Developing and Evaluating a Jejakatua Virtual Campus Tour Prototype Using Auto-stitching Technique

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Abstract.
This paper describes the design and manufacture of virtual campuses with auto-stitching techniques. The automatic stitching technique using Insta360 allows getting a panoramic view of the 360° campus area. The creation of a virtual campus is built by each campus to support campus promotion more fully and more closely. The prototype of the Virtual Campus Exploration (Jejakatua) application was implemented at the Faculty of Computer Science UPN "Veterans" Jatim the Jejakatua application page and evaluated by users using a set of questionnaires distributed using Google Forms. The results of testing by the black box test the built system is in accordance with the design and can be operated properly. Studying the questionnaire to 30 respondents from UPN "Veteran" Jatim academicians gave a pretty good average response. So Jejakatua is fully built using the auto-stitching method using Insta360 and is quite feasible to be implemented on Campus.

Keyword: Jejakatua, Auto-stitching, Virtual Campus Tour, Digital Promotion Media

1. Introduction
Virtual tours provide information through multimedia, giving users the impression they are navigating locations and experiencing them in real-time. Virtual tours have the opportunity to give a person's experience of visiting a virtual location but with an actual and realistic feeling as representing the desired place [1] [2], virtual tours also have characters that are able to represent places, locations, layouts, objects, and other facilities available in the environment can interact and the ability to navigate freely in the virtual. In the digital development era, there are a lot of tourism sites that use virtual tours as a digital promotion media, not apart from being a campus digital promotion media to attract students and campus partners who will be able to collaborate. Prospective students and prospective partners certainly do not want to linger on the way to campus to just look at the conditions of the buildings and campus facilities available, for them will spend time, energy, and costs. Therefore [3]–[7] conducted research on the design and implementation of virtual tours for the campus so that the navigation limitations of the maps application can be replaced with the virtual tour application. A campus that will deeply display parts of the building room. many techniques used by previous researchers but in this study will focus on auto-stitching using insta360 which will then be integrated with KRPano Viewer as an application tasked with collecting various panoramic photos. So, in the end, this research will give results from the making and evaluation of the campus virtual tour application which is then called Jejakatua by using auto-stitching techniques.

2. Literature Review
2.1 Virtual Tour Campus
Virtual tour in Indonesia is still having interesting discussion, so until now university virtual tour is still being an interesting object to explore for the researcher and also expanding due to the growing needs and problems. Even there's not much universities using this virtual realities technology yet, the virtual tour trend is continue to grow among the universities. University virtual tour is actually virtual tour that technically combining between photography technology and information technology that aiming to giving
comprehensive informations about places in interactive mode [4] [8]. Architecture information and architecture can be proceed further to be an information source about university and its facilities, and also can be converted as virtual tour application.

2.2 Digital Campus Promotion

In its utilization, virtual tour can also be used as promotion media or information media to engaging people with some specific location [1], [5]–[7], [9], [10]. Generally, virtual tour often used as country and culture promotions, in this digital information era, the virtual tour utilization can be also used as university promotions media. This activity has been held by the researchers [11], [4] [12]. Virtual Tour ability to give detailed information encourage many universities to use university virtual tour facility. Basically, university virtual tour is one of the efforts of university business stakeholder to competing to gain more chances about collecting more new university students and also future business partnership.

3. Method

This application development is adopting Multimedia Development Life Cycle (MDLC) model software process proposed by [13]. The main, fundamental reason of choosing this model is the software requirement specification is easily understandable and also the work flow is guided by the past researches [14].

![MDLC Implementation](image)

Figure 1 shows the 1-6 steps on setting the university virtual tour. At the first step, researchers formulate the needs, tools, and concept of Jejakatua building process. Conceptually, UPN “Veteran” Jatim is the researchers’ object supported by HTML 5, CSS 3, Insta360. At the second step, the researchers build special design to finish the application design using UML. At the third step, researchers deciding on the spot ‘hotspot’ then collecting panoramic photos 360 using auto-stitching technique with insta360 air.

At the fourth step, the third steps results is being processed with KRPano Viewer, so the researchers get the overview of the university virtual tour. HTML 5 and CSS 3 are supporting user-friendly overview for Jejakatua. At the fifth step, it is the examination step. The researchers implementing black box testing
technique then evaluating the purpose’ building conformity. At the sixth step, the quality-control passed application is distributing to the public by uploading it to Jejakatua web-page.

