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DECISION SUPPORT SYSTEM FOR MOVIE RECOMMENDATIONS BASED ON MULTI USER PREFERENCES USING THE SIMPLE ADDITIVE WEIGHTING METHOD

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ABSTRACT

At this time advances in technology and information have experienced rapid progress, one of which is in the field of entertainment, both audio and visual. And one of the entertainments is movies. With the increasing number of movies, there are several classifications of movie genres to assist users in finding and selecting movies to watch, but the genre classification itself is still very general. Due to the above factors, especially in genre, subgenre, rating, movie duration which always develops over time according to a certain pattern and also audiences who have different movie preferences, the researcher sees that there is a need for an application that can recommend movies with preferences that can be set according to the wishes of movie lovers. From the problems that arise, this research was built using the Simple Additive Weighting (SAW) method which aims to make it easier for users to determine which movie to choose. This system produces a web-based information system using several parameters, namely the main genre of a movie, subgenre, movie rating, movie duration, and year of making.

Keywords: *Simple additive weighting, movie, genre, recommendation, application*

1. INTRODUCTION

At this time the advancement of technology and information has progressed rapidly. One area that is experiencing rapid development is the field of entertainment. There are many types of entertainment that are around us, both audio and visual. And one of the entertainments is movies. The development of the movie began with the use of the kinetoscope invented by Thomas Alfa Edison, which was used by individual viewers at that time. The initial movie was still mute and colorless. The screening of movies in cinemas for the first time was carried out in the early 20th century, until the first Hollywood movie industry, even today it dominates the popular movie industry globally. In 1927 technology was capable enough to produce speech movies whose dialogue could be heard live, but still in black and white. Until 1937 movie technology was able to produce color movies that were more interesting and followed by story lines that were gaining in popularity. In the 1970s, movies could be recorded in mass quantities using videotapes which were then sold. In the 1980s laser disc technology was invented, then VCD and then DVD technology. Until now, digital movies, which are more practical, are much in vogue so that the popularity of movies increases and movies become closer to the parallels of modern society and the development of technology will also have an impact on the number of movies which will continue to increase every year.

With the increasing number of movies, there are several classifications of movie genres to assist users in finding and selecting movies to view, but the genre classification itself is still very general. Until now there are many applications for recommending movies, but most of these applications can only search for one criterion from a movie, it can be based on genre, year, or other criteria regardless of the preferences of other criteria simultaneously from other criteria or elements in the movie, where maybe there are viewers who want horror movies with drama seasonings or viewers who want drama movies with a duration of only 1 hour but with the highest movie rating.

Because of the factors above, especially in genre, subgenre, rating, movie duration which always develops over time according to certain patterns and also audiences who have different movie preferences, the researcher sees that there is a need for an application that can recommend movies with preferences that can be set according to the

wishes or preferences of users, namely movie lovers.

From the problems that arise, this research was built using the Simple Additive Weighting (SAW) method which aims to make it easier for users to determine which movie to choose. This created system produces a web-based information system using several parameters, namely the main genre of a movie, subgenre, movie rating, movie duration, and the year the movie was made. This system uses data that is already available from the IMDB website. The reason for selecting the SAW method in the development of a movie recommendation system is because the assessment can be carried out precisely and quickly because it is based on predetermined criteria values and preference weights. Based on the explanations that have been discussed, in this research is carried out with the title Movie Recommendation Support System Based on Multiple User Preferences Using the Simple Additive Weighting Method.

2. METHOD

2.1 Decision Support Systems (DSS)

According to Bonczek [2], defines a Decision Support System (DSS) as a computer-based system consisting of three interacting components, a language system (a mechanism to provide communication between users and other Decision Support System components).), knowledge systems (repositories of problem domain knowledge that exist in Decision Support Systems or as data or as procedures), and problem processing systems (relationships between two other components, consisting of one or more general problem manipulation capabilities required for decision making)

2.2 Characteristic of Decision Support Systems

The characteristics of a decision support system are as follows:

1) Support a decision support system that focuses on Management by Perception.
2) The existence of a human/machine interface, where humans as users still control the decision-making process.
3) Support decision making in solving unstructured and semi-structured problems.
4) Using models, both mathematical models, statistics and other appropriate models to support the decision-making process.
5) Able to provide appropriate information for the needs of interactive models.
6) Have an integrated subsystem in a decision support system so that it can function as a unified system.
7) The existence of comprehensive data support to fulfill the existing functions at the management level.
8) Easy to use approach, meaning ease of use of the system, this is a characteristic of an effective decision support system, which allows users to be free and fast to interact.
9) Having the ability to adapt appropriately to changes that occur in other words the system can face problems that just arise as a result of changing conditions.

