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Tourism Object Information System In Madura Web Based

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A B S T R A C T

Madura is one of island in East Java that has four regency; those are Bangkalan, Sampang, Pamekasan and Sumenep. Madura was called Salt Island because it is one of the largest producer of salt in Indonesia. Madura is also famous of diversity culinary tours and beautiful tourism. This final project create information system that can be introducing Madura especially four regency in Madura. The introduction are tourism, hotel, the price of ticket in every tourism, the price of foods the history of Madura and pictures. Hopefully this information system can help tourists to get all of any information about tourisms and hotels in Madura easily. With the web-based tourist information system in Madura, it can help tourists in finding tourist attractions and culinary tourism in Madura From the results of the implementation of the design of tourist information systems in Madura, information about tourist attractions, culinary tours, and hotels can be accessed easily and not limited to time and place.

Keywords: Madura, Hotel, Information System.

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1. Introduction

Madura is an island that is included in the province of East Java which has four districts including Bangkalan, Sampang, Pamekasan, and Sumenep. Madura Island is known as the salt island, because it is one of the regions in Indonesia that produces the most salt. Madura Island is famous for its diverse culinary and tourist attractions, with a total area of 5,168 km2.

Madura Island has experienced very significant progress in various fields, one of which is in terms of tourism. Tourist attractions and culinary tours in Madura are very diverse ranging from culinary tours, tourist attractions and various other tours. This causes many tourists who are interested in visiting Madura to see tourist attractions and culinary tours in Madura.

Tourists who are interested in tours in Madura usually first seek information from the internet or information from people who have already visited the island of Madura. The information sought usually starts from the location information of attractions, hotels, ticket prices, food prices, the history of the island of Madura, and souvenirs typical of Madura. Along with the rapid development of technology, one of which is the internet, it is time for manual information management to be gradually replaced with information management that is technological in nature

1.1. Scope of problem

a. The location of the research object in Madura consisting of

- Hotel

Bangkalan Regency: Ningrat Hotel
Sampang Regency: Hotel Happy
Pamekasan Regency: FrontOne Hotel, Odaita Hotel
Sumenep Regency: Hotel C1

- Tourist attraction

Bangkalan Regency: Bukit Geger Tourism, Konang Natural Fire, Rongkang Beach, Maneron Beach, Cow Race, Aer Mata Ebhu Market, Arosbaya Great Tomb, Pasyaan Syaichona Cholil, Bujuk Sunan Cendana, Lighthouse Area, Cakraningrat Museum, City Recreation Park, Arosbaya Grand Tomb Tretan, Batik Writing.

Sampang Regency: Camplong Tourism Beach, Wide Cave, Nepa Monkey Forest Tourism, Toroan Waterfall, Nepa Reservoir Tourism, Klampis Reservoir, Oto Baths', Trunojoyo Site of Preaching, Trunojoyo Site, Ratu Ebu Site, Daksan Well, Site of Santo Merto Tomb, Site of Tomb Tomb Bangsacara and Ragapatmi, Tomb of Sayyid Ustman Bin Ali Bin Al-Habsyi's Tomb, Seven Sorcerer Wells, Prince Panji Laras's Story.

Pamekasan Regency: Jumiang Beach, Talang Siring Beach, Batu Kerbuy Beach, Api Kunjung Padam, Sambir Pasean Valley, Pasarean Pangeran Ronggosukowati, Pasarean Batu Ampar, Aulokitesvara Temple, Klampar Batik Village, Regional Museum, Arek Lancor Monument, Kerapan Sapi, Sapi Ronggosukowati Sonok

Sumenep Regency: Lombang Beach, Slopeng Beach, Gili Iyang, Gili Labak, Badur Beach, Sumenep Palace, Kalianget Old City, Muang Sangkal Dance, Ludruk, Saronen, Asta Tenggi, Sumenep Jamik Mosque, Asta Yusuf Talango, Payudan Cave, Panaongan Old City .

- Culinary tour

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Bangkalan Regency: Soto Mata Sapi,
Nasi Serpang, Tajin Sobih
Sampang Regency: Duck Songkem,
Kobel Rice
Pamekasan Regency: Nasi Jamila,
Nasi Ramoy, Campt Langtolang, Soto Ayam Keppo, Campur Bazar, Campur Lorjuk
Sumenep Regency: Soto Sumenep, Sate Madura

b. Hotel data in the information system uses hotel data that is well known in each district.
c. The maximum number of attractions in each regency is 30 tourist attractions, culinary tourism and hotels

Design and manufacture of web-based simeulue district tourism information systems. Ali Fuadi, Information System Study Program at the School of Information Management and Computer STMIK U'BUDIYAH INDONESIA, 2013 Simeulue is one of the tourist destination districts in Aceh, ranging from local tourists to foreign countries. The tourism categories that become the choice are beach tourism, waterfalls, culture, and other tourism. The purpose of making this information system is to promote tourism so that it is more widely known by the public. The system design method used to identify the components of information system design includes the design of ERD, DFD, Flowchart, and database table structure. For making this information system using notepad ++ software with PHP programming language and Mysql database. With this information system, it is expected to make it easier for tourists to get information about attractions to be visited.

A case study web based tourism information system in Karimunjawa Jepara. Zainul Adfar, Sulastri, Karimunjawa Islands consists of 27 islands located in the Java Sea. Which has the potential for tourism such as nature tourism, religion and culinary tourism. Hotel and home stay as a place for lodging for tourists. To get to Karimunjawa, you can use boat transportation. Tourists from outside the area generally do not know tourism in Karimunjawa Jepara. To overcome this, the application of web-based information systems as an appropriate step in providing tourism information Karimunjawa Jepara. the problem faced in this research is how to design a web-based tourism information system in Karimunjawa Jepara that is interesting and easily accessible to tourists. The purpose of this study is to analyze, design and build a web-based tourism information system that can provide complete information to users about attractions, hotels, cruise schedules. Analysis tools used in this study are Use Case Diagrams, Activity Diagrams, Sequence Diagrams and Class Diagrams. This research has resulted in a web-based tourism information system application that serves to provide tourism information in Karimunjawa Jepara. "Information about the tourism displayed is still very simple, so it needs to be developed further so that the appearance and information generated is more complete and interesting".

Web-based tourism information system: a case study of lodging facilities in the province of Yogyakarta. R. Soelistijadi. This WEB-based Lodging Information System provides some information that is directly related to lodging information in the Yogyakarta Province Region. The information system built is interactive in which the user (the user of information) can choose their own lodging information needed. In this case the information selected is based on several criteria, namely the location of the inn, the rental price listed and the number of bedrooms provided. This is based on the idea that each tourist has their own considerations in determining a representative lodging. The research objects used in this research are several villas in the province of Yogyakarta. The choice of location is given the province's statistical ranks second after the province of Bali in terms of Tourist Destinations (DTW).

2. Methods

2.1. Observation

A data collection technique by direct observation of objects in the field

2.2. Interview

Interviews were conducted with parties related to the title of the final project, namely the manager of the tourist attraction

2.3. Study of literature

Observations by looking for information from users who use a similar system elsewhere, as a material consideration in building a new system

2.4. Information Systems

The information system is also a system that contains a SPD (Data Processing System) network that is equipped with communication channels used in the data organization system. The process elements of an information system are: collecting data, processing data, and spreading information. In information systems, humans interact with humans, humans with computers, and computers with computers. In information systems data, information, or knowledge flows carried by documents or electronic communication media, such as telephone or computer networks.

2.5. The web

Web or website can be interpreted as a collection of pages that display information on text data, still or motion picture data, animated data, sound, video and or a combination of all, both static and dynamic that form a series of interrelated buildings where each - each connected by networks (hyperlinks).

2.6. Tourism

The term tourism comes from two syllables, namely pari and tourism. Pari means many, many times or in circles. Tourism means travel or traveling. So tourism is a trip that is made many times or circling from one place to another. Tourism has a very broad meaning, and not just traveling alone, but also relates to the objects and tourist attractions visited, means of transportation used, services, accommodations, restaurants, entertainment, social interaction between tourists and local locals.

2.7. System Design

From the context diagram, to manage the admin level system correctly input the username and password to go to the admin main page. Admin has the duty to input data and manage the contents of the system in the form of additional districts, hotels, tours, culinary, photos which are then processed to be displayed on public pages.

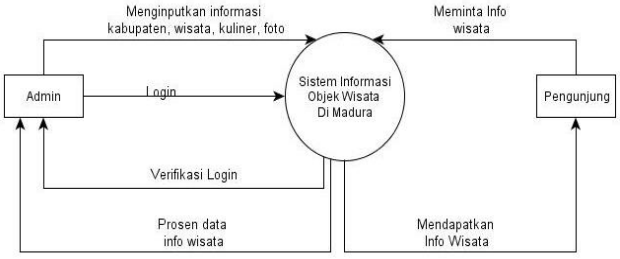

Figure 1. Context Diagram

From the visitors do not need to log in, so visitors can immediately get the desired information.

3. Result and Discussion

a. Main course

The main menu is the menu that will appear first when the user first accesses it.

