DSS to Determine the Location of Housing Using the Fuzzy Method

1ˢᵗ Deny Purnama Ramadan
Program Computer Science Department, Graduate Program Magister Teknologi Informasi Raharja University
Tangerang, Indonesia
denypurnama13@gmail.com

2ⁿᵈ Fahmi Rizky Nugraha
Program Computer Science Department, Graduate Program Magister Teknologi Informasi Raharja University
Tangerang, Indonesia

3ʳᵈ Harco Leslie Hendric Spits Warnars
Program Computer Science Department, BINUS Graduate Program - Doctor of Computer Science Bina Nusantara University
Jakarta, Indonesia

Abstract—**The choice of location to optimize business activities such as housing, factories, shop houses is determined through mechanisms and patterns that can be understood. Various criteria that have been taken into consideration include land availability, raw materials, distance, accessibility, transportation, labor costs, security guarantees, absorption of local markets, political stability, and other supporting facilities. Some location theories generally use the approach of minimizing costs, maximizing profits, market approaches, attractiveness. One effort to help facilitate housing developers in optimizing it is to build software (software) based on fuzzy artificial intelligence applications. Based on the decision-making criteria determined by the entrepreneur. So entrepreneurs, especially in the field of Developer / developers no longer bother to find out or get information about the location of housing construction desired by consumers, and can reduce unwanted risks and time savings.**

Keywords: DSS, housing, fuzzy method

I. INTRODUCTION

The house is an important need to support human life, usually the house is used as a place of activity and rest with the family, besides that the house can be used as a good investment because of rising prices, therefore many housing developers have sprung up to compete to build ideal housing for the community, Ideal housing can be seen from several factors, namely the criteria for distance to the causeway, distance from the city center, population density, criteria for public transportation access, criteria for public demand.

The location of housing construction becomes a very important factor because it can determine the success or failure of the sale of the housing later, therefore housing developers must be good at analyzing the location to be built, but not all developers can analyze the location properly, coupled with human factors error which can reduce the accuracy of the analysis. To help developers overcome this need to form a website-based system that can help housing developers in determining the right location, in the development of IT science there is an application model that can recommend decisions or support decisions, namely the Decision Support System (DSS), the application can be used flexibly wherever and whenever with internet connection conditions, DSS can simplify and speed up housing developers to determine which location decision is best and meets the considerations that have been determined, The

model used in determining the housing location selection decision is the fuzzy method is a rule-based decision making process that aims to solve problems, where the system is difficult to model or there is abundant ambiguity and ambiguity. Fuzzy logic is determined by logical equations rather than complex differential equations and is derived from thoughts that identify and take advantage of the grayness between two extremes. Fuzzy logic system consists of fuzzy sets and fuzzy rules.

online housing condition assessments and improvement decision support systems (DSS). This system consists of three main parts: the interface module, the analysis module, and the database module.

The operations analysis module that combines GA and AHP makes complex operating processes more effective and efficient. The dynamic database module contributes to updating instant cost data and adding new refinement skills for action on the market. (Juan, Y. K., Kim. 2009). [1]

Fuzzy logic is one of the components forming Soft Computing. The basis of fuzzy logic is fuzzy set theory. In fuzzy set theory, the role of the degree of membership as a determinant of the existence of elements in a set is very important. The value of membership or the degree of membership or membership function becomes the main characteristic of reasoning with fuzzy logic, Fuzzy logic is an improvement from the application of boolean logic, in boolean algebra that only recognizes notations 1 and 0. Fuzzy logic allows membership to be valued between 0 to 1. Therefore it can be said that a condition can be partly true and partly wrong at the same time (Kusumadewi S, Purnomo H, 2010). [2]

Business Intelligence in relation to management support for structured and unstructured data, is a process of integrating and uniting components to handle data in the business intelligence framework. The approach will be carried out with three types of approaches, namely integrating structured and unstructured data, analyzing data collections and distributing the results of the analysis into a form that suits your needs. The above approach can utilize three layers of business intelligence framework in the form of data layers (Baars dan Kemper, 2006) [3]

MCDM assessment methods can assist stakeholders in making more accurate and comprehensive decisions regarding affordability, reflecting the quality and

sustainability of housing locations, rather than focusing exclusively on housing costs and income. The methodology presented can be adopted by a number of interested parties, including local governments, governments, developers and investors. This tool can be used on a local, national or international scale. The weight (importance) of the criteria can be adjusted to the requirements of the relevant parties and depends on the local situation (Emma Mulliner, et ., Al., 2013) [4]

In a large measure, science is based on classical bivalent, Aristotelian, logic. In science, binarization is the norm not an exception. In human cognition, the opposite is true. One of the main contributions of fuzzy logic is that provide the basis for far-reaching change in almost all fields of science from bodybuilding to pluralism, from black and white to gray. In the coming years, this step is likely to be accelerated, and the impact of fuzzy logic is possible to become more visible and more substantive. Finally, what might happen in science as in almost fuzzy logic Everything will, or will be permitted, become a matter of degree. This is what I saw in the crystal ball (Lotfi A. Zadeh et,. Al,. 2015) [5]

