ONLINE BASED ACADEMIC INFORMATION SYSTEM (CASE STUDY: SD. HIDAYATUR ROHMAN ASEMROWO SURABAYA)

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ABSTRACT

The influence of technology is very large, especially in the development of information. Accurate, fast, and precise information is very important for life today because information becomes a necessity in conveying something. The use of computers is one of the developments in information that is very useful because it can perform data processing, making reports and sending information remotely and in determining the potential of students. Determination of the potential is absolutely necessary by the school agency, namely the school, the guidance teacher has an important role in granting status to students. Determination of student potential requires special professional handling, because it involves the success of students in facing the examinations that will be given. Mistakes in determining students' readiness to face national exams can negatively affect the process and results of student exams themselves. So we need a method that can help minimize the impact of mistakes when determining the potential of these students, namely by grouping data techniques from the results of data mining. The need for data mining because of the large amount of data that can be used to produce useful information and knowledge. Naïve Bayes is a machine learning method that uses probability calculations. The use of this algorithm is considered appropriate because Naive Bayesian Classifier is one classification algorithm that is simple but has high capability and accuracy.

Keywords: *Academic Information Systems, Information Management, Naïve Bayes Classification.*

1. INTRODUCTION

Hidayatur Rohman Asemrowo Surabaya Primary School is one of the elementary schools in Surabaya. The information system in the elementary school is still done manually and also in determining potential students in certain subjects. The information retrieval process is still using paper media and then recapitulated using a computer in the Microsoft Word application and printed, then pasted on the school notice board, in this school found problems in processing school information, student grade data, and determining the potential of students who are still using Microsoft Office applications that are in the process of writing take a long time and sometimes data loss occurs. This makes it difficult for the administration section to provide reports to the school principal, as well as to the parents. In this research conducted is to build an academic information system about school identity, student grades and determination of student potential conducted at Hidayatur Rohman Asemrowo Primary School, Surabaya.

The information system that will be built is based on a website, aimed at conducting structured academic activities, so that a better and maximum work process can be generated by using centralized data storage so that it can facilitate the activities of adding data, searching and publishing data using computer technology. The academic information system is expected to make it easier for school agencies and the outside community so that information can be obtained quickly, precisely and accurately.

Based on this, an appropriate information system is needed to help manage school data, so in this study intends to build an information system entitled "ONLINE BASED ACADEMIC INFORMATION SYSTEMS IN THE BASIC SCHOOL HIDAYATUR ROHMAN ASEMROWO SURABAYA".

2. BASIC THEORY

2.1 Academic Information System

Academic Information System is a system that provides information services in the form of data in matters relating to academics. Where in this case the services provided such as data storage for new students, determining class, determining the schedule of lessons, making a teaching schedule, division of homeroom teachers, assessment process [1].

According to Academic Information System (SIA) is software used to present information and organize administration related to academic activities [2]. With the use of software like this, it is expected that academic administrative activities can be managed well and the information needed can be obtained easily and quickly.

2.2 Academic Achievement Assessment

Achievement is the result that students have achieved in the learning process. According to Cece Wijaya, learning achievement can be in the form of statements in the form of numbers and behavioral values. This statement is reinforced by Thorndike and Hasein who stated that learning outcomes will be known if there is a change in behavior that will be expressed in numbers or values [3].

According to Hadari Nawawi, learning achievement is the level of student success in learning subject matter at school expressed in the form of scores obtained from test results regarding a number of specific materials [4].

2.3 Academic Potential Students

Potential is "all the possibilities or abilities that exist in an individual and during their development can really be realized"[5].

The learning potentials that exist in a student are not the same as the potential possessed by others. As stated by Agus Soejono "A person's potential is not the same as the potential of another person . One is sharper in mind, or finer in feeling, or stronger in will or more robust, stronger in body than others " [6]. According to Djamarah, Students who have the potential for a lesson will study seriously, because there is an attraction for him [7]. Students are easy to understand, the learning process will run smoothly when accompanied by potential [8]. Potential is also the main motivational tool that can arouse the enthusiasm of students' learning in a certain span of time.

