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Designing An Athlete Selection Application Using The Topsis Method

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***Abstract*—:** Athletes are a profession that is of great interest to young people in various sports. Psychological factors that support success and the role of coaches in sports are very necessary for the success of talented athletes in their fields. Currently, coaches have certain training programs that aim to increase the athlete's agility, strength, and speed. This program is felt to be less effective because decision-making is done by considering the weighting of two categories, namely physical and psychological. The weight of the criteria obtained will assist coaches in maximizing the physical and psychological abilities of athletes in order to achieve the expected championship targets. For this reason, a plan was created to select talented athletes using the Topsis method (Technique for Others Reference by Similarity to Ideal Solution). This design is facilitated by an Android-based interface with simple logic, an easy-to-understand category calculation input process, and a mathematical model for determining the best athletes so that it can help coaches and be effective in selecting talented athletes

Keywords: athletes, training programs, system design, criteria weights, TOPSIS

I. Introduction

An athlete must increase his or her potential with hard training and a disciplined attitude, and the role of the coach is to help the athlete achieve goals with a training program. Someone who wants to become an athlete for the competition must follow the existing selections in order to see the potential that the athlete has. An athlete also has a certain training program that aims to increase agility, strength, and speed. For an athlete, not only is a training program needed, but it is also necessary to know what psychological factors support success in sports. Athlete comes from the Greek word athlos, which means "contest". Another term for an athlete is an athlete, namely a person who is trained to compete with their strengths in order to achieve achievements. Those who are called athletes are sports players who excel at regional, national, and international levels [1]. So it can be said that athletes are people who do exercises to gain body strength, endurance, speed, agility, balance, flexibility, and strength by preparing themselves long before the competition starts.

A decision support system is a method that is widely used to complete practical decision-making and has a concept where the selected alternative is the best alternative [1]. Previous research from testing took the form of rankings based on calculations of the scores resulting from athlete selection that had been carried out. Other research using the TOPSIS method will be more precise because it is based on predetermined criteria values and weights, so it will get more accurate results [2] and [3]. This decision support system helps assess every prospective taekwondo athlete who takes part in the selection process to take part in the taekwondo championship. A decision support system that can determine a decision to be taken [4] is useful for facilitating decision-making related to championship selection problems. This researcher tries to help coaches' problems in determining talented athletes, which is facilitated by the interface. Decision-making is carried out by considering the weighting of two categories, namely physical and psychological. The TOPSIS method is a decision-support system using the HTML programming language with a MySQL database. Applications are capable of processing input data in the form of data, data criteria, or alternative data [5]. The TOPSIS method is used because the concept is simple, easy to understand, and computationally efficient [6] [7]. The logic is simple, the calculation process is easy to understand, and the best alternative selected is a simple mathematical model for determining the best athlete.

II. RESEARCH METHODS

TOPSIS uses the principle that the selected alternative must have the closest distance from the positive ideal solution and the farthest from the negative ideal solution from a geometric point of view by using Euclidean distance to determine the relative closeness of an alternative to the optimal solution. [7] [8][9]

2.1. Method of collecting data

Literature review

The literature study carried out by researchers came from various sources, such as books, literature, previous scientific journals related to research, and all other trusted sources that could support this research.

Observation

This method is used by going directly and observing what is needed to find the information and knowledge needed for research material.

Interview

The interview method is carried out by asking a number of questions of the interviewer to be answered by sources from the school to obtain information.
The development method used in this research is waterfall, a classic method that is systematic and sequential in building software. The stages carried out are as follows:

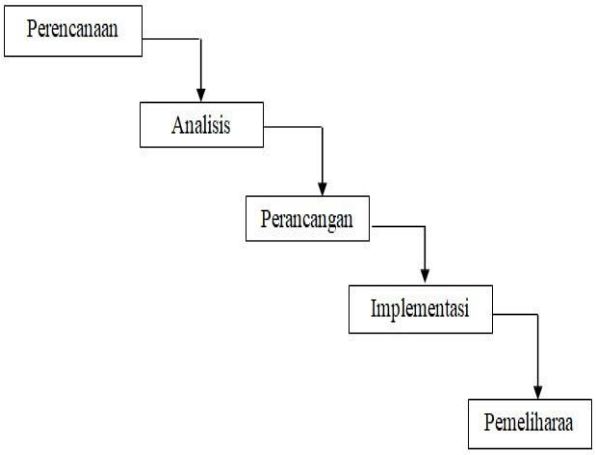

Fig. 2: Waterfall Method

2.2. Software Requirements Analysis Information technology for implementing the Topsis method for selecting talented athletes requires the following software:
a. Windows 10 Operating System
b. Android Studio
c. Java 2.