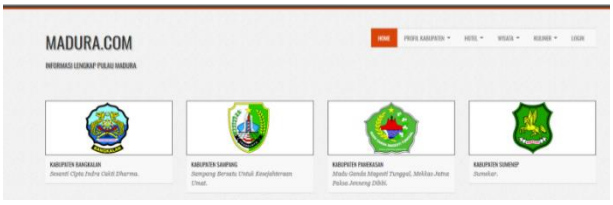

Figure 2. Main course

b. Regency Profile Menu

The district profile menu has several district profiles in Madura

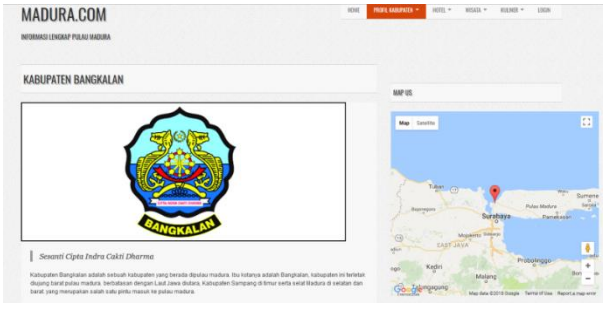

Figure 3. Regency Profile Menu

c. Tourism Menu

In the tourist menu the user can choose from several tours, such as nature tourism, cultural tourism, religious tourism, and artificial tourism.

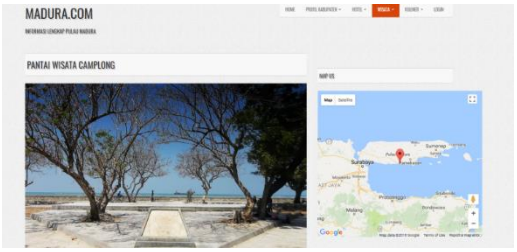

Figure 4. Tourism Menu

d. Main Menu Admin

The admin main menu can be accessed if the admin manages to enter the login page.

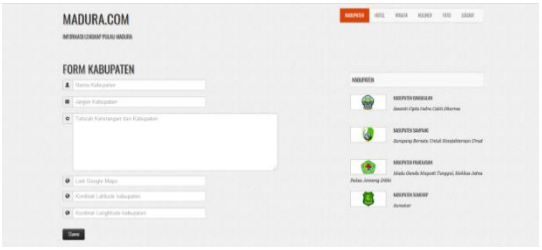

Figure 5. Main Menu Admin

4. Conclusion

Based on the results of research and implementation carried out in this Final Project, it can be concluded that:

a. With the web-based tourist information system in Madura, it can help tourists in finding tourist attractions and culinary tourism in Madura

b. From the results of the implementation of the design of tourist information systems in Madura, information about tourist attractions, culinary tours, and hotels can be accessed easily and not limited to time and place.

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Visualization of Learning Analytics on E-Learning Information System Subject

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A B S T R A C T

E-Learning as the concept of education today that utilize computer network technology to do the learning, but the E-learning at less value in assesing the behaviour pattern of students to learn because E-learning has not been able to provide an appropriate learning features with the character of students doing learning. In order to learning process on the E-learning system attractive and easily evaluated by lecturer or students, it is necessary to visual learning analytics in the system. Visual learning analytics conducted to analyze with the last result in the form of learning-based images, graphs, or diagrams. The system uses E-learning Information systems courses, the system processed by take the log of E-learning as a source to behaviour pattern of user, and then data are group based on determined criteria. The results of these grouping then visualized in form of a speedometer. By implemented this system, lecturer can easily observed, evaluated and asses the behaviour of students in do the learning, and students can evaluated behaviour patterns himself in do the learning. Based on the trial results were applied, overall the systems can be implemented properly by the students and lecturer with an average value of 7.7 out of students and the average value of 8 from lecturers is entered into either good category.

Keywords: E-Learning, Visual Learning Analytics, Information System

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1. Introductions

E-Learning or Electronic Learning is a form of learning that utilizes computer technology and computer or internet networks to conduct distance learning and training. At present E-Learning has been widely used by various types of educational institutions because it is flexible and can save tuition fees. Due to the presence of computer equipment and internet connections that are deemed optimal, this condition has encouraged the campus to pioneer the development of E-Learning. There are several majors that have applied E-Learning as a method of learning, not least in the department of informatics engineering, especially in the Information Systems course. Basically E-Learning that is used in Information Systems courses currently cannot assess student development in learning, as well as students who have not been able to evaluate themselves in learning in E-Learning. With these conditions, there is a need for visualization of learning analysis (Learning Analytics) obtained from log tables as a source to look for patterns of student behavior which are then visualized in various forms such as speedometer, graphics, etc.

Visualization is engineering in making drawings, diagrams or animations for the appearance of information, and data visualization can convert data into visual formats or tables so that the characteristics of data and relationships between data items or attributes can be analyzed or reported [1]. Learning Analytics is the collection and analysis of data related to student learning. The purpose of Learning Analytics is to observe and understand student learning behavior to enable appropriate interventions [2]. The activities of using E-Learning are analyzed into four categories, namely: "course summary, per-student statistics, per-resource statistics, and time-based statistics" [3]. Learning Analytics involves the collection and analysis of data to predict and improve student success. One of the factors driving increased interest in the existence of learning analytics is the tendency to increase accountability at all levels of education. In addition to national-level interests, there are more local goals in Learning Analytics, including predicting student performance, suggesting learning that is relevant to students, increasing student reflection and awareness, detecting unwanted student learning behavior [4].

Dian Kusuma Ningtyas (2008) conducted a study entitled "Analysis of the Behavior of E-Learning System Users in Gunadarma University". In this study, researchers used the Log Data Mining clustering approach to look for patterns of E-Learning user behavior at Gunadarma University. The initial step taken is to analyze the log to find out all activities carried out when accessing the E-Learning system, then to apply the concept of data mining based on clustering techniques. The next step is to look for user access patterns, the pattern of user concern is the user's time in accessing the E-Learning system and activities that are often carried out. The final result shows that there is a lot of student interest in higher subjects and accessing E-Learning is mostly done in the last week [5].

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2. Methods

2.1. System Design

To build a system, the design is needed to simplify the work process because it will be more structured in each process and if something goes wrong it will be easier to overcome them. The following is a picture of the overall system design:

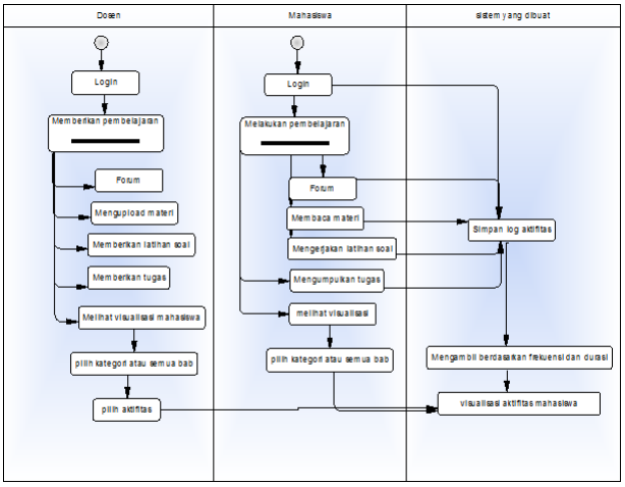

Figure 1. Overall System Design

From the system design in Figure 1, it can be seen that the process of running the system is first logged in after that students can do several kinds of learning activities such as discussion in the forum, reading material, doing exercises and collecting assignments. Activity data that students do will be stored in the log table system, then the system will retrieve data based on the duration and frequency of activities. After the data is processed it is then displayed in the form of a speedometer visualization.

the activities used in this study include the following:

a. Number of tasks performed (assignment)

Every student is obliged to send assignments given by the instructor. In this activity the parameter is the number of assignments sent by students, sometimes there are students who neglected or forgot about sending assignments. If a student sends assignments to a number of assignments given by the lecturer, the results from visualizing student behavior on these criteria will be valuable maximum. The following is the formula (1) used to get the speedometer value on the activity of collecting tasks:

$$Rumus = \frac{\sum tugas\ yang\ dikerjakan}{Jumlah\ Tugas}\ x\ Nilai\ max\ speedometer \quad (1)$$

To calculate the value of the activity of collecting assignments as in formula (1) is the number of assignments done by students compared to the number of assignments given by lecturers, then multiply by the maximum value of the speedometer.

b. Login system

The login system includes the number of times students log in to do learning on the Visual Learning Analytics system. The following is the formula (2) used to get the speedometer value for system login activity:

$$Rumus = \frac{\sum Login\ sistem}{Max\ Login\ sistem}\ x\ Nilai\ max\ speedometer \quad (2)$$

To calculate the value of system login activity as in formula (2) is the number of student logins compared with the most number of logins performed by his friends in one class, then multiplied by the maximum speedometer value.

c. Active in the forum

Active in the forum in question is the number of times a student makes a post or comments on a forum, the system will count how many students make a post and make a comment. The number of posts and comments are taken from the log table and then visualized in the form of a speedometer, the needle will lead to a certain value according to the frequency of the forum. The following is the formula (3) used to get speedometer values on active activities in the forum :

$$Rumus = \frac{\sum postingan}{Max\ Postingan}\ x\ Nilai\ max\ speedometer \quad (3)$$

To find the speedometer value of active activities in the forum in formula (3), the frequency in posting and commenting is compared with the active frequency in the student forum in one class then multiplied by the maximum value of the speedometer.

d. Access material

The material access activity is calculated from the number of times (frequency) and how long (duration) students access the material. The more and more students in reading the material, the speedometer value the bigger, and vice versa. The following are formulas (4) and formulas (5) used to calculate the speedometer value of material access:

$$durasi\ akses = \frac{\sum durasi\ akses\ materi}{jumlah\ akses\ materi} \quad (4)$$

$$rumus = \frac{durasi\ akses}{max durasi\ akses}\ x\ nilai max speedometer \quad (5)$$

To get the speedometer value the first step that must be done is to look for the average value of the duration of access to the material as in formula (4). Duration of material access is added up by the total number of accesses then divided by the number of material accesses. After that, the next step is to find the speedometer value as in formula (5). The average duration of access to material calculated in a formula (4) is then compared with the average access of other students in one class, then multiplied by the maximum value of the speedometer.

e. The amount of work on the exercises

This activity is calculated from the number of times students work on the exercises. The more students in doing the exercises, the greater the speedometer value, and vice versa. The following is the formula (6) used to get the speedometer value to do the exercise questions:

$$Rumus = \frac{\sum Mengerjakan\ Latihan\ soal}{Max\ Mengerjakan\ latihan\ soal}\ x\ Nilai\ max\ speedometer \quad (6)$$

To find the speedometer value doing the exercises in formula (6) is the number of students doing the exercises compared to students in one class, then multiplying by the maximum value of the speedometer.

