Blackbox Testing Using Fuzzy Clustering Based on Boundary Value Analysis on The Text Opinion Mining Application in Traditional Culture Arts Presentation

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Abstract

The success of organizing a traditional work of art cannot be separated from the important role of data and information obtained from the public in general and viewers or art connoisseurs in particular. This information is an indicator that can be used to measure the amount of public attention to traditional arts, which is an effort to promote traditional cultural arts. Data and information related to traditional artworks were obtained from filling out the instruments that were distributed to the public online to produce an opinion form that contained a complete description with a discussion containing the aesthetic of the artwork. Opinion data is needed as a measure of progress and preservation of a work of art. The linguistic measurement of opinion can be solved using fuzzy methods in a cryptic form that can be weighted. In this study, the authors tested the audience opinion text mining application on the presentation of traditional cultural artworks using fuzzy clustering using the functional testing method (Black box testing). Through this test will be discussed related to the menu or module to produce information.

Keywords: text mining, fuzzy clustering, art, black-box testing

I. INTRODUCTION

In order to improve and promote a traditional work of art, instrument components that can be used as evaluation materials are needed. The assessment instrument can be obtained if a traditional artwork activity has been held. Things that will be evaluated in relation to the implementation of art performances can be started on how the general publication model to the public as a source of opinion data, the implementation of activities, the conditions of the infrastructure provided during the activity, the level of audience understanding of the meaning conveyed, the skills of the actors in performing arts, the quality of the scenario, the level of creativity and innovation, educational values and social messages conveyed as well as several other things until the implementation of art performance activities has been completed(Cao *et al.*, 2020). The success of holding a traditional art performance cannot be separated from the opinion of the audience. The audience's opinion contains information that can be used to measure people's attention and enthusiasm for art. Data and information related to traditional artworks were obtained from filling out the instruments that were distributed to the public online to produce an opinion form that contained a complete description with a discussion containing the aesthetic of the artwork(Xu *et al.*, 2019). Opinion data is needed as a measure of progress and preservation of a work of art. The linguistic measurement of opinion can be solved using fuzzy methods in a cryptic form that can be weighted. To optimize the processing of opinion data so that it is effective and accurate, a text mining application for audience opinion is made to present traditional cultural artworks using fuzzy clustering(Maji and Mahapatra, 2020). Before the implementation stage is carried out, a testing phase is required.

The software used needs to be tested due to provide an assessment of whether the software or application can be operated according to the expected function or not. The application developer must provide a separate session to test the application that has been created so that it can detect errors and

deficiencies. Software testing is an important part of the quality of software development apart from analysis, layout, and coding(Nurdewanto *et al.*, 2020). There are several ways of testing software that has been written in several pieces of literature. It is stated that in the software testing process, there are several general characteristics such as : Application testing starts from the module stage and leads to integration in computer systems, Application test techniques are carried out by software makers, Application testing techniques in large projects, carried out by groups independent examiner(Sonalitha *et al.*, 2020)(Li *et al.*, 2019).

The model used for testing is functional testing or Black-box testing. This test is more focused on the Boundary Value model which discusses the entire menu and the process of using it. In principle, testing the Black-Box method or generally called functional testing is a way of testing software without knowing the structure or content of programming code(Seyedzadeh *et al.*, 2020)(He and Tan, 2020). The tester is aware of what the application has to do but has no knowledge of how the programming in the application runs it. The reason for using the Black-Box method is one of which there is a separation of perspectives between the user and the application developer. Additionally, access to programming code is not required. So that the Black-Box testing method is very efficient for testing applications with a large programming structure.

II. RESEARCH METHODOLOGY

A. Software Testing

The research methodology used in testing this opinion text mining application uses the Black-Box testing method. The amount of time and place of research on testing web-based opinion text mining software was conducted at Merdeka University Malang. Research implementation for 8 months. From August 2019 to February 2020.