There are 50 users participating at testing Jejakatua. Researchers give the closed-questionaire and collecting the beta testers’opinion about Jejakatua application. The questionnaire is separated become many categories which is visualisation, navigation, building purpose, and users’ satisfaction (Ibrahim, 2010). There are 5 options for every question. They are Excellent (5) very good, (4) good, (3) netral, (2) low, (1) very low. The researchers use [11] for the scoring standart that is low (0-1.66), netral (1.67-3.33), and good (3.34-5.00).

4. Result

This result will be presented in the form of the work of 360° panoramas with auto-stitching techniques, their application to the Paradox, and the results of the evaluation.

4.1 Panorama 360° with auto-stitching

![Figure 2. Front view of the Computer Science Faculty Building](image)

![Figure 3. Classroom of the Computer Science Faculty Building](image)

Figures 2 and 3 show the results of panoramic shooting using auto-stitching techniques, the results obtained will then be continued by combining various panoramic photos into one series in a hotspot.
4.2 Jejakatua Apps

![Front View of the Computer Science Faculty Building in Jejakatua](image1)

Figure 4. Front View of the Computer Science Faculty Building in Jejakatua

![Main Lobby View of the Computer Science Faculty Building in Jejakatua](image2)

Figure 5. Main Lobby View of the Computer Science Faculty Building in Jejakatua

Figure 4 and 5 are the results of a series of process steps so as to produce a combination of panoramic photos that can be accessed through the Jejakatua page.

4.3 Testing and Evaluation Jejakatua Apps

In line with needs research, the test for Jejakatua application in this research is using Black-box test, and these are the results:

| Modul             | Scenario | Testing          | Result   |
|-------------------|----------|------------------|----------|
| Panoramic         | Normal   | Black-box        | Accepted |
|                   | Alternative | Black-box    | Accepted |
| Auto-stitching    | Normal   | Black-box        | Accepted |
|                   | Alternative | Black-box    | Accepted |
| Related event module | Normal   | Black-box        | Accepted |
|                   | Alternative | Black-box    | Accepted |
The result from table 2 give the explanation about Jejakatua testing run to UPN “Veteran” Jatim, it runs normal. The first study about this virtual reality application reveals that if we take pictures using panoramic picture 360° and auto-stitching we have to synchronize first between insta360 Air and installed insta360 software in our smartphone. Second, the test result reveals that auto-stitching mode works successfully for building Jejakatua, and should be able to build another university virtual tour. The results offers in auto-stitching panoramic 360 mode, paradox application, and evaluation results. For the evaluation results Ms. Excel with measurement of mean, media, and mode. The following results are the data output of the questionnaire that has been distributed online to users of Jejakatua.

| Category       | Median | Modus | Mean | Marks Scale |
|----------------|--------|-------|------|-------------|
| Appearance     | 4      | 3     | 3.54 | Good        |
| Navigation     | 3      | 3     | 3.32 | Enough      |
| Purpose        | 3.5    | 3     | 3.42 | Good        |
| User satisfaction | 3      | 4     | 3.28 | Enough      |

Result from Table 1 shows that there are median value from user’s evaluation for every feature in Jejakatua from the value of 3, it shows that Jejakatua gains uite good feedback from users and this score results shows that Jejakatua is acceptable for the users. The researchers is not examining about social technology impact so this research simply assuming these following points. First of all, Jejakatua overview is gaining enough attention from the users, and it causes the users don’t easily get bored on using Jejakatua. Second, our navigation feature is gaining uite good csoring from the users, that means our current navigation system is user friendly.

Third, the purpose of making Jejakatua is in line with users expectation who want to know about UPN “Veteran” Jatim location detail. Last but not least, users satisfaction of using Jejakatua is gaining quite good score, means in this condition (prototype), user feel that Jejakatua is giving a satisfying service. With a little bit more descriptive analysis shown above, the researchers not giving enough theoretical feedback due to technology acceptance model or adoption theory model as done by [15]–[18]. Because of it, so the researchers deeply suggest for further research, researchers can also developing into VR [6], [19] can also tested to Jejakatua reliability and acceptability, at the stage of development the Parrots can be optimized to be developed into a Saas using mobile technology [20], [21].

5. Conclusion
In conclusion, this research has achieved its goal. Jejakatua has been successfully built through automated sewing techniques with Insta360 tools, as a result, the prototype of the Jejakatua application has passed functionality testing through black-box testing, and has received good feedback from users based on user evaluations from questionnaires distributed by openly providing the Jejakatua page. Researchers understand many of the shortcomings in this research, to enhance the development of the Research Foundation recommending ideas that can be worked on in the future, namely the addition of VR features that allow users to have very different experiences to view campuses with strong digital images and test their acceptance of high school students who happen to be prospective students and prospective partners.

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