3. Result and Discussion

3.1. System Display

After the system is tested on students of Information Systems courses, the activity data in the log tables are grouped according to frequency and duration, then the data is visualized. The following is a display of the activities carried out by students and then will be visualized:

Login

Figure 2. Login

In Figure 2 is a display of the login page, the user login system by entering a username and password. The frequency of students logging in will be compared with the frequency of other students, then the results of these frequencies are visualized as shown below:

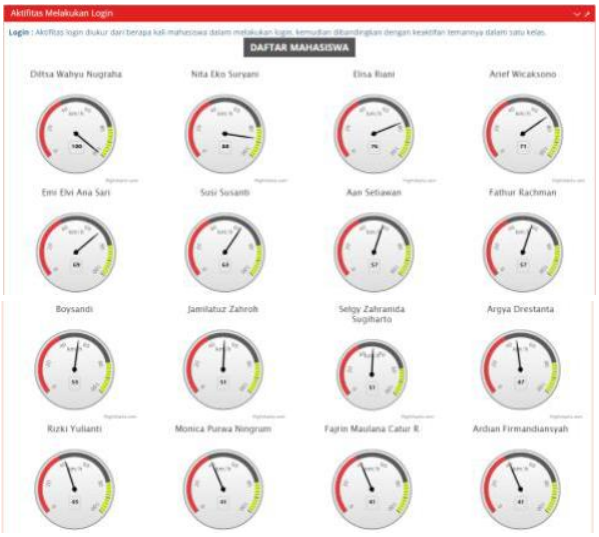

Figure 3. Visualization of login activities

In figure 3 it can be seen that the student who gets the highest speedometer score is Diltsa, while the other students get a speedometer score below 100. This means that diltsa is the student who most frequently login the system when compared with his classmates. From the results of the visualization, lecturers can find out active students and students who are less active in system logins.

3.2. Objectivity Test

To find out whether the system has been made in accordance with the desired objectives, then testing the scenario is done by distributing questionnaires to lecturers and course students

Information system. The assessment given in the questionnaire is further processed with the following stages of the process:

1. Calculate the average value for each variable
2. Grouping the results of the calculation of each variable into three categories, namely:
   a. good, if it's> 7.5
   b. enough, if 7.5 => average => 5
   c. less, if average <5

The following is a graph of the average results of assessments conducted by students:

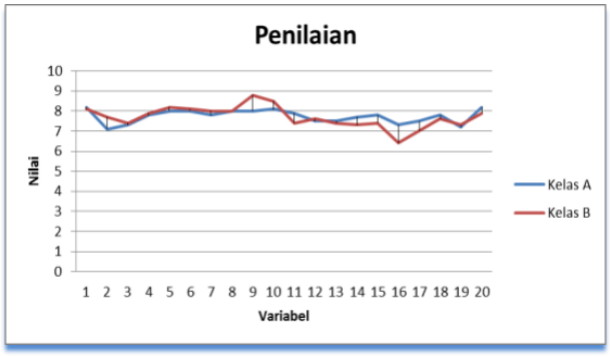

Figure 4. Student Assessment Questionnaire Chart

The following is the average calculation of grade A and B questionnaire assessments:

Table 1. Average assessment of student questionnaires

No	Question	Value
1.	Ease of access to the E-Learning system	8,2
2.	Interface (display) E-Learning system	7,4
3.	The appeal of E-Learning	7,4
4.	Ease of getting information	7,9
5.	Clarity of available information and data	8,1
6.	Clarity of available information and data	8
7.	Ease of operation and can be studied again	7,9
8.	Complete learning activities on the E-Learning system	8
9.	Ease of doing material access activities	8,4
10.	Ease of carrying out activities to collect tasks	8,3
11.	Ease of doing the practice questions	7,7
12.	Ease of operating forum features	7,6
13.	Interface (display) visualization of student learning activities	7,5
14.	The appeal of visualization	7,5

15.	Ease of information obtained from the results of visualization	7,6
16.	The suitability of learning activities with the results of visualization	6,9
17.	Completeness of visualized learning activities	7,3
18.	With the visualization can easily evaluate learning activities	7,7
19.	Ease of understanding the results of visualization	7,3
20.	Assessment of visual learning analytics as a whole	8,1
Average		7,7

From the results of the calculation of the average of each variable in table 1 above, it is obtained the average rating of an overall student score of 7.7. From these results, it can be concluded that the Visual system Learning Analytics falls into the category of both overall variables for students.

4. Conclusion

a. Conclusion

Conclusions from research on visualization of learning analysis (learning analytics) on E-Learning information systems courses:

1. The Visual Learning Analytics system can be used by lecturers and students to monitor learning activities undertaken by students. This is proven by the visualization features found on user pages. Lecturers can see all student activities that are visualized and students can evaluate their learning activities.
2. Visualized student behavior patterns consist of system login activities, active in forums, doing question exercises, and collecting assignments obtained from log tables which are calculated based on the frequency and reading material activities that are calculated based on duration and frequency.
3. The results of the trial conducted from March 12 - April 3, 2016, showed that the Visual Learning Analytics system as a whole is good and can be used to evaluate and monitor student learning. This was obtained from the assessment of students on 20 variables with an average value of 7.7 and the assessment of lecturers on 21 variables with an average value of 8.

b. Suggestion

Suggestions that can be given in this research for system development are:

1. The built visualization only analyzes 5 student activities so that they can be further developed to add activities that can be visualized.
2. Visualization in this system is mostly obtained from the frequency of each activity, so it can be developed to visualize all activities based on duration and frequency.

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Sentiment Analysis to Prediction DKI Jakarta Governor 2017 on Indonesian Twitter

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A B S T R A C T

This study was conducted to test opinion data tweet of three candidates for governor Jakarta, 2017. Data only in Indonesian tweet, data tweet 100 tweets with keywords AHY, 100 tweets with keywords Ahok, and 100 tweets with keywords Anies. Data taken by random either from a normal user or online media at Twitter. Indonesian tweet opinion with three candidates for governor Jakarta in 2017 divided into three sentiment: positive, neutral and negative. Preprocessing data is, Lower Case Tokens, Normalization, Tokenization, Cleansing and Filtering. Classification method in this study using Naïve Bayes classifier (NBC), because this method is the most widely performed for sentiment analysis and proven always produce highest accuracy. Results of classification, Precision AHY data scored the highest with 95% and 95% Recall, while Ahok data lowest Precision scores with 81.6% and 82% recall.

Keywords: data mining; machine learning; sentiment analysis; jakarta governor candidate 2017; naïve bayes classifier.

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1. Introduction

Social media, especially Twitter lately bustling discussing Jakarta Governor Election will be held soon in 2017. Schedule Jakarta Governor Election has been set [1]. Since registration and set a candidate for Governor Jakarta in 2017, names of candidates many discussed, in real world or the virtual world. Everyone is think free opine on Jakarta governor candidate in 2017 so many opinions, not only positive or neutral opinion but negative. Media development so quickly, much online media from news media to social media. Social media alone so much, from Facebook, Twitter, Path, Instagram, Google+, Tumblr, LinkedIn and so many more [2]. Social media today is not only used as a means of friendship, make friends, but it already used to other activities. Promo merchandise, buying and selling up promo political or campaigns candidate legislative and presidential candidate,

Social media especially Twitter today being a communication device is very popular in internet users. Official Twitter developer conference Chirp, 2010, the company delivered the statistics regarding site and Twitter users. The statistics said in April 2010, Twitter has 106 million accounts and 180 million unique visitors each month. Number of Twitter users mentioned user continues increase to 300,000 per day [3]. Digital Buzz blog a site provides statistics infographic mentions same statistical data. Successor team of candidates the governor or mayor can justify any means in campaign of the candidate. Especially on governor election campaign or mayor the region, there is the term Black Campaign, especially in social media. Because the current promotions, imaging campaigns not only in real world but also in cyberspace. Social media, especially Twitter now become one of the promotions or campaigns are effective and efficient.