2.4 Naive Bayes Algorithm Theory

Naive Bayes algorithm is one of the algorithms in the classification technique. Naive Bayes is a classification with probability and statistical methods raised by the British scientist Thomas Bayes, which predicts future opportunities based on past experience so that it is known as the Bayes Theorem. The theorem is combined with Naive where it is assumed that the conditions between attributes are independent. The Naive Bayes classification is assumed that the presence or absence of certain characteristics of a class has nothing to do with the characteristics of other classes.

The equation from the Bayes theorem is:

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

Information :

X: Data with unknown classes

H: The data X hypothesis is a specific class

P (H | X): H hypothesis probability based on condition X (posteriori probability)

P (H): Hypothesis probability H (prior probability)

P (X | H): Probability of X based on conditions on the hypothesis H P (X): Probability of X

To explain the Naive Bayes theorem, it is important to know that the classification process requires a number of clues to determine what class is suitable for the analyzed sample. Therefore, the Bayes theorem above is adjusted as follows:

$$P(C|F_1 \dots F_n) = \frac{P(C)P(F_1 \dots . F_n|C)}{P(F_1 \dots F_n)} \quad \text{.....}$$

Where Variable C represents class, while variable F 1 ... Fn represents the characteristics of the instructions needed to classify. Then the formula explains that the chance of entering certain characteristic samples in class C (Posterior) is the chance of the emergence of class C (before the entry of the sample, often called prior), multiplied by the chance of the appearance of sample characteristics in class C (also called likelihood), divided with the opportunity for the emergence of sample characteristics globally (also called evidence). Therefore, the formula above can also be written simply as follows:

$$\text{Posterior} = \frac{Prior\ x\ likeli\ hood}{evidence}$$

Evidence values are always fixed for each class in one sample. The value of the posterior will later be compared with the values of the posterior of other classes to determine to which class a sample will be classified. Further elaboration of the Bayes formula is carried out by describing (C | F1, ..., F_n) using the multiplication rules as follows:

$$\begin{aligned} P(C|F_1, \dots, F_n) &= P(C)\, P(F_1, .., F_n|C) \\ &= P(C)P(F_1|C)P(F_2, \dots, F_n|C, F_1) \\ &= P(C)P(F_1|C)P(F_2|C, F_1)P(F_3, \dots, F_n|C, F_1, F_2) \\ &= P(C)P(F_1|C)P(F_2|C, F_1)P(F_3|C, F_1, F_2), P(F_4, \dots, F_n|C, F_1, F_2, F_3) \\ &= P(C)P(F_1|C)P(F_2|C, F_1)P(F_3|C, F_1, F_2) \dots P(F_n|C, F_1, F_2, F_3, .., F_{n-1}) \end{aligned}$$

It can be seen that the results of the elaboration cause more and more complex factors - conditions that affect the probability value, which is almost impossible to analyze one by one. As a result, the calculation becomes difficult to do. Here is used a very high assumption of independence (naive), that each of the instructions (F1, F2 ... Fn) are independent of each other. Assuming the following similarities apply:

$$P(P_i|F_j) = \frac{P(F_i \cap F_j)}{P(F_j)} = \frac{P(F_i)P(F_j)}{P(F_j)} = P(F_i)$$

Untuk $i \neq j$, sehingga

$$P(F_i|C, F_j) = P(F_i|C)$$

From the above equation it can be concluded that the assumption of naive independence makes the conditions of opportunity become simple, so calculations are possible. Furthermore, the elaboration of P (C | F1, ..., Fn) can be simplified to:

$$P(C|F_1, .., F_n) = P(C)P(F_1|C)P(F_2|C)P(F_3|C) \dots$$

The equation above is a model of the Naive Bayes theorem which will then be used in the classification process. For classification with continuous data the Gauss Density formula is used:

$$P(X_i = x_i|Y = y_j) = \frac{1}{\sqrt{2\pi\sigma_{ij}}} e^{-\frac{(x_i - \mu_{ij})^2}{2\sigma^2_{ij}}}$$

Information :

P: Opportunity

X: Attribute to i

xi: Attribute value to i

Y: Sub class Y is sought

yi: Sub class Y is sought

μ: Mean, declares the average of all attributes

σ: Standard deviation, denotes variants of all attributes

The flow of the Naive Bayes method is as follows:

1. Read the training data
2. Calculate the Amount and probability, but if numeric data then:
   a. Find probabilistic values by calculating the appropriate amount of data from the same category divided by the amount of data in that category.
   b. Find the mean and standard deviation of each parameter which is a numeric data.