B. Opinion data sampling

Opinion data is distributed online to the audience at the time the art performance is held. Can be accessed through the address https://bit.ly/opinipenontonseni. The number of respondents collected was 148 people. for Instrument data and data collection Opinion data instruments to be used in the fuzzy clustering process consist of several categories, as follows: The identity of the respondent or research object includes email address, contact number, year of birth, gender, nationality, latest education, domicile location, whether or not you have seen art performances. To respond to the artworks, everyone needs a driving factor. The driving factor in implementing data sampling includes the frequency of watching artworks presentation, the motivation that encourages watching, and the purpose of watching(Baradaran and Navi, 2020)(Charwand *et al.*, 2020). In the representation of interest in art, it is necessary to identify an interest in traditional art, so the quality factors that support performances are considered including building conditions, lighting quality, sound system, music, property equipment, ease of viewers to reach locations, and whether or not there are publications. In a traditional art performance, it cannot be separated from the quality of the performance itself, the quality of the performance includes several instruments, namely the attitudes of the presenters, the skills of the presenters, and the scenario of the presentation(Bharill *et al.*, 2020)(De La Rosa and Yu, 2020). an instrument in the form of understanding the meaning of an art presentation is closely related to the ability to enjoy works of art in its implementation. Understanding the meaning conveyed in the performance concerns the level of understanding of the art that has just been watched and the ease with which the audience can capture educational messages, values, and social criticism(Al Kindhi *et al.*, 2019)(Bambang *et al.*, 2019). After being able to understand and enjoy the performance of traditional works of art, sustainability in the form of action is the main instrument in expressing attitudes which include the desire to recommend to others the desire to be involved in advancing traditional arts and the type of role you want to take to advance the art. Following are the modules tested using the Black-Box method:

Table 1. Test class data

Class Test	**Items Test**
Login	Fill in the login
	Verification
	Forgot password feature
Web Configuration	Fill in the web identity data

User Management	User list
	Edit feature
Import respondent data	External data pull feature
Clustering Process	Fill in the clustering process identity
Text mining process	Case folding
	Filtering
	Stemming
	TF
	IDF
Cluster Testing Process	Recap test results
	Recap of the final clustering results

III. RESULT AND DISCUSSION

In the discussion, there are main components, namely the Text mining Process, and the Clustering Process as the main components embedded in the application, the results obtained for the first time are application testing. The purpose of this application test is to determine the level of effectiveness of the text mining application in the opinion of art performance audiences(Lu *et al.*, 2008). Following are the specifications of the Text Mining application, Audience Opinion on Traditional Cultural Art Work Using Fuzzy Clustering:

Table 2. System specifications

The programming language used	PHP
Admin page	Admin backend Admin template
URL	http://opini-penonton.metodefuzzy.com/
A browser application that can be used	Microsoft Edge, Mozila Firefox, Chrome, Safari
Database	MySQL (MariaDB)

Before being able to login in figure 1, the username and password must be added first by a Superadmin level user. There is no forget password feature available. If you have forgotten your password, the user must report it to Superadmin.

Figure 1. Login page

For web configuration that is used in figure 2 and 3, it can only be done by superadmin level users, and limited User Management has the ability to have no date and time when a user was added and there is no history log that records the activity of each user.

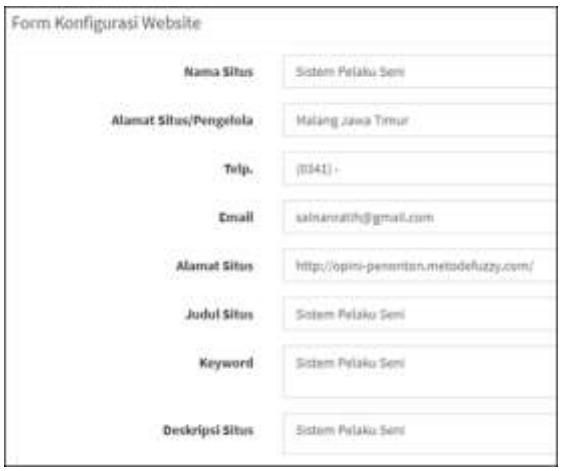


Figure 2. Web Configuration page

Figure 3. List of users

Import process in figure 4. Respondent data is used to extract audience opinion instrument data that is circulated online at the time of the performance. Receipt of respondent data has not been integrated directly into the application. So that the admin must import from the Google Form results sheet and adjust it to the provided xls template.

Figure 4. Form for importing external data

A. Clustering Process

In the clustering process in figure 5, several steps are carried out, namely including the user filling in the name of the testing process as the identity of the test after which the user fills in the number of clusters that divide opinion data into several clusters, to group similar opinion data after that the user fills in the number of iterations and the user clicks the Process button Clusters to run processes. The clustering process takes a long time (2 clusters, 2 iterations takes an average of 9-10 minutes on localhost), so when running on web hosting, the clustering process will be interrupted and stopped by the timeout from the webserver.