Sentiment analysis or opinion mining is the process of understanding, extract and process the textual data automatically to get the sentiment of information contained in an opinion sentence. The magnitude of effect and benefits to research sentiment analysis, sentiment analysis based applications is growing rapidly. Even in America, there are about 20-30 companies that focus on sentiment analysis service [4]. Social network mining (SNM) has become one of main themes on agenda of research data mining lately. Partly resulting from this research, we can extract information from a variety of social media, but the sources of information to develop dynamically requires a flexible approach [5]. In addition to sentiment analysis, data mining has also been developed for the prediction of precipitation such as those used to predict rainfall in Malaysia [6]. In this study used the data mining sentiment analysis of public opinion in Twitter to Jakarta governor candidate in 2017. There are three data for candidates for Governor Jakarta in 2017 were categorized into positive opinion, neutral and negative. The amount of sentiment to Jakarta governor candidate in 2017 could be one of the parameters of victory or defeat of a candidate.

Research by Merfat M. Altawaier [7] uses machine learning to classify sentiment tweet in Arabic Twitter. Three methods of classification used is Naïve Bayes classifier (NBC), Decision Tree (DT) and Support Vector Machine (SVM). This study determined classification of sentiment tweet Arabic Twitter, tweet about politics and arts with two sentiment: positive

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and negative. Weighting was conducted using TF-IDF (Term Frequency – Inverse Document Frequency) and use a Arabic stemming algorithm. of three techniques or classification methods, Decision Tree (DT) method best the other method with f-measure of 78%.

Research by Mesut Kaya [8] uses machine learning to classify the Turkish political news. This study determined classification of sentiment Turkish political news and political news to determine whether Turkey has a positive or negative sentiment. feature of Turkish political news machine learning algorithms extracted with Naïve Bayes classifier (NBC), Maximum Entropy (ME) and Support Vector Machine (SVM) to generate a classification model. This study obtained Accuracy 72.05% for the Naïve Bayes classifier (NBC), Maximum Entropy Accuracy 69.44% and 66.81% for the SVM to use bigram tokenization.

Researches other using machine learning made by Pak. and Paurobek [9]. Use emoticons to build a corpus of English Twitter with sentiment positive, negative and neutral. For the class of neutral Pak and Paurobek take data tweet from account English media. Classification used Naïve Bayes classifier (NBC), tokenization method used unigram, Bigram and n-grams. Best performasi generated when using classification Naive Bayes classifier (NBC) and tokenization method Bigram.

Research machine learning for sentiment classification the 2014 presidential candidates G.A.Buntoro [10]. This research holds views and opinions of the people by dividing them into five class attribute, which is very positive, positive, neutral, negative and very negative. The classification process in this study using the classification method Naive Bayes classifier (NBC) with the preprocessing data using tokenization, cleansing and filtering. data tweet in Indonesian Twitter about Indonesia Presidential candidate 2014, dataset of 900 tweets were distributed evenly into five class attribute. The highest of results accuracy obtained when using a Naive Bayes classifier (NBC) tokenization n-gram, stopword list WEKA and emoticons, with accuracy 71.9%, 71.6% Precision, 71.9% recall, 66,1% TP rate and 65% TN rate.

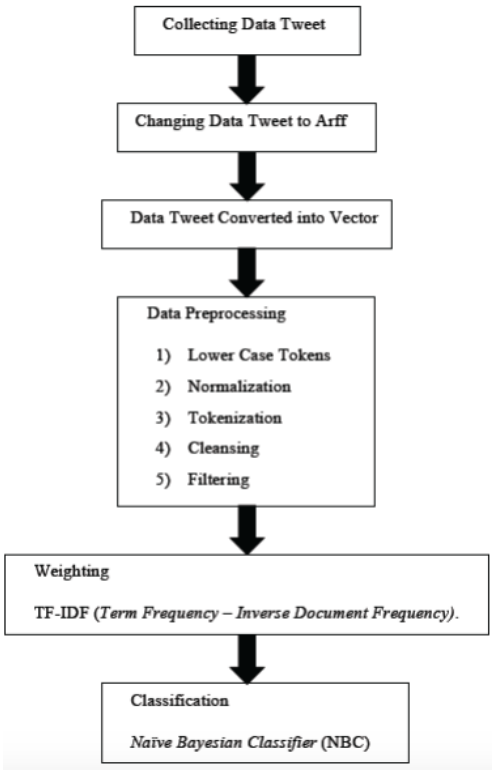
With machine learning research by Frangky [11] tried to repeat experiment sentiment classification movie review by Pang to Indonesian. In connection with not be training corpora for Indonesian, then applied to machine translation tools to translate English corpus created Pang native to ndonesian and the results are used to train translate classification. Wide choice of machine translation is used from commercial tools to simple translation word by word and text classification methods attempted. Average accuracy of the results obtained for the Naïve Bayes method was 74.6% and 75.62% for SVM method. Best results are obtained together with that obtained when using experiments in English.

2. Methodology

This study was conducted to test data tweet to opinion of three candidates for governor Jakarta, 2017. Data only tweet in Indonesian, which is 100 tweets with keywords AHY, 100 tweets with keywords Ahok, and 100 tweets with keywords Anies. Data taken at random either from a normal user or online media at Twitter. Tweet Indonesian opinion with the three candidates for governor Jakarta in 2017 and then divided into three sentiment: positive, neutral and negative. Preprocessing Data is, Lower Case Tokens, Normalization, Tokenization, Cleansing and Filtering. The Classification method in this study using Naïve Bayes classifier (NBC), because this method the most powerfully performed for sentiment analysis and proven always produce the highest accuracy. Research steps in accordance with the flow of the study are:

Figure-1 Flowchart Method

2.1. Collect data tweet



Data taken with Crawling tweet from social media Twitter. Data only tweet in Indonesian, which is 100 tweets with keywords AHY, 100 tweets with keywords Ahok, and 100 tweets with keywords Anies. Data taken at random either from a normal user or online media at Twitter.

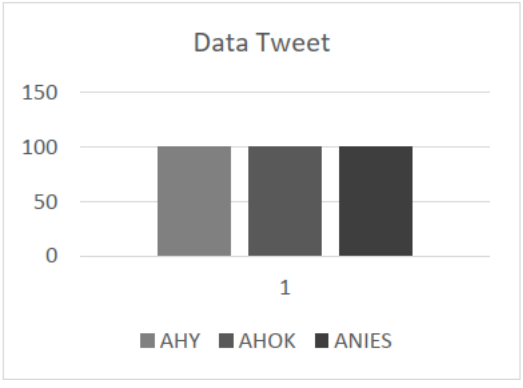


Figure-2 Data tweet

2.2. Converts data into a format tweet ARFF

Data tweet collected in text, then converts to ARFF file (Attribute Relation File Format) [12]. To manufacture file ARFF by manual.

2.3. Data tweet converted into vector

Data tweet has been shaped ARFF, then converted into a file vector [14]. How to turn data into vector by selecting StringToWordVector in WEKA tool.

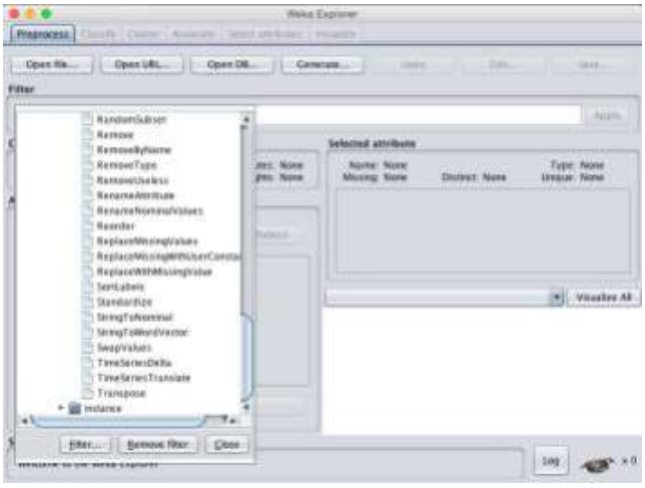


Figure-3 Data tweet converted into vector

The result of the conversion of the ARFF file into vector shapes can be seen in Figure 3.

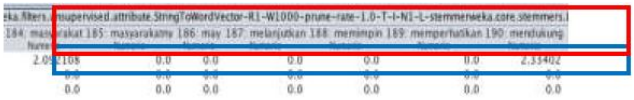


Figure-4 Example vector from tweet data

In Figure 3. The part which inside red box are words that exist in the data tweet. For each row of data representing each tweet. On line 1 the blue box can be seen word " masyarakat" has a value of 2.092108 and the word "mendukung" has a value of 2.33402. While others worth 0.0, it means the word "masyarakat" and "mendukung" contained in first data tweet.

2.4. Preprocessing Data

Perform preprocessing data tweet. Preprocessing data include lower case tokens, normalization, tokenization cleansing and filtering. All stages of preprocessing data using WEKA 3.8.1 tools. Stages preprocessing conducted as:

1) Lower Case Tokens tweet is to make the data be all lowercase, for example of capital letters to lowercase.
2) Normalization is to normalize words that are not standard, for example slang word, Alay word in Indonesian. 3) Tokenization is to break down the tweet into some word or set of words that stand alone. This study uses three methods tokenization, unigram, Bigram, and n-gram with a minimum value n = 1 and maximum n = 3. The process tokenization uses existing menu in WEKA. In tokenizer select tokenization choose and select the method that will be used.
3) Cleansing is process removing the symbols of little importance in a tweet, that the data could interfere with the classification process will be. This process is by using the menu on WEKA delimiters.
4) Filtering is to remove the words are less important or less affect the classification process will be. This process is by using stop word list. Stop word list in this study is stop word list WEKA and Indonesian stop word list by Tala [13].