3. SYSTEM ANALYSIS AND DESIGN

3.1 System Analysis

The stages of system analysis have the task of defining system problems, analyzing system requirements and everything needed in the process of online-based academic information systems (case study: SD. Hidayatur Rohman Asemrowo Surabaya).

3.2 Problem Analysis

In the data management system at Rohman Asemrowo Hidayatur Elementary School in Surabaya, there are several obstacles in the process of analyzing information related to school identity, processing data values, and in determining students' potential. Because each student has their own grades and are different. In determining the potential of students is still conventional and the process is long by looking at the value of report cards. In addition, each grade collected was entered in the leger grade book, a new average was recorded into the student report card and then submitted to each student. The process of finding data on student grades requires considerable time and energy so that the performance of the system becomes less effective and takes a very long time. Less effective processing of grades so that there are still errors in providing value information for students and guardians of students.

3.3 Data Flow Diagram (DFD)

Data flow diagrams illustrate system flow. The following is a data flow diagram based online academic information system.

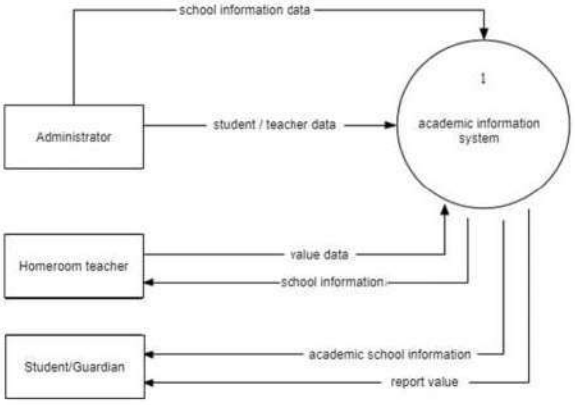

Figure 4.2 DFD Level 1 Academic Information System

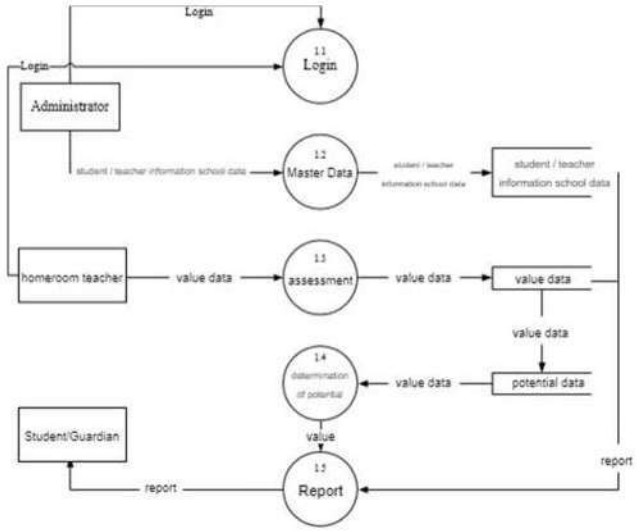

Figure 4.3 DFD Level 2 From Process 1 Academic Information System

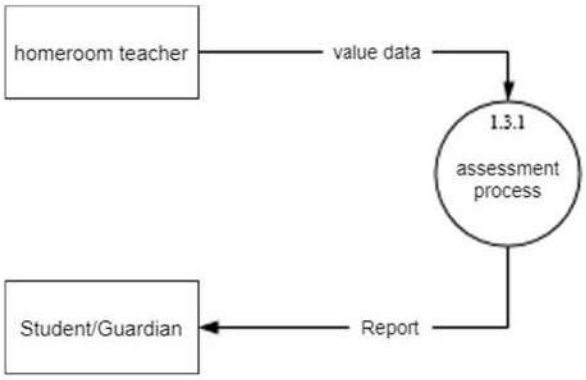

Figure 4.4 DFD Level 3 From Process 1.3 Evaluation of Academic Information Systems