Hardware Requirements Analysis The minimum hardware specifications used are as follows:
a. Laptop Processor AMD A9;
b. RAM 4GB;
c. Android Smartphones
d. USB cable

TOPSIS STAGES :

1. Determine the normalized decision matrix

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}$$

Rij : is an attribute value that has been normalized
Xij : is the value of each attribute
m : is the attribute value available for each criterion

2. Calculating normalization and weighting

$$v_{ij} = r_{ij} \times w_j$$

3. Look for the value of the positive ideal solution (max) and the negative ideal solution (min)

dimana :

y_j^+ adalah : - max y_{ij}, jika j adalah atribut keuntungan
- min y_{ij}, jika j adalah atribut biaya

y_j^- adalah : - min y_{ij}, jika j adalah atribut keuntungan
- max y_{ij}, jika j adalah atribut biaya

4. Determine the distance between the value of each alternative and the positive and negative ideal solution matrices

$$D^+ = \sqrt{\sum_{i=1}^{m} (yi - yij^+)^2}$$

$$D^- = \sqrt{\sum_{i=1}^{m} (yi - yij^-)^2}$$

5. Find D+ and D- for each alternative

$$D_i^+ = \sqrt{\sum_{j=1}^{n} \left(y_i^+ - y_{ij}\right)^2} \quad ; i=1,2,\ldots,m$$

$$D_i^- = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_i^-\right)^2} \quad ; i=1,2,\ldots,m$$

III. RESULT AND DISCUSSION

3.1 User Flowchat

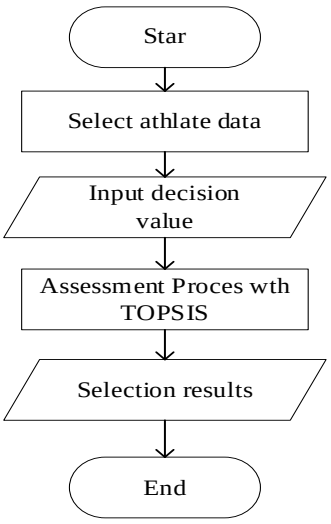

Fig 3.1 : Election system flowchat

The system flowchart explains the flow of the athlete selection system, namely by selecting athlete data, then carrying out the process of inputting athlete scores for each criterion. The next stage is a calculation process using the TOPSIS method, and then the results of determining talented athletes will appear.

Table 3.1 athlete database

Field Name	Type	Size	Description
Idatlet	int	5	Id
Nama Atlet	varchar	50	Nama Atlet
Tempat, Tanggal Lahir	varchar	25	Tempat, Tanggal Lahir
Usia	varchar	5	Usia
Alamat	varchar	50	Alamat
No Hp	varchar	15	No Hp

Table 3.2 Assessment database

Field Name		Type	Size	Description
Idnilai		int	5	Id
Nama Atlet		varchar	50	Nama Atlet
Fisik	Daya Tahan	varchar	4	Daya Tahan
	Kecepatan	varchar	4	Kecepatan
	Kelincahan	varchar	4	Kelincahan
	Kekuatan	varchar	4	Kekuatan
Psikis	Mental	varchar	4	Mental

3.2. ***Use Case Athlete selection diagram***

The following is a use case diagram of the proposed system

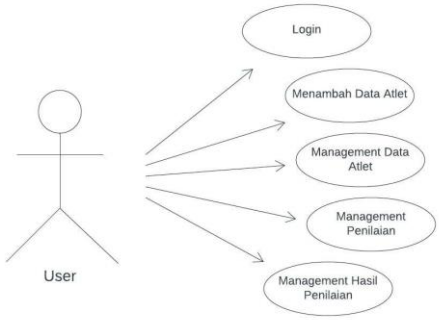

Fig 3.2 Use Case Use

A use case diagram describes the expected functionality of a system. What is emphasized is "what" the system does, not "how". The system use case represents an interaction between actors and the system.

