment, the capacity to rapidly respond to perpetually changing programming frameworks and necessities is vital. New development is produced ceaselessly and can be added to existing automation in parallel to the advancement of the product itself. In both manual and automated testing circumstances, development needs to be altered for time expansion as the product undertaking advances. At the point when choosing what tests to automate to start with, their quality versus the push to make them, need to be considered. Manual testing can be ordinary, error prone and subsequently bothering. Test automation alleviates testers' disappointments and permits the test execution without client collaboration while ensuring repeatability and precision. Therefore, testers can now focus on harder test situations.

Based on [12], heuristic evaluation evaluators commented that difficulties using traditional technique such as on papers are quite a burden and time consuming. This has inspired to develop an improved web based tool for the evaluators.

Among of the advantages are easy to access and effective to manage the information that has been being identified in usability evaluation. Besides, it also allows group efforts between evaluators, developers and researchers disseminated in various sites to work on similar problems of interest. [10] also highlighted that the improved heuristics are able to release new problems that could have been test escapee. Regardless of these advantages, literatures also revealed the shortcomings of heuristic evaluation. The other HE techniques might not detect many usability problems as other usability engineering methods [9].

## 4. Methodology

Rapid Application Development (RAD) approach is selected for the project due to short project duration. It allows the Automated Heuristic Evaluator (AHE) to be made earlier enable users to view, test and provide feedback for the application faster. AHE is developed using PHP, JScripts and HTML language platform. Early user feedback obtained will allow prototype modification and enhancement. Finally, a user acceptance study was conducted with 7 participants based on the modified 12 Heuristic Principle.

## 5. Results and Discussion

Automated Heuristic Evaluator (AHE) aims to assist software testers to ease the process of website testing as well to overcome the drawbacks of manual method of website testing. AHE entails four modified heuristic principles that are Compatibility, language & control, navigation and visual clarity. Figure 1 shows the overview of the AHE system interface, which shows the AHE's outputs of each feature. For compatibility, a user is required to enter the URL of the web page. The system will then perform the evaluation and shows the result whether the web page has a mobile site and a clean and lightweight interface can be viewed. Invalid link validator will inform the user the invalid links, successful links, redirect link total invalid hyperlinks and total links that have been validated by the system. While visual clarity will resize the images to the maximum level which is viewable. For readability, the system will perform the calculation range from 0 to 100. A higher score indicates that the website is considered easy to read by users.

Figure 2 presents AHE system architecture, the users or the software testers begin testing by initiating the AHE using Google Chrome web browser. Upon initiating the AHE, users are required to enter the website URL and submit it to back end program. The back end programming will perform evaluation or testing on the website using the PHP and Jscript platform. Once the testing is done the result will be sent back to user to view and proceed for further evaluation.

Preliminary user acceptance testing is conducted by allowing the testers to use the system and the result of the testing is evaluated based on their respond towards the system. The testing involves seven software testers. Each user will be given some tasks that he needs to perform using AHE system. A set of questionnaire will be given once he has finished the tasks. Table 1 presents user acceptance testing results conducted for AHE. Based on Table 1, 72% of testers found that the AHE was easy to use and able to respond and carry out website testing using the AHE system without any difficulties. It was also found that 57% of testers were able to continue using AHE without assistance able to use all AHE features from beginning till end of process to get testing results using AHE. Overall, it was found that user acceptance towards AHE are satisfactory.

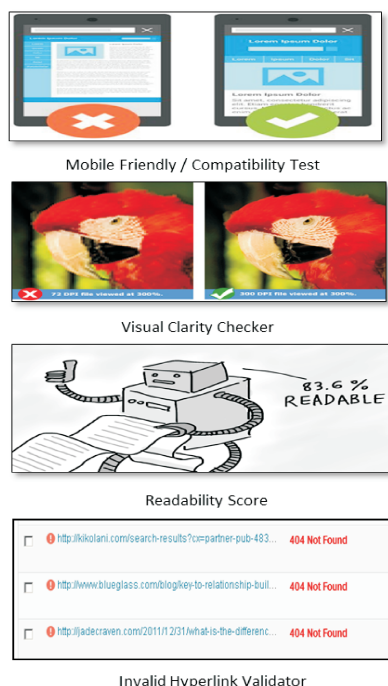


Figure 1. AHE features overview

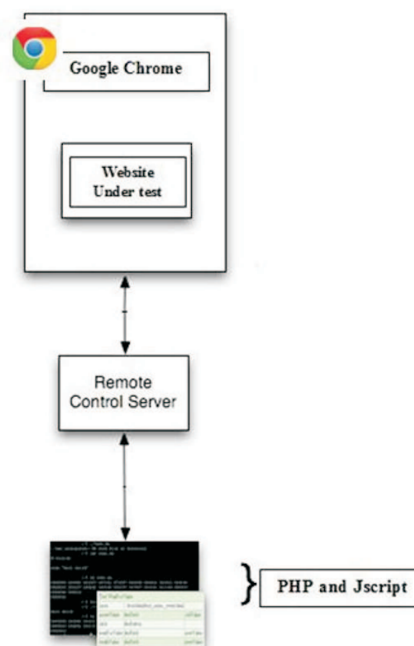


Figure 2. System architecture

Table 1. User acceptance testing results

Description	Strongly agree/ agree	Neutral	Disagree / Strongly disagree
Ease of use	72%	14%	14%
User respond to system	72%	14%	14%
User continue using system	57%	43%	0%
User able to use the system	57%	28%	14%

## 6. Conclusions

Automated software testing is becoming vital for several software projects in order to automatically verify key functionalities, test for regressions and aide teams to carry a large number of tests in a short period of time. Many system development projects especially larger projects still require a significant amount of manual functional testing in addition to automated testing, either because of the lack of sufficient resources or skills to automate all tests. Thus, a webpage testing tool called Automated Heuristic Evaluator (AHE) is developed to assist and ease up software testers tasks for webpages validation of heuristics problems. AHE is also found to be able accelerate overall webpage testing process and ease up test documentations procedures before and after testing. For future work, the tool should include with more creative interface and the design of the web based tool should be responsive layout and the code should be well synchronized and documented for future use.

## Competing Interests

The authors declare that they have no competing interests.

## Authors' Contributions

All the authors contributed significantly in writing this article. The authors read and approved the final manuscript.

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