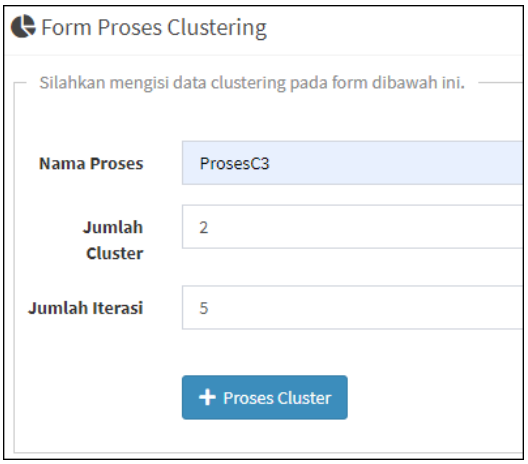


Figure 5. Form for the clustering process

B. Text mining process

To produce the characteristic value of each opinion cluster, each description goes through several stages as follows: the first stage is Case Folding, which is at this stage the program removes ASCII characters other than letters, and performs lower cases and is obtained. The resulting data shows all text to be lower cases, The resulting data shows that there are no characters other than letters and in the Case Folding results list view, there are no features or information on original opinion data and case folding

results as a comparison. After that the Filtering process is carried out, in the filtering process, important words are taken from the tokenizing results(De La Rosa and Yu, 2020). This step can be done with 2 techniques, namely, stop lists (removing words that are not important) and word lists (storing important words). The results are obtained in the form of a recap of filtering results and the list view of filtering results, there are no features or information on words. which are grouped informatively in the table, which one-stop list or word list. So that the accuracy of the filtering process cannot be known. after that, do the steaming process(Zhao and Cheng, 2011). The stemming process is carried out to find the basic words from the filtering results by removing the affixes so that in the results of the testing there is already a recap of stemming results and some words such as performances, awareness, cultivated, equipment, developed, staging, marketing is still in the Stemming results.

No.	Nama/ID	Keyword	TF
1	1	apresiasi	0
2	1	bagus	1
3	1	buruk	0
4	1	cukup bagus	0

Figure 6. Recap of TF results

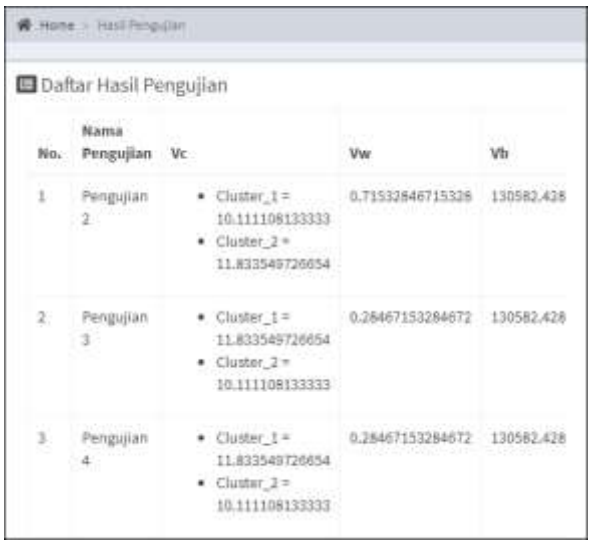
No.	Keyword	DF	IDF
1	apresiasi	26	1.676
2	bagus	103	0.3
3	buruk	0	0
4	cukup bagus	55	0.927
5	cukup mengerti	53	0.964
6	cukup paham	76	0.604
7	cukup tangkap	51	1.003

Figure 7. Recap of IDF results

The next step is TF (Term Frequency) or calculating the frequency of the appearance of each of these keywords in Figure 6. The test results are given the weight of these keywords to show the level of importance of these keywords from an opinion description. On the TF Result List page, there is no record navigation. The last button is available to go to the last record(Meng *et al.*, 2020)(De La Rosa and Yu, 2020). There is no information on what the total number of keywords is, the total keywords per respondent, and the TF ranking to find out the highest or lowest keywords of an audience and Filters per user do not work properly. In the IDF (inverse document frequency) test, Figure 7 is obtained. There is no information on the total number of keywords, total keywords per respondent, and IDF orders.