The proposed GKWFLICM has the same nature of the original KWFLICM algorithm by exploiting the fuzzy G ′′ factor as a local equation they measure M-dimensional data. GKWFLICM has improved the performance of FCM grouping for M-dimensional feature space data and makes it more robust for noise and noise. GKWFLICM also overcomes the FCM weakness of poor performance for different sized clusters and different density clusters (Memon, K. H., & Lee, D. H. 2018) [6]

II. FUZZY METHOD

Fuzzy analysis begins with data from one of the housing developers, which determines the best housing location, there are 4 input variables consisting of Distance to road, Distance to city center, Access to public transportation, population density. By conducting research with the Fuzzy method and the output variable is the decision

Distance to road / m
1   Close   100-350
2   Medium 300-650
3   Far   600-950

Distance to city center /m
1   Close   2000-5000
2   Medium 4000-7000
3   Far   6000-9000

Population density / kk
1   Deserted 100-400
2   Medium 300-700
3   Heavy   600-800-more

Access to public transportation
1   Deserted 2-3
2   Medium 3-5
3   Heavy   5-6

In the next process each fuzzy variable will be calculated using the membership function of the shoulder curve and the triangle curve as an approach to obtain the degree of membership of a value in a fuzzy set with this formula.

$$\mu[x] = \begin{cases} 0; & x \geq c \quad x \leq a \\ (x-a)/(b-a); & a < x < b \\ (c-x)/(c-b); & b < x < c \end{cases}$$

Figure 1. Formula degree of membership

In the next step, look for alpha and z1 values using the following formula :

Alpha = is the smallest value of the fuzzy membership value

Z1   = Zmax – a1(Zmax-Zmin)

after all the values can be fulfilled the next process is the defuzzification process in the following way :

z = (a-predicate 1 * z1) -n / (a-predicate1-n)

the value of Z is then compared to the output curve that has been made to find out the value entered into the criteria that have been defined the output curve used in this study is as follows :
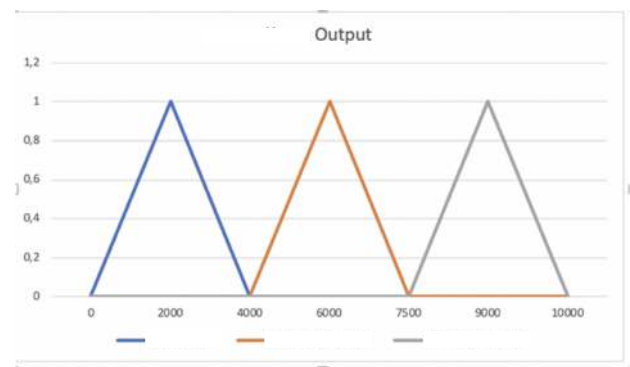

Figure 2. Curva output

Description :
Blue : Recommendation
Orange : Enough Recommendations
Grey : Not Recommendation

Fuzzy Output Curve used in this system is based on the distance criteria with justification that every person wants to have occupancy with a close and strategic distance, so it can be concluded that the criteria of distance to the city and distance to the road have the greatest weight that affects the value of Z, therefore the smaller the value Z in the location of housing the better.

III. RESULTS AND DISCUSSION

Figure 3. Model Use Case Diagram

| Actor	Process	Description
All user	Login	Login is used to enter the system
All user	Add criteria	This process is used to add criteria if there are additions or subtractions
All user	Add Rules	This process is used to add criteria if there are additions or subtractions
Analyst	Input Data Location	The process for adding housing location data before it is assessed by the system
Analyst	Report	Reports are location recommendations issued by the system
Admin	Registration	The process for adding user analyst accounts.

Figure 4. Admin Login Activity Diagram
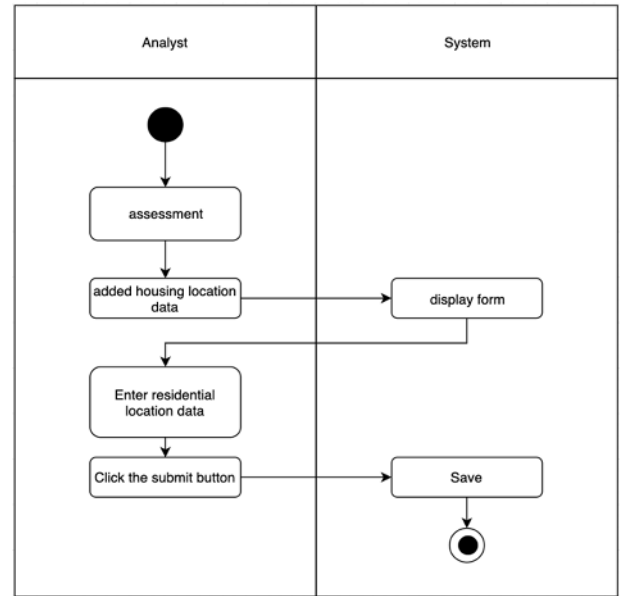
Figure 5. Input Data Location