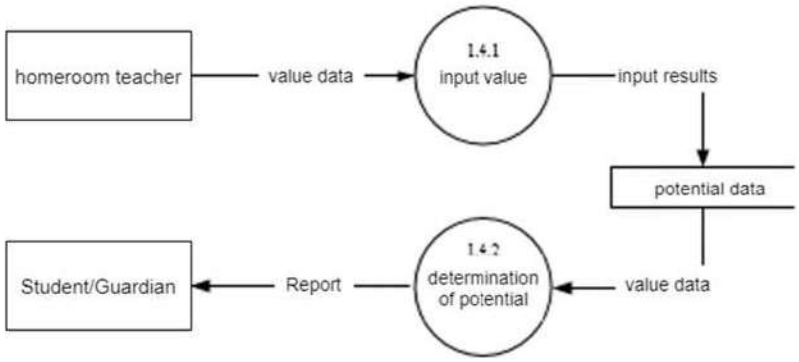

Figure 4.5 DFD Level 2 From Process 1.4 Determination of Potential

3.4 Flowchart

Flowchart is a flow chart of a system procedure logically.

1. Student / guardian flowchart access.

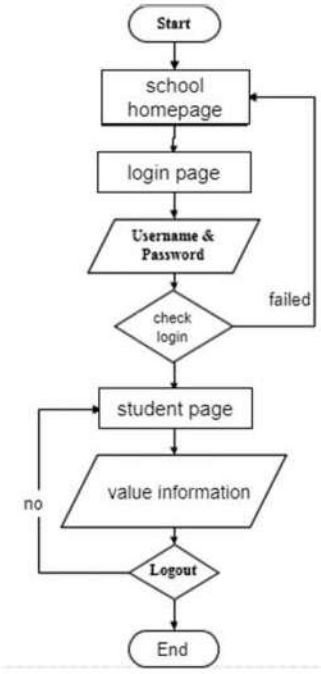

Figure 4.6 Student / Guardian Access Flowchart

2. Homeroom teacher access flowchart.

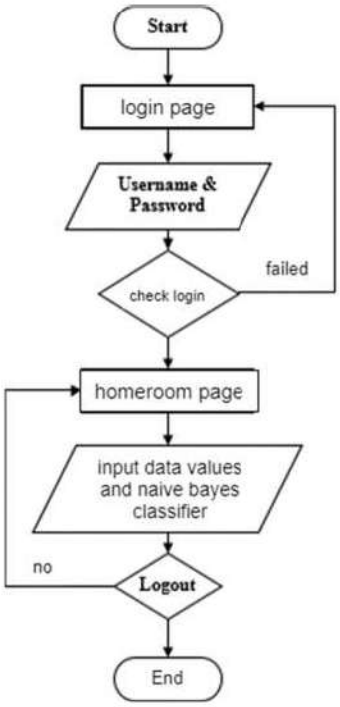

Figure 4.7 Access Guardian Class Flowchart

3. Administrator access flowchart.

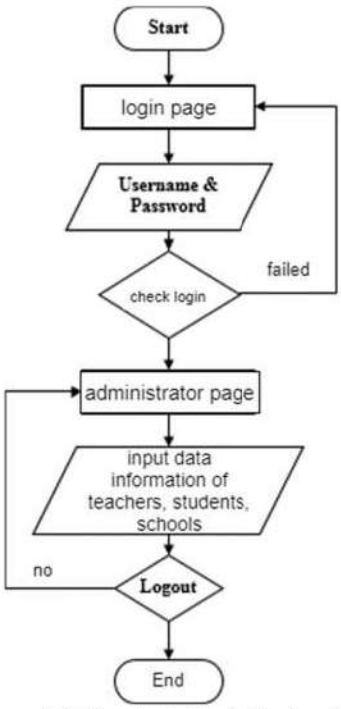

Figure 4.8 Flowchart Administrator Access

3.5 ERD (Entity Relations Diagram)

Entity Relations Diagram (ERD) is a picture of a system in which there is a relationship between entities and their correlations. ERD is used to model data structures and relationships between data.