2.5. Weighting

In next stage is to give weight to each word (term). Weighting is to get the value of a word successfully extracted. The method used for assigning weights in this study is TF-IDF (Term Frequency - Inverse Document Frequency). Because this method works best when combined with the classification method Naive Bayes classifier (NBC).

Figure-5 TF-IDF (Term Frequency – Inverse Document Frequency)

Classification

In this study, classification data using WEKA 3.8.1 tools. Classification methods used in this study the Naïve Bayes classifier (NBC). Naïve Bayes Classifier (NBC) is a method of classifier based on Bayesian probability theorem and assuming that each variable X is free (independence). In other words, Naïve Bayesian Classifier (NBC) assuming the presence of an attribute (variable) has nothing to do with being of attributes (variables) to another. Here is the formula.

$$P(H|X) = \frac{P(X|H)P(H)}{P(X)} \quad (1)$$

In the process of classification data tested using 10-fold cross validation [15]. The dataset will be divided into two, namely 10 parts by 9/10 parts used for the training process and 1/10 part is used for the testing process. Iteration lasts 10 times with a variety of data, training and testing using a combination of 10 parts data.

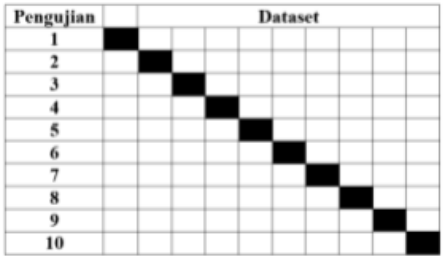


Figure-6 Ilustration 10 fold cross validation

2.6. Evaluation Results

To evaluate the performance of TP rate, FP rate, Precision, Recall and F-measure of the experiments that have been using. Evaluation using the Confusion Matrix is true positive rate (TP rate), true negative rate (TN rate), false positive rate (FP rate) and false negative rate (FN rate) as an indicator. TP rate is the percentage of positive successful class are classified as positive grade, while TN rate is the percentage of negative class who succeeded classified as negative class. FP rate is negative class are classified as positive class. FN rate is a positive grade classified as negative class [16].

Table 1. Confusion Matrix.

		Predicted	
		Negative	**Positive**
Actual	Negative	a	b
	Positif	c	d

3. Result and Discussion

The dataset in this study using ARFF format collected from Twitter. Data taken only tweet in Indonesian. Tweet opinion on the three candidates for governor in 2017 DKI well drawn randomly from a normal user or online media at Twitter.

The dataset used by 300 Tweets, data is split equally (balanced) each class, because the data is not balanced (imbalanced), a classification that is built has a tendency to ignore the minority class [15]. Data is divided into about 100 for AHY tweet, tweet to Ahok 100, and 100 tweets for Anies. Labelling is done manually with the help of experts Indonesian.

Table 2. Dataset Details

Sentimen	AHY	Ahok	Anies
Positive	62	33	62
Neutral	25	10	26
Negative	13	57	12

3.1. Candidates for Governor AHY

The first experiments with data tweet AHY using the classification method Naïve Bayesian Classifier (NBC) produces Precision, Recall, and F-measure

Table 3. Result AHY Dataset

	TP	FP	FN	Precision	Recall	F-measure
Positif	60	2	2	0,952	0,968	0,96
Netral	24	1	1	1	0,96	0,98
Negatif	11	2	2	0,846	0,846	0,846
Average	95	5		0,95	0,95	0,95

From Table 3, we can see Precision of positive sentiment was 95.2% and for Recall was 96.8%. For the neutral sentiment, Precision 100% and Recall 96%. For negative sentiment, Precision and Recall same is 84.6%. In experiments with this data is not much going misclassification, as evidenced by the value of precision and recall is very high.

3.2. Candidates for Governor Ahok

The second experiments with the data tweet Ahok using the classification method Naïve Bayesian Classifier (NBC) produces Precision, Recall, and F-measure.

Table 4. Result AHOK Dataset.

	TP	FP	FN	Precision	Recall	F-measure
Positif	29	4	4	0,853	0,879	0,866
Netral	4	1	5	0,444	0,4	0,421
Negatif	49	4	4	0,86	0,86	0,86
Average	82	9	13	0,816	0,82	0,818

From Table 4, we can see Precision of positive sentiment was 85.3%% and for Recall is 87.9%. For the neutral sentiment, Precision 44.4 %% and Recall 40%. For the negative sentiment Precision and Recall same is 86%. In experiments with this data, the error occurred at a neutral sentiment, as evidenced by the more neutral sentiment data is classified into another sentiment. So the value of precision and recall of neutral sentiment is quite small.

3.3. Candidates for Governor Anies

The third experiments with data tweet Anies using the classification method Naïve Bayesian Classifier (NBC) produces Precision, Recall, and F-measure.

Table 5. Result Anies Dataset

	TP	FP	FN	Precision	Recall	F-measure
Positif	54	1	0	0,885	0,871	0,878
Netral	19	6	1	0,655	0,731	0,691
Negatif	9	1	0	0,9	0,75	0,818
Average	82	8	1	0,827	0,82	0,822

From Table 5, we can see Precision of positive sentiment was 88.5% and for Recall is 87.1%. For the neutral sentiment Precision 65.5% and Recall 73.1%. For the negative sentiment Precision 90% and Recall 75%. Experiment with this data, pretty much an error occurred while neutral sentiment classification, although the value is not more neutral sentiment which was classified as neutral sentiment. So the value of precision and recall of neutral sentiment has been quite high.

3.4. Comparison of the data analysis of three candidates for Governor of DKI 2017

After experiments with the three dataset candidates for governor DKI Jakarta in 2017, the following average values Precision, Recall, and F-measure.

Table 6. Result Dataset Analysis

Candidates	Precision	Recall	F-measure
AHY	0,95	0,95	0,95
Ahok	0,816	0,82	0,818
Anies	0,827	0,82	0,822

From Table 6, we can see the highest scored Precision, Recall and F-measure is AHY dataset with Precision 95.2%, Recall 96.8% and F-measure 95%. The Lowest Scored Precision, Recall and F-measure is Ahok dataset with Precision 81.6%, Recall 82% and F-measure 81.8%. Data AHY get the highest score due to positive sentiment on the data AHY most successful classified as positive sentiment. As for the data Ahok be the lowest for the most successful negative sentiment classified as negative sentiment.

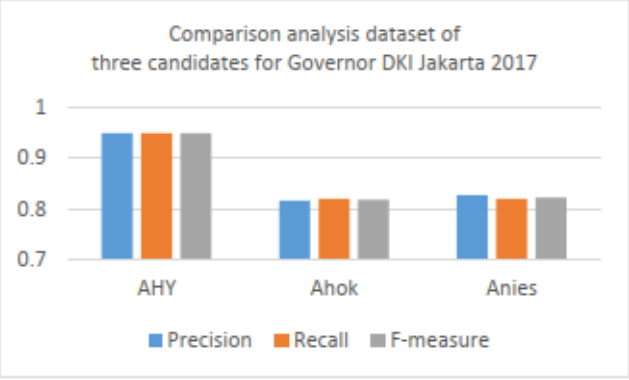


Figure-7 Comparison analysis dataset of three candidates for Governor DKI Jakarta 2017

4. CONCLUSIONS

This study was conducted to test the data tweet to the opinion of three candidates for governor of Jakarta, 2017. Data taken only tweet in Indonesian, which is 100 tweets with keywords AHY, 100 tweets with keywords Ahok, and 100 tweets with keywords Anies. Data taken at random either from a normal user or online media at Twitter. Tweet Indonesian opinion with the three candidates for governor of Jakarta in 2017 and then divided into three sentiments: positive, neutral and negative. Preprocessing Data is Lower Case Tokens, Normalization, tokenization, Cleansing and Filtering. For the method of classification in this study using Naïve Bayes classifier (NBC), because this method is the most powerfully performed for sentiment analysis and proven always produce the highest accuracy. From the results of the classification, the AHY dataset scored the highest with Precision 95% and Recall 95%, while Ahok dataset lowest scores with Precision 81.6% and Recall 82%. In this study also showed that the positive sentiment on the data AHY most successful classified as positive sentiment, as evidenced by the value of precision and recall is very high. For the most successful negative sentiment classified as negative sentiment contained in the data Ahok. For further research needs to be tested was developed using more data and Real Time. Need to develop also stop word lists and Indonesian stemming were able to improve the accuracy of the Indonesian sentiment analysis.

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Effect of Cycocel Concentration on Result of Mini Potato Tubers (Solanum tuberosum L.) in Hydroponic Substrate

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A B S T R A C T

This study aimed to determine the effect of cycocel on mini potato tuber yield at various concentrations. Preparation of potato planet has done at plant tissue culture laboratory ,Faculty of Agriculture, University of Jember, in February-April 2016 and field experiments was carried out at Jampit Village, District Sempol, Bondowoso, May to September 2016. The research method used is Complete Random Design (RAL) single factor. Factor concentration of cycocel consisting of five levels, namely: 0 ppm (C0), 500 ppm (C1), 1000 ppm (C2), 1500 ppm (C3), and 2000 ppm (C4), with six replications. The results showed that the plant which treated by cycocel 2000 ppm has a shorter plant height of 27.40 cm, lower plant fresh weight 35.62 grams, and the higher number of tubers 15,83 compared to the others factors. On the other variables cycocel has no significant effect, on number of stems and total weight of tubers per plant.