Activity Diagrams Activity diagrams can also depict parallel processes that may occur in several executions. The following is the activity diagram that is up.

1. Login Page Display

This page contains the username, password, and login button

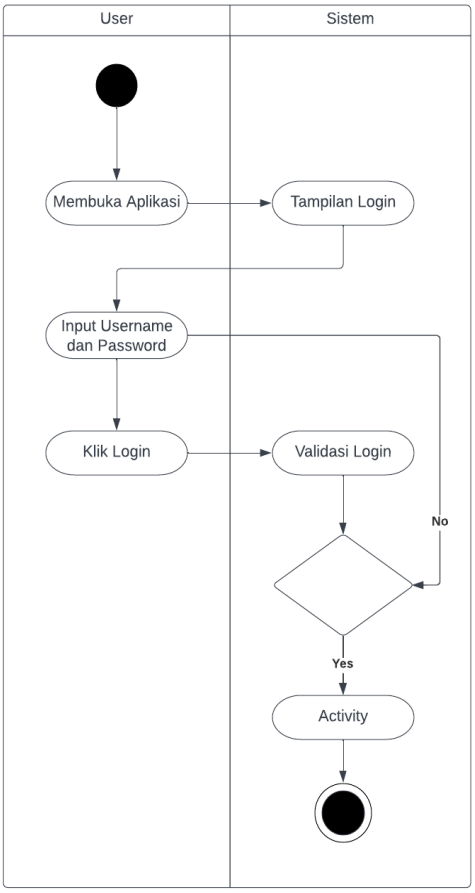

Fig. 3.3 Activity Diagram Login

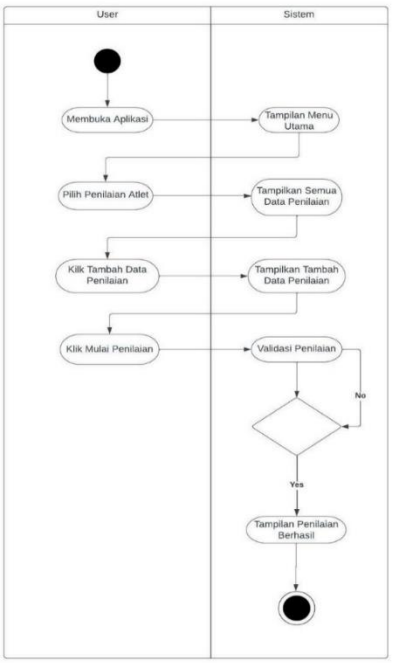

Fig 3.4 Assessment Management Activity Diagram

Fig.3.5. Login page display

1. Admin Home View
   This page contains an assessment history button, a user account button, a button about the application, and a button about logging out.

Fig.3.6. Home Admin view

Display of the Athlete Determination This view contains a list of athlete determinations

Fig.3.7. Display of the Athlete Determination

Weigh Rules display
This display contains a lisf of weight rules

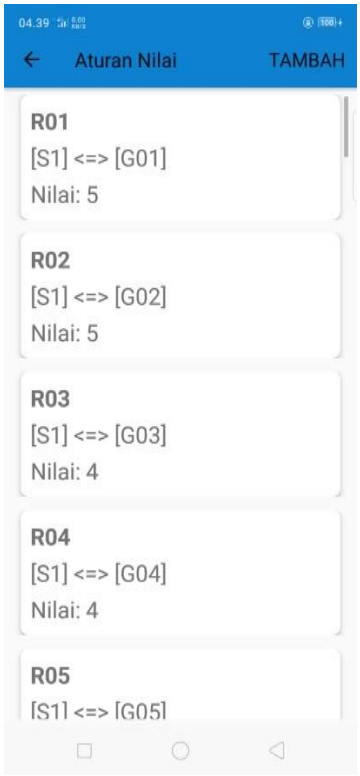

Fig 3.8. Weigh Rules display

Add Assessment Results page This page contains columns for name, date of birth, age, address, cellphone number, and save

Fig.3.10. Add Assessment Results page

IV. CONCLUSION

Application of the topsis method for selecting talented athletes who have carried out a testing process. When the testing process runs well, all applications can be accessed. This application can be used on smartphones that already use Nougat-based Android operations. This talented athlete selection application is recommended for coaches to determine talented athletes using a simple calculation algorithm, and through this application, you can store data in a database, so it is easy to use again

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