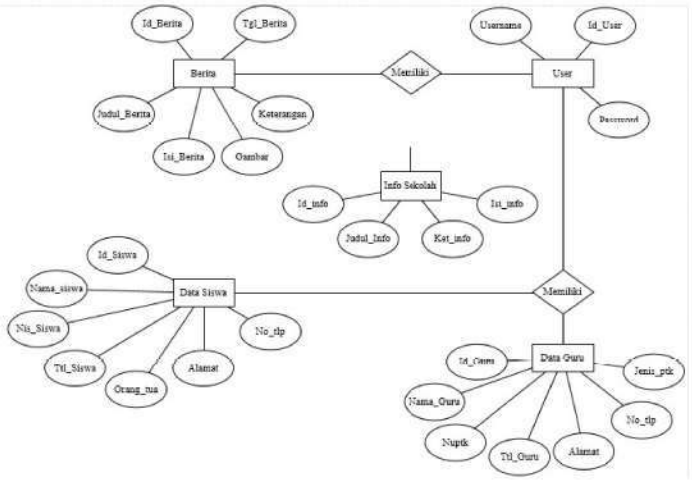

Figure 4.9 ERD Administrator Access

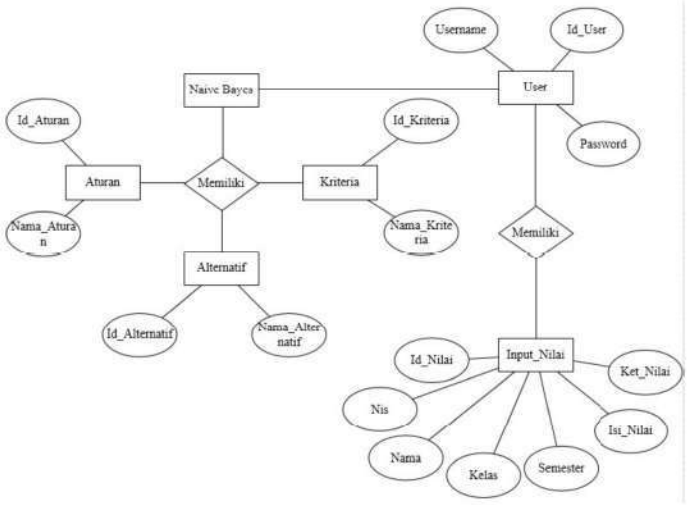

Figure 4.1.0 ERD Homeroom Teacher Access

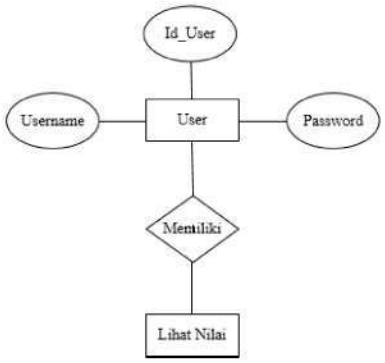

Figure 4.1.1 ERD Student / Guardian Access

4. IMPLEMENTATION

4.1 Interface Implementation

Interface implementation is a form or menu that exists in a system. The form or menu consists of:

a) Home menu.
b) Administrator Dashboard Page.

c) Student Data Form.
d) Teacher Data Form.
e) School Profile Data Information Form.
f) Lesson Schedule Information Form.
g) Student Dashboard Page.
h) Form See Student Grades.
i) Teacher's Dashboard Page.
j) Student Value Input Form.
k) Naive Bayes Web Service page.

The following is the homepage display of Hidayatur Rohman's Elementary School Academic Information System.