2.3 Simple Additive Weighting (SAW)

The Simple Additive Weighting method is one of the methods used to solve the problem of Fuzzy Multiple Attribute Decision Making (FMADM). The Simple Additive Weighting (SAW) method is a method used to find optimal alternatives from a number of alternatives with certain criteria.

Simple Additive Weighting (SAW) which is also known as weighted linear combination or scoring methods is a simple and most often used multi attribute decision technique. The method is based on the weighted average. An evaluation score is calculated for each alternative by multiplying the scaled value given to the alternative of that attribute with the weights of relative importance directly assigned by decision maker followed by summing of the products for all criteria

The steps for the completion of the Simple Additive Weighting are as follows:

1) Determine the criteria Namely the criteria that will be used as a reference in making decisions, namely Ci and the nature of each that will be used as a reference in decision making, namely "C".
2) Determine the suitability rating of each alternative on each criterion
3) Make a decision matrix based on the criteria
4) Normalize the weight normalize the matrix based on the equation adjusted for the type of attribute (attribute profit or attribute cost) so that the normalized matrix R is obtained.

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max_i(x_{ij})} & If\ j\ are\ the\ benefit\ criteria \\ \dfrac{Min(x_{ij})}{x_{ij}} & if\ j\ are\ the\ cost\ criteria \end{cases} \quad (1)$$

Description :
R_{ij} : normalized performance rating value
X_{ij} : attribute value owned by each criterion
$Max_i(x_{ij})$: the largest value of each criterion
$Min_i(x_{ij})$: the smallest value of each criterion
Benefit : if the value is owned the higher the better
Cost : if the value is owned the lower the better

5) Determine the value of the vector V
The formula to find the preference value for each alternative (Vi) is given as follows:

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (2)$$

Description :
V_i : Value of Vector
W_j : weight value of each criterion
Rij : : weight value of each criterion

6) Ranking the values of the vector V
Concluding as a final stage

3. SYSTEM ANALYSIS AND DESIGN

3.1 Analysis

In the development of this system, there are two user level who can interact with the system. These two level are admin and member.

Table 1. User Level in the decision support system for movie recommendations based on multi user preferences using the simple additive weighting method

User Level	User Description
Admin	The access rights that admin users can exercise include inserting, updating and deleting data on the master data member module, movies, content, and data settings on the web.
Member	The access rights that can be exercised by the user as a member are insert member data, get movie recommendations based on the movie criteria that have been entered by the member.

In a decision support system for recommendations based on the preferences of multiple users using the simple additive weighting method, these are several criteria and alternatives that serve as a reference / basic for members. these criteria will be used as the basis for calculations in the simple additive weighting method. these criteria will be shown in table 2 as follows

Table 2. Criteria Table

Criteria	Description
C1	Movie Ratings
C2	Age Restriction
C3	Number Of Genres
C4	Movie Duration

The assessment criteria are based on the standards of the movie data available on IMDB. From each of these weights, then created a variable-variables. Where from a variable will be converted into its fuzzy number

1) Movie Ratings

Table 3. Movie Rating Criteria Table

Criteria Movie Ratings	Value	Description
> 8.5	5	Very good
7.6 - 8.5	4	Well
6.6 - 7.5	3	Enough
6.0 - 6.5	2	Not enough
< 6.0	1	Very less

2) Age Restriction

Table 4. Age Restriction Criteria Table

Criteria Age Restriction	Value	Description
G / SU	5	Very good
PG	4	Well
PG - 13	3	Enough
R	2	Not enough
NC-17	1	Very less

3) Number Of Genres

Table 5. Number Of Genre Criteria Table

Criteria Number Of Genres	Value	Description
> 4	5	Very good
3	4	Well
2	3	Enough
1	2	Not enough
0	1	Very less

4) Movie Duration

Table 6.Movie Duration Criteria Table

Criteria Movie Ratings	Value	Description
<= 60 minutes	1	Very Well
61-90 minutes	2	Well
91 -120 minutes	3	Enough

3.2 System Design

The system is designed in the form of a web application that can be used on all devices connected to the internet. that will apply Simple Additive Weighting method. The implementation that will be used will be shown in the flowchart below.