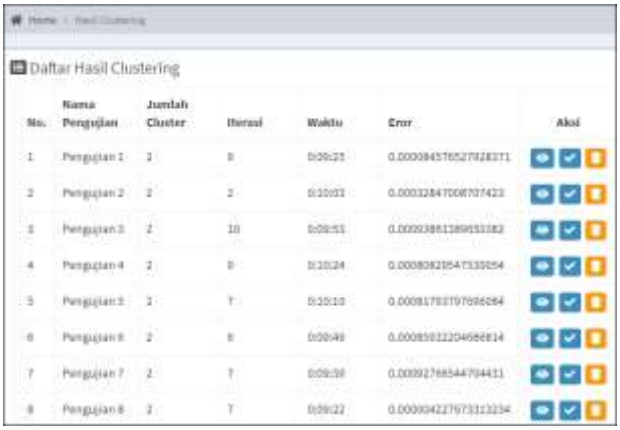
C. Cluster Testing

The user first chooses the identity of the clustering process which is made at the clustering process stage of the test results, the results can be seen in Figure 8, the results of each test are displayed in each clustering process, Sorting cannot be done to find out which clustering process has the smallest V so that It is known that the best cluster value, then the variant within-cluster Vw, this variation is utilized to see the comes about of the fluctuation of information conveyance in a cluster(Gan, 2019)(Charwand *et al.*, 2020). this variation is utilized to see the comes about of the fluctuation of information conveyance in a cluster. The littler the Vw value, the superior the cluster. Within the between cluster (Vb) variation, this variation is utilized to see the comes about of the change of information conveyance between clusters. The more prominent the Vb value, the way better the cluster(Gan, 2019)(Kim *et al.*, 2020). To see the variations of all clusters, it can be seen at the V esteem, the littler the V value, the superior the cluster value. by reason of there are no specific opinion data filter settings to be processed, all opinion data collected and stored in the database are processed immediately, so that the Vc, Vb, Vw, and V data are uniform or similar.



Daftar Hasil Pengujian

No.	Nama Pengujian	Vc	Vw	Vh
1	Pengujian 2	• Cluster_1 = 10.111108133333 • Cluster_2 = 11.833549726654	0.71532846715328	130582.428
2	Pengujian 3	• Cluster_1 = 11.833549726654 • Cluster_2 = 10.111108133333	0.28467153284672	130582.428
3	Pengujian 4	• Cluster_1 = 11.833549726654 • Cluster_2 = 10.111108133333	0.28467153284672	130582.428



Daftar Hasil Clustering

No.	Nama Pengujian	Jumlah Cluster	Iterasi	Waktu	Error	Aksi
1	Pengujian 1	2	8	0:09:25	0.000084576527828371	
2	Pengujian 2	2	2	0:10:03	0.000328470087074223	
3	Pengujian 3	2	10	0:09:51	0.000038613898553382	
4	Pengujian 4	2	9	0:10:24	0.000082185475339054	
5	Pengujian 5	2	7	0:10:10	0.000817937976986084	
6	Pengujian 6	2	8	0:09:48	0.000893222046868814	
7	Pengujian 7	2	7	0:09:59	0.000927665447944431	
8	Pengujian 8	2	7	0:09:22	0.000004227673313234	

Figure 8. Recap of clustering test results Figure 9. Recap of clustering result data

The results of Final Clustering in Figure 9 are in the form of data format displayed. Final Clustering Results List only displays the calculated data in the form of a percentage for each keyword, but there is no conclusion from the audience characteristics in each cluster that is generated using this percentage data in figure 10.

Daftar Hasil Final Clustering

Karakteristik Cluster_1

No.	Keyword	Prosentase
1	tidak pernah	0.83 %
2	pernah	0.79 %
3	sering	3.26 %
4	jarang	4.17 %
…		
33	tidak tangkap	0.83 %
34	tangkap	3.94 %

Figure 10. Recap of the final clustering result data

IV. CONCLUSION AND FURTHER RESEARCH

After testing the application, here are the conclusions of the recommendations given to complement the features of the application, namely the results of clustering using an infographic display, displayed in graphical form so that the reading of the conclusions and information displayed is easy to understand. however, the results of the clustering process can be downloaded by the user in the form of CSV or PDF data so that they can be used for further data processing or as reporting. The conclusions in the infographic can show the character of the audience's opinion according to the existing categories in the respondent form, for example, quality, the meaning of the art displayed, etc. which can be used as information for further development in the art sector in Malang. acceptance of respondent data is integrated directly into the application. There is no need to import from the Google Form results sheet and in the Filter Results data, it is necessary to display the discarded words, which can be used as evaluation material. Then From the list of Final Clustering Results, information can be displayed as a conclusion of the audience characteristics in each cluster produced. In the Clustering Process Form, it is recommended that the process name be automatically generated by the system, for example using a combined format of date - time - and ID or serial number. In the Clustering Process Form, recommendations for the number of iterations by default can be displayed or iterations can be carried out continuously and the process can

stop automatically until the resulting error value is within the specified range. needs to be recommended. For the history of admin user activity to be recorded, it is necessary to provide a log module. Also, the clustering assessment results from collecting opinion data need to be given a date or period limit. External factors such as economic conditions, or other external factors may differ over some time. Technically, this can also help the application run more optimally and process filtered data only at a certain time, not all data in the processed database.

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