Keywords: Hydroponic, mini tubers, cycocel concentrations, potato plant, granola

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1. Introduction

Solanum *tuberosum L.* is one of most pupular as top five staple food in the world to supply our carbohydrate. Those five are rice, wheat, potato, buckwheat, and also corn. Poatoes is secondary staple in Indonesia, it has high demand in entire year. The quality of potato seeds is a major factor in determining the yield of potato production. The availability of national certified potato seeds currently only reaches 6% of the total requirement of 128.6 thousand tons of seeds per year (Directorate General of Horticulture in Dianawati et al., 2013). This causes low productivity of potatoes, so the results obtained by farmers are not yet optimal. One effort to obtain quality seeds can be obtained through tissue culture methods and continued with rapid propagation techniques through planting macro cuttings in the field (Siska et al., 2010).

The alternative that can be done is to produce mini potato tuber (G0) as a source seed, can be done with the cultivation method of substrate hydroponic plants with the aim to multiplication of mini tubers as seeds. In this technique, plants are planted on non-soil media. There are many advantages to the use of hydroponic methods in the production of potato seed base compared to more conventional methods, including a higher level of multiplication of mini tubers, no risk of physiological disease contamination, no need for soil sterilization, and an easier management system (Correa et al., 2009).

Regulatory substances are also one of the determinants of tuber formation, including gibberellins, cytokines and inhibitors or often known as retardants. Growth regulators (PGR) are basically non-nutritional organic compounds which in low concentrations are able to encourage, inhibit and change plant growth and development. Provision of growth regulators must be at the right concentration, in order to encourage plant growth and mini tuber formation. Growth inhibitors have a function to suppress the elongated growth of buds and form short branches. Giving cycocel can cause the extension of the cell extension, especially in the sub-apical meristem area that inhibits plant height. According to Siska (2010) states, the addition of growth inhibitors will reduce the negative effects of gibberilin biosynthesis. The results of the study Pangaribuan et al., (1995), giving cycocels at weeks 3 and 5 have been able to increase the number of stolons that form more tubers. Based on this background, it is necessary to conduct a study or research entitled "Effect of Cycocel Concentration on the Production of Potato Mini Tubers (Solanum tuberosum L.) in Hydroponic Substrate".

2. Methods

The study was carried out in the tissue culture laboratory of the University of Jember in February - April 2016 and in the screen house of Jampit Village, Sempol District, Bondowoso Regency, in May - September 2016. The research method used was a single factor Randomized Complete Design (CRD). Cycocel concentration factors

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consisting of 5 levels, namely: 0 ppm (C0), 500 ppm (C1), 1000 ppm (C2), 1500 ppm (C3), and 2000 ppm (C4), with 6 replications.

The experiment was conducted with several stages including:

2.1. Preparation

Phase one of the study was to produce plantlets of prospective seedlings of the Granola variety, in the plant tissue culture laboratory. Planlet production is carried out in a sterile (in-vitro) environment in laminar air flow (LAF). The step in multiplying plantlets begins with cutting the planting material (explant) from the culture bottle carefully using scissors or scalpel. Take a plantlet bud and put it into a petri dish, then add enough distilled water and 7 drops of betadine. Remove the sterilized explant with a solution of betadine and distilled water in an empty petri to drain it. Cut the explant into several sections with a cutting length of 2-3 cm. Plant explants into new culture media using tweezers. One bottle of culture media was filled with three plant explant stems. Culture media that had been filled with explants were then placed in the incubation chamber. Maintain clean storage shelves and spray alcohol every day on the surface of culture bottles in an effort to avoid the growth of fungi / bacteria that cause contamination. Planlets that have grown normally and have more than 2 pairs of leaves and roots, are acclimatized on sterile sand media, provided there is no contamination in the previous in vitro culture. Harvesting can be done when the plants have ready harvest criteria. The first criterion is the tuber has matured, which is 110 days old on granola varieties. The leaves and stems have yellowed, tuber skin is not easy to peel or blister when pressed. After harvesting the tubers can be directly selected or graded then taken and stored in a warehouse as a prospective seed.

2.2. Field Experiment

Adapt planlets in a new field condition for 3 days, then plant the seeds of potato plants in a hydroponic substrate (sand) medium. Perform treatment by giving watering nutrient solution 2 times a day. The spraying treatment of retard and cycocel on plants was carried out when the plants were aged 3 MST and the second spraying was 5 MST. Cycocel treatment was carried out twice, when the plants were 3 and 5 MST. Cycocel is sprayed on the entire surface of the plant concentration of 0 ppm, 500 ppm, 1000 ppm, 1500 ppm, 2000 ppm.

3. Result

The result of research can see in Table 1

Tabel 1. Rekapitulation F-value for each dependent variable

No	Variabel	F-Hitung	F-tabel	
			5%	1%
1	Height	6,99**	2,76	4,18
2	Twig	1,01		
3	Wet weight of plant	10,07**		
4	total wet weight tuber/plant	0,62		
5	Total tuber/plant	3,13*		

**have significant diference, *insignificant different

Tabel 2. Toral tuber base on grade per each plant

Treatment	S	M	L
C0	5,00	4,83	1,33
C1	5,33	7,83	1,00
C2	6,83	5,17	0,83
C3	6,50	6,83	1,16
C4	8,00	7,00	0,83

Note : C0= 0 ppm, C1= 500 ppm, C2=1000 ppm, C3=1500 ppm, C4= 2000 ppm.

The treatment of 2000 ppm cycocel spraying showed better results in reducing plant height, plant fresh weight, and increasing the number of tubers per plant with a smaller size. This shows that the initial cycocel treatment can increase tuber formation faster than without cycocel treatment.

4. Discussion

Hormones play an important role both in encouraging and increasing various activities in the plant body. In this research, the treatment of retardan spraying with the trademark cycocel was given to plants aged 3 and 5 MST.

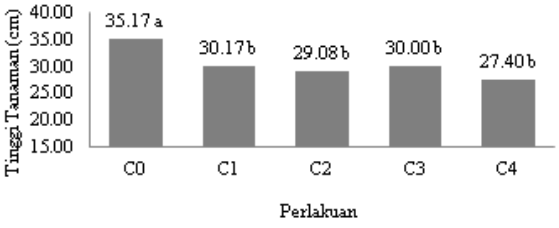

Figure 1. Height of potato plant

The observation of plant height showed very significant different tendencies. Shorter plant height in plants that are applied cycocel is different from plants that are not applied cycocel (C1) which has a higher plant height. Cycocel treatment with a concentration of 2000 ppm showed the highest plant height results. This shows that cycocel affects the height of potato plants, the lower growth of plant height is thought to be due to the inhibition of gibberellin's biosynthesis. Gibberellins are a type of hormone that functions to increase cell division and cell enlargement in plants. The performance of cycocel with gibberellins is antagonistic so that the treatment of cycocel in plants can inhibit plant height growth. Kashid et al. (2010) stated that cycocel is an anti-gibberellin inhibitor, which is a dwarfing agent and its spraying on plants will cause giberelin deficiency which will ultimately reduce growth by inhibiting geranyl

pyrophosphate to coponyl pyrophosphate which is the initial stage of giberellin synthesis.

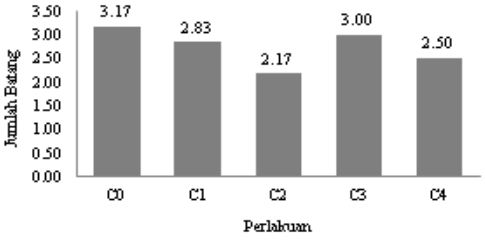

Figure 2. Total twig of potato plant

In the observation variable of the number of potato plant stems, according to the results of the analysis of variance stated no significant difference between plants treated with cycocel with plants that were not applied cycocel. This is presumably because the number of stems on potato plants is not affected by cycocel. Cycocel affects the height of potato plants because the biosynthesis of gibelelin is inhibited. In the observations made in the study, the transfer of photosynthate results did not affect the number of stems formed in plants, but were transferred to other parts of plants that needed them.

Figure 3. Wet weight of potato plant

The results of observations of fresh plant weight, cycocel administration stated that the results were not significantly different after further testing, but the fresh weight of plants decreased with increasing concentrations of cycocel applied to plants. It is suspected that cell elongation in plants experiences inhibition and decreases in vegetative growth which decreases causing the plant's fresh weight to be smaller. The mechanism of action of cycocels can be absorbed by plants through leaves, stem tissue or roots, then transported in the xylem to the apical growing point. Upon reaching the sub-apical meristem, this active compound will inhibit the production of gibberellins by inhibiting the oxidation of kaurene to kaurenoic acid which is a cytochrome P 450 being a catalyst for reaction in microsomes (Arteca in nuraini, 2015). The same results were delivered by Mustafa et al., (2014), the retardant application of paklobutrazol in kalosi potato varieties at a dose of 1 ml / l and 3 ml / l had lower leaf fresh weight compared to plants that were not applied to paclobutrazol ie control.