Figure 5.1 Academic Information System Home

5. TESTING AND DISCUSSION OF RESULTS

5.1 Testing

The testing process is carried out by functional testing. Functional testing is a type of Blackbox testing which bases test cases on the specifications of the software components being tested. Functions are tested by providing input and checking output, and internal program structures are rarely considered. Function testing ensures that all requirements are met in the application system. Thus its functions are tasks designed to be carried out by the system. Function testing concentrates on the results of the process, not how the process occurs.

5.2 Test result

Overall testing of Naïve Bayes Web Service is carried out using File Integration. This test is carried out to evaluate whether the system can be used properly.

Testing is done by Entering the Application page, Synchronization Results, Data Consistency Test, and Exiting the Application page. Testing the Application by entering the registered User Application Page.

Figure 6.1 Entering the Application Page

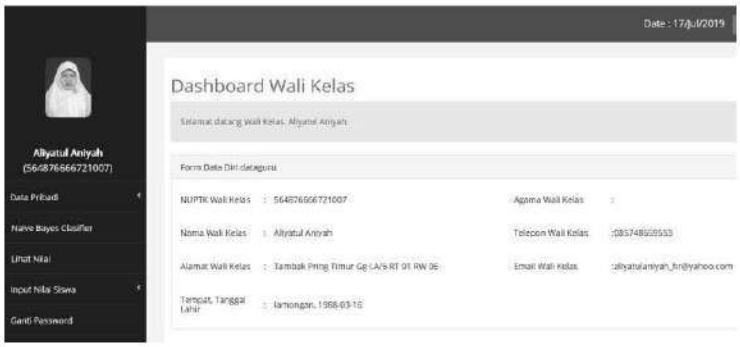

Figure 6.2 Entering the Homeroom Dashboard Page

The application is entered on the Teacher Admin Dashboard page as shown in Figure 6.2, the application runs well. The application then displays the Synchronization Process of the Naïve Bayes Web Service by selecting the Naïve Bayes Classifier option.

Figure 6.3 Synchronization Process

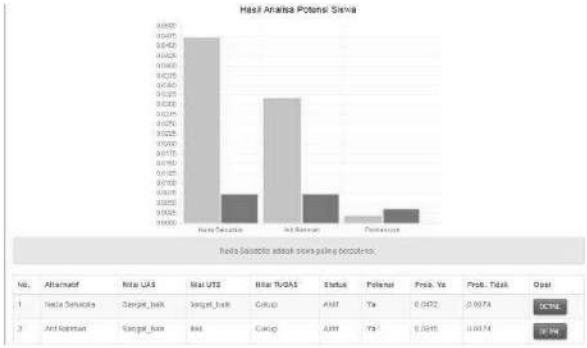

Figure 6.4 Analysis Results

The application successfully synchronizes data Naïve Bayes Web Service, as in the picture above, the application runs well.

From the results of manual calculations and Naïve Bayes Web Services above have the same results, namely Student Sofiansyah Maulana Potential = **Yes**, Probability Yes = 0.0891, Probability No = 0.0117. Siswi Siti Nur Habibah Potential = **Yes**, Probability Yes = 0.1019. Probability No = 0. Student Sofiyah Potential = **Yes**, Probability Yes = 0.0162, Probability No = 0. And these students were declared eligible to be delegated in an educational event in mathematics.

6. CONCLUSION

6.1 Conclusion

Based on the System Implementation, the functional testing test results in the previous Chapter, it can be concluded that the Academic Information System Application Based Online and Naïve Bayes Web Service Application has been running as expected. And the results of manual calculations and Naïve Bayes Web Servise above have the same results, namely Student Sofiansyah Maulana Potential = Yes, Probability Yes = 0.0891, Probability No = 0.0117. Siswi Siti Nur Habibah Potential = Yes, Probability Yes = 0.1019. Probability No = 0. Student Sofiyah Potential = Yes, Probability Yes = 0.0162, Probability No = 0.

6.2 Suggestion

With the further development of Information Technology by following the latest trends, it is hoped that this application can be developed further by adjusting the needs and utilizing more advanced Information Technology. Need to study the latest information and technology to add more dynamic features so that the use of the system is more optimal, controlled and also user friendly. Researchers suggest adding data synchronization based on the change in time so that the Web Service data exchange security features also need to be improved.

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