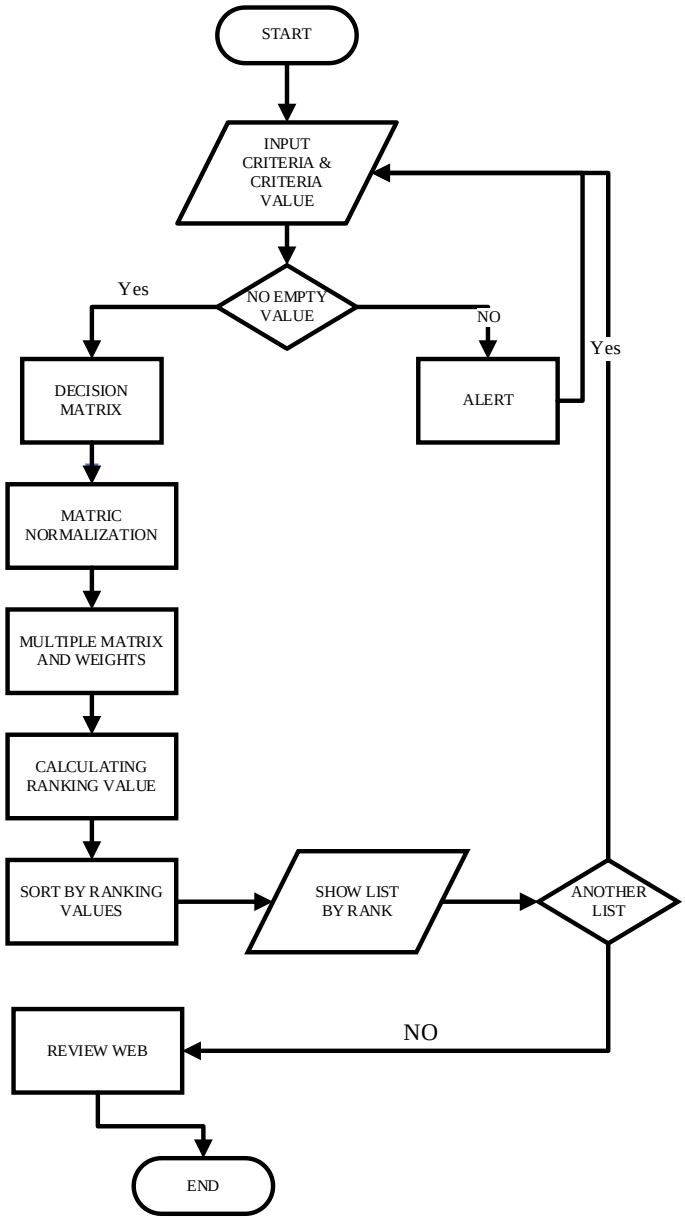

Figure 1. Flowchart Of The Main Function

4. RESULT AND DISCUSSION

4.1 Simple Additive Weighting Implementation Test Result on The System

To prove the results of the Simple Additive Weighting experiment on our system, we will carry out an experiment that will be taken from the sample data that is already available.

Table 7. Criteria Table

Description	Selected Criterion Value
Movie Ratings	7-8
Age Restriction	PG-13
Number Of Genres	Action, Adventure, horror
Movie Duration	90-150

Based on the filters that have been taken randomly in table 7. data will be obtained indicating movies that have 1 criterion value that matches the filter or several movies that have criterion values that match the filters that have been taken

Table 8. Movie Table

Alternative	C1	C2	C3	C4
Spy Kids	5.5	PG	1	88 minutes
The Dry	7	R	1	117 minutes
A Knight's Tale	6.9	PG-13	0	132 minutes
Punch-Drunk Love	7.3	R	2	95 minutes
The Mummy Returns	6.4	PG-13	0	130 minutes
Mank	7	R	2	131 minutes
The Devil All the Time	7.1	R	1	138 minutes
Cidade de Deus	8.6	R	1	130 minutes
How to Lose a Guy in 10 Days	6.4	PG-13	1	116 minutes

After getting a list of movies that match the criteria, then the next step is to start the first process using the simple additive weighting method, namely changing the values of all the criteria from the list of movies obtained into fuzzy numbers according to table 3 through table 6.

Table 9. Fuzzy Table

Alternative	C1	C2	C3	C4
Spy Kids	Very less	Well	Not enough	Well
The Dry	Enough	Not enough	Not enough	Enough
A Knight's Tale	Enough	Enough	Very less	Not enough
Punch-Drunk Love	Enough	Not enough	Enough	Enough
The Mummy Returns	Very less	Enough	Very less	Not enough
Mank	Enough	Not enough	Enough	Not enough
The Devil All the Time	Enough	Not enough	Not enough	Not enough
Cidade de Deus	Very Well	Not enough	Not enough	Not enough
How to Lose a Guy in 10 Days	Not enough	Enough	Not enough	Not enough

Then next we will do the second process in the simple additive weighting method, namely we will change the data that we got in the previous table into a table with decimal values or according to table 3 to table 6. from this process we will get movie data that will be displayed in table 10