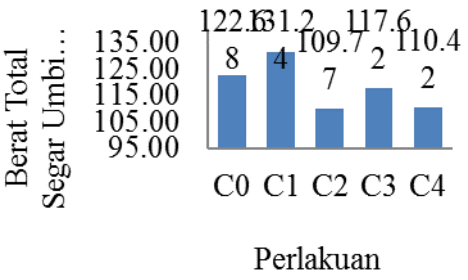

Figure 4. Totl weight tuber of potato plant

In the observation variable of total fresh weight of tubers per plant according to the results of the analysis of the variance stated no significant difference between plants treated with cycocel with plants that were not applied to cycocel, but the total fresh weight data of each plant showed that plants applied with cycocel had a total fresh weight that was more fresh small compared to plants that are not applied with cycocel. This is presumably due to the size of the tubers that form on plants are not the same. Endogenously gibberellins cause inhibition of mini tubers formation, so that the results of photosynthate translocation in plants are widely used for tuber enlargement resulting in a higher total fresh tuber weight. Unlike plants that are applied with cycocels which have a lower total weight, because photosynthate is widely used for tuber formation as a response to inhibition of gibberellin's biosynthesis in plant bodies that affects tuber formation. According to Sakya et al. (2013), the use of cytokinins alone is not enough, the addition of retardants or growth inhibitors is also needed to inhibit and suppress the activity of gibberellins, so that this inhibition can accelerate and focus energy for the formation of sweet potatoes. The distance between the source to the sink gives a real influence on the results of photosynthate translocation in the body of the plant, allegedly the closer the distance between the source to the sink, the rate of photosynthate translocation in the body of the plant is faster. Strengthened by the results of the study stated by Eristo and Ikhwan, (2014), the effectiveness of photosynthate translocation depends on the distance between the source and the user, the low height of the plant will shorten the distance between the source and the user thereby increasing photosynthate translocation

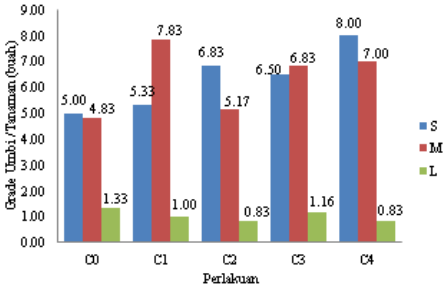

Figure 5. Tuber grade of plant

In plants that are not applied cycocels tend to produce higher class L bulbs compared to plants that are applied cycocels. It is suspected that the formation of mini tubers in these plants is longer due to the phegetative phase which is not inhibited so that the tubers produced in plants without cycocel application are less. In line with the results of the study, Pangaribuan et al. (1995) reported that cycocel application could increase

the number of tubers formed with application time at the age of 3 and 5 MST (3.3 fruits / plant) more than in controls (1.37 fruits / plant). In accordance with the statement of Kashid et al. (2010), an increase in crop production with retardant applications results in shorter plant height, but is very useful in the efficiency of increasing translocation of photosynthate results to food storage and seed filling. Siska et al. (2010) reported the results of their study that the application of cycocels with a concentration of 1500 ppm increased the production of mini potato tubers with an average number of 4.50 per crop. In the principle of seed germination, a large number of tubers is more concerned than producing tuber weights. In the research data, the S and M class tubers dominate much on the yield data, in contrast to the class L bulbs, only a small portion of each treatment. Directorate of horticultural seeding (2014), stipulates that G0 mini tuber production is exempted from the expected tuber grade, for G0 seed class the factor observed when examining tubers is that there is a mixture of other varieties, OPT attacks and mechanical damage

5. Conclusion

- Application of cycocel in potato plants has a significant effect in reducing plant height and plant fresh weight
- Cycocel treatment with a concentration of 2000 ppm produces more tubers up to 15.83 fruits / plant than other treatments.Please make sure that you use

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Design and Calculation Analysis for Thermal Control System of CubeSat Modeling

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A B S T R A C T

Thermal control subsystem (TCS) as one of the satellite subsystems has a function for maintain a thermal control for over all the components of the satellite within their required temperature limits for alls mission phase. This objective can be reached with keeping the balance of energy, among incoming energy and discharge energy. In this paper temperature distribution (worst hot case and worst cold case) of nanosatellite in low earth orbit using some data assumptions for calculating the spherical, solar array and sphere of the satellite are used. For the sphere of the satellite is not describes in this paper. Temperature distribution of a cubsat was computed using SCDE (Spacecraft Control Design Engineering) based on the Microsoft Excel. It was created self by author using some references. The thermal analysis results show that average the maximum and minimum temperature's based on low earth satellite's altitude (400 km to 700 km) are 32.62°C and -75.32°C for the spherical of the satellite, and 67.15°C and -75.12°C for the solar array of the satellite.

Keywords: Thermal, Temperature, Satellite, Spherical, Solar Array.

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1. Introduction

The main goal of Thermal Control Subsystem is to keeping all subsystem of the satellite in the allowable
range at all mission phase. It is necessary subsystem for a satellite, even a nanosatellite has thermal control subsystem (Janson et. al., 1993; Nazari and Emami, 2008). The thermal analysis and control provide the necessary means to control the temperature of the satellite during the harsh conditions in space. Spacecraft thermal control is a process of energy management in which environmental heating plays a major role (Wertz and Larson, 1991). Both of the thermal design roles are some parameters such as thermo optical properties of thermal surfaces, specific heat and thermal conductivity of materials, components power dissipations and thermal boundary conditions (direct solar flux, albedo reflected radiation, infrared radiation reflected from earth and heat generated by satellite's internal electronics), and too some orbitals elements data. Many thermal analyses have done with thermal models using both of software analysis or a thermal calculation analysis using the energy balance equations. All of them are gives us many experiences for satellite thermal control system analyzing. Nazari and Emami (2008) studied thermal control techniques about power consumption for observation satellite with compare between passive and active thermal control analysis. Bulut et al., (2010) reported thermal design and analysis for hot and cold cases temperature of nanosatellite using ThermXL software. Da Silva et al., (2014) reported thermal design control and analysis for payload temperatures of the Amazonia-1 satellite in three critical cases and verified using SINDA/FLUINT thermal analyzer. Nobari and Novinzade (2009) presented the thermal analysis of the satellite using the first law of thermodynamics where in elements number of thermal subsystem network can be solved with the energy balance equations. Arslantas et al., (2017) presented the thermal analysis simulation model using six nodes and thermal physical parameters tolerance value based on ECSS standard for calculating the maximum and minimum temperatures of the thermal model surface of the satellite.

In this study, the model is constructed using the energy balance equations to compute the equilibrium temperature of the satellite using mathematical model technique. The development of nanosatellites is currently a trend technology in the area of space science and engineering research (government, universities, industry, aerospace, militery, etc). The cubesat under this study is a cube shaped satellites have a mass approximately 1 kg based on the standard (Mehrparvar, A., 2014), and surface dimension of 10 x 10 x 10 cm each. The geometry of cubesat model was built in Femap. Femap is finite element modelling and post-processing software that can be used to create geometry or import CAD geometry from other model software. The cubesat model also design approach is using passive thermal control with consideration of the simplicity, cost, the reliability, the limited mass and the lower power consumption (Bulut et al., 2010). The passive thermal control too is mostly defined by its thermo optical properties. The

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highest and lowest temperatures on cubesat surface during on the orbit can be calculated with consideration the effect of thermo optical properties in order to find out how much the temperature that occurs on the satellite. The thermal analysis of cubesat in this study is used some data such as sun emissivity, temperature absolut of sun surface, radius of sun and radius of earth for radiation calculation, because this parameter will be used in spherical, solar array and sphere for satellite (Solar Constant in Appendix B). In orbital heat fluxes, solar radiation has the maximum value of 1428 W/m2, and the minimum value of 1316 W/m2. The radiation of a black body is used at 288°K (emissivity of sun value is 1) (Abouel-Fotouh et al., 2006). This paper describse of the thermal design and calculation analysis of cubesat using the mathematical model in equation energy balance approach in SCDE (Spacecraft Control Design Engineering) based on Microsoft Excel for predicting worst hot and cold case distribution temperatures on the satellite.

Thermal control system of the satellite consists of active and passive thermal control elements in order to maintain the satellite components and structure within a controlled range of temperature throughout the mission of the spacecraft, from the Beginning of Life (BOL) to the End of Life (EOL) (da Silva et al., 2014). The passive thermal controls are usually uses OSR (Optical Solar Reflector) and MLI (Multi Layer Insulation), and active thermal control are usually use heater and heat pipe. The heaters function to maintain the temperature of the battery and earth sensor (Tetsuo et al., 2007), and in part of a thermal subsystem, a heater is too have responsible for maintaining ideal temperature range for the different satellite subsystems (Nobari and Novinzade, 2009).

2. Methodology

For the thermal analysis of a satellite the following data must be known as in the design process, meanwhile some data provision such as Stefan Boltzmann, earth radius, solar flux, and earth IR emission. The thermalization analysis process in this study could be implemented as the following process in Fig.1.

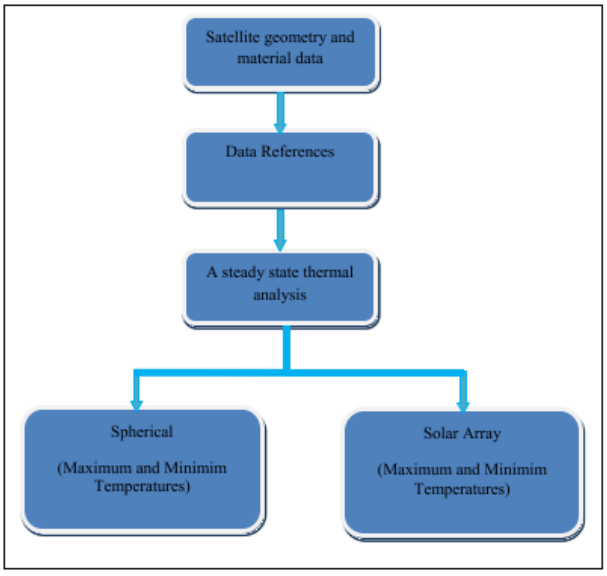

Figure-1. Athermalization calculation process

The geometry model of the cubesat in this study is presented by Fig.2, with a cube shape platform. The structure material uses an aluminum 7075-T651 with thermalphysical properties are presented in Table.1, in order to thermal analysis each that the thermal spherical spacecraft with an aluminum material panel have absorptivity and emissivity value are 0.6 and 0.8. For solar array panel are use absorptivity and emissivity on the top surface value are 0.68, and solar panel on the bottom surface used absorptivity and emissivity value are 0.6, whereas both the absorptivity and emissivity for sphere of the satellite have value are 0.6 and 0.8. Using SCDE for thermal spherical, solar array and sphere calculation was computed easily with derified all formula in Microsoft Excel. Using some data provitions constants and both data when we need, the worst hot and cold case can be calculated.

Table 1: Thermalphysical properties

Properties	Value	Unit
Conductivity, k	0.20139	W/mm°C
Specific Heat, Cp	77.28	J/Ton°C
Mass Density, ρ	2,59E+01	Ton/mm3

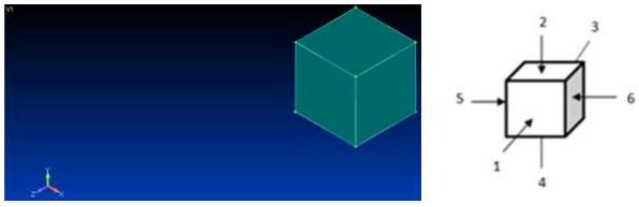

Figure-2. Cubesat model and configuration

3. Result and Discussion

Thermal control system in this study is managed using passive thermal control system with some considerations of an orbit environment for the cubesat, and appropriate the structure surface treatment by controling thermal properties is used. The objective of the thermal control system is to keep the temperature of the satellite and its components within the allowed temperature ranges, and therefore for extremely severe temperatures ranging when satellite orbiting in space between -150°C to +150°C, and basically often use the electronics and structure components in satellite based on COTS (commercial off-the-shelf) within temperatures operation range are between -20°C and +80°C. It's still allowable in the satellite platform. The aim of thermal design is to provide the comfortable environment for all the components in the cubesat. The thermal control of the cubesat in orbit is usually achieved by balancing the thermal energy, dissipated by the internal electronics components and the energy absorbed from its environment with the energy emitted by a satellite. Its mean conservation of energy can be described as equation (1) (Czernik S., 2004).

$$Q_{in} = Q_{out}$$

$$Q_{sun} + Q_{albedo} + Q_{earth} + Q_P = Q_{sat-earth} + Q_{sat-space} \quad (1)$$

The temperature of an orbiting satellite with internal power dissipation QW, available area surface of the satellite A, and satellite cross sectional AC, the radiation properties of its surface and orbital geometry are determined by its radiation environment (Hass and Schach, 1959). All of them are considered for a spherical satellite thermal calculation. The

maximum and minimum temperatures for the spherical satellite thermal can be calculated by equation (2) and equation (3) (Col. John E. Keesee, In Lecture Notes).

$$T_{max} = \left[\frac{(A_c G_s . \alpha) + (A.F . q_{1max} . \varepsilon) + (G_s . a . \alpha . K_a . A.F) + Q_W}{A . \sigma . \varepsilon} \right]^{1/4} \quad (2)$$

$$T_{min} = \left[\frac{(A.F . q_{1min} . \varepsilon + Q_W)}{A . \sigma . \varepsilon} \right]^{1/4} \quad (3)$$

Where F is the view factor of cylinders (= (1- cos ρ)/2), the ρ is the angular radius of the earth , the Ac and A are the area of cylinders (m2) and the satellite surface area (m2), the Gs is solar flux (W/m2) with a blackbody is equal to 1418 W/m2, the σ and ε are absorptivity and emissivity of satellite surface, the σ is Stefan Boltzmann's constant, equal to 5.67x10-8 W/m2K4, the a is albedo, equal to 0.3 up to 0.35. The q1min and q1max are the minimum and maximum Earth IR emission, equal to 216 W/m2 and 258 W/m2, the Ka is the albedo reflection factor, and the Qw is power dissipation on satellite.

Using equation (2) and equation (3), we can do hand calculation for both of steady state temperatures the satellite (Tmax and Tmin) with some data required as, radiation from the sun with effective area exposed to solar radiation is 0.06 m2 and solar emitted heat flux is 1418 W/m2. Radiation and albedo from the earth with infrared load is assumed to be 258 W/m2, the albedo coefficient is 35% and maximum power dissipation is 1.8 Watts. The spherical maximum temperature for satellite can be calculation with equation 2 and its results is 58.07°C. Otherwise, when radiation and albedo from the earth with infrared minimum load is assumed to be 216 W/m2 and minimum power dissipation is 1 Watt, the spherical minium temperature for satellite can be calculation using equation 3 and its results is -37.24°C, respectively.

Most satellites are used solar arrays as a primary power source for long lifetime the satellite operation in orbits. Furtherrmore, solar arrays are to be assisted by batteries that used as secondary power source to store and deliver energy. This store energy is needed by satellite when the operation of the satellite systems and charging the battery to supply power when in eclipse periods (McGuire, et al., 2016). For this energy, it must be considered also the amount of solar array temperatures using equation (4) and equation (5) (Col. John E. Keesee, In Lecture Notes).

$$T_{max(SA)} = \left[\frac{(G_s . \alpha_t) + (F_p . q_{1max} . \varepsilon_b) + (G_s . a . \alpha_b . K_a . F_p) - Gs . \eta}{\sigma . (\varepsilon_b + \varepsilon_t)} \right]^{1/4} \quad (4)$$

$$T_{min(SA)} = \left[\frac{(F_p . q_{1min} . \varepsilon_b)}{\sigma . (\varepsilon_b + \varepsilon_t)} \right]^{1/4} \quad (5)$$

Where Fp is the view factors (Fp = sin2 ρ), the εt and the εb are the IR emissivity on the top and the bottom surface of solar arrays, the σt and the σb are the solar absorptivity on the top and the bottom surface of solar arrays, and the η is the solar array efficiency.

Using equation (4) and equation (5), we can do hand calculation for both of steady state temperatures the satellite (Tmax and Tmin) with some data required such as solar absorptivity and IR emissivity on the top surface of solar array are 0.68 and 0.88, and solar absorptivity and IR emissivity on the bottom surface of solar array are 0.6 and 0.8 with solar emitted heat flux is 1418 W/m2. Radiation and albedo from the earth with infrared load is assumed to be 258 W/m2, the albedo coefficient is 35% and maximum power required during daylight is 10 Watts. Finally the maximum solar array temperature for satellite can be calculated using equation 2 and its results is 68.43°C. Otherwise, when radiation and albedo from the earth with infrared minimum load is assumed to be 216 W/m2 and minimum power required during eclipse is 5 Watts, the minium solar array temperature for satellite can be calculated using equation 3 and its results is -72.96°C. The goal of the implemented calculation by SCDE is to calculate the temperature profile of the satellite with Low Earth Orbit. Furthermore, we can describse some amount of the temperatures for satellite based on the satellite altitude in orbit (400 km to 700 km) is plotted in Table 2.

Table 2. An example of a table.

Altitude (km)	Spherical Temperature		Solar Array Temperature	
	Max	Min	Max	Min
400	35.05°C	-72.30°C	68.43°C	-72.96°C
500	33.31°C	-74.45°C	67.56°C	-74.42°C
600	31.76°C	-76.38°C	66.71°C	-75.85°C
700	30.36°C	-78.15°C	65.89°C	-77.25°C
Average	32.62°C	-75.32°C	67.15°C	-75.12°C

4. Conclusion

Based on altitude, the satellites in low earth orbit have an experience a different maximum and minimum temperature environment and the usage of thermo optical porperties properly have effect to the satellite. In this study, thermal control of the satellite model can be solved using the energy balance equations to compute the temperature gradients, the result of the thermal analysis both for spherical and solar array of the satellite based on satellite altitude have turned out of extremly for used in the satellite. The analysis results show that the average the maximum and minimum temperature's based on low earth satellite's altitude (400 km to 700 km) are 32.62°C and -75.32°C for the spherical of the satellite, and 67.15°C and -75.12°C for the solar array of the satellite. The calculations show that the minimum temperature for solar array is need thermal active control system, and battery is needed for store the power energy solar array.

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