Table 10. Fuzzy Number Conversion Results Table

Alternative	C1	C2	C3	C4
Spy Kids	1	4	2	2
The Dry	3	2	2	3
A Knight's Tale	3	3	1	4
Punch-Drunk Love	3	2	3	3
The Mummy Returns	2	3	1	4
Mank	3	2	3	4
The Devil All the Time	3	2	2	4

Cidade de Deus	5	2	2	4
How to Lose a Guy in 10 Days	2	3	2	4

After we get data like table 10 then we will then carry out the normalization process by carrying out calculations according to the appropriate formula as in figure no 1. That is dividing the available values with the largest data on the selected criteria. This formula can be used for all criteria that are benefit, then for criteria that are value cost, you can use the formula for the smallest value on the criteria divided by the value available

Table 11. Normalized Conversion Results Table

Alternative	C1	C2	C3	C4
Spy Kids	0,2	1	0,667	1
The Dry	0,6	0,5	0,667	0,667
A Knight's Tale	0,6	0,75	0,333	0,5
Punch-Drunk Love	0,6	0,5	1	0,667
The Mummy Returns	0,4	0,75	0,333	0,5
Mank	0,6	0,5	1	0,5
The Devil All the Time	0,6	0,5	0,667	0,5
Cidade de Deus	1	0,5	0,667	0,5
How to Lose a Guy in 10 Days	0,4	0,75	0,667	0,5

Then after getting the normalized data which we can see in table 11 then the next process is to multiply by the weight value of the value we have determined. and we can get the total value that we can get from adding up the values of all the criteria that we have got in table 12.

Table 12. Results Table

Alternative	C1	C2	C3	C4	Total	Ranking
Spy Kids	0,07	0,3	0,167	0,1	0,63667	4
The Dry	0,21	0,15	0,167	0,067	0,59333	5
A Knight's Tale	0,21	0,225	0,083	0,05	0,56833	8
Punch-Drunk Love	0,21	0,15	0,25	0,067	0,67667	2
The Mummy Returns	0,14	0,225	0,083	0,05	0,49833	9
Mank	0,21	0,15	0,25	0,05	0,66	3
The Devil All the Time	0,21	0,15	0,167	0,05	0,57667	7
Cidade de Deus	0,35	0,15	0,167	0,05	0,71667	1
How to Lose a Guy in 10 Days	0,14	0,225	0,167	0,05	0,58167	6

After we get the total value for each movie that we have obtained, the next process is to rank according to the total value that we have obtained. and after doing the ranking, the movie ranking will be obtained according to the selected criteria.

5. CONCLUSION

This final project is entitled "DECISION SUPPORT SYSTEM FOR MOVIE RECOMMENDATIONS BASED ON MULTI USER PREFERENCES USING THE SIMPLE ADDITIVE WEIGHTING METHOD" with the ultimate goal of getting the 10 best movies that can be recommended based on the desired criteria and criteria values. The conclusions obtained in this study are:

1) The design of the information system using the Simple Additive Weighting method has been successfully built and has successfully gone through several test processes on several functions with good results
2) Applications can apply the SAW method, although there are some recommendations that are not in accordance with manual calculations. This is due to the difference in sorting the data with the same total preference value.

3) The application can display the results of movie recommendations that match the options that have been selected.

REFRENCES

[1] Afshari, A., Mojahed, M., & Yusuff, R. M. (2010). Simple additive weighting approach to personnel selection problem. *International journal of innovation, management and technology*, *1*(5), 511.

[2] Bonczel, Robert H., Holsapple, Clyde W (1981), *Foundation of Decision Support System*, Elsevier Inc.

[2] Suwarno, J., 2020. Implementasi Metode FMADM Dengan Menggunakan Algoritma SAW (Simple Additive Weighting) Untuk Pemilihan Karyawan Terbaik. *Journal of Artificial Intelligence and Innovative Applications (JOAIIA)*, *1*(4), pp.213-219.

[3] Fauzan, R., Indrasary, Y. and Muthia, N., 2018. Sistem Pendukung Keputusan Penerimaan Beasiswa Bidik Misi di POLIBAN dengan Metode SAW Berbasis Web. *Jurnal Online Informatika*, *2*(2), pp.79-83.

[4] Firdaus, I.H., Abdillah, G., Renaldi, F. and Jl, U.J.A.Y., 2016. Sistem Pendukung Keputusan Penentuan Karyawan Terbaik Menggunakan Metode Ahp Dan Topsis. *Semin. Nas. Teknol. Inf. dan Komun*, *2016*, pp.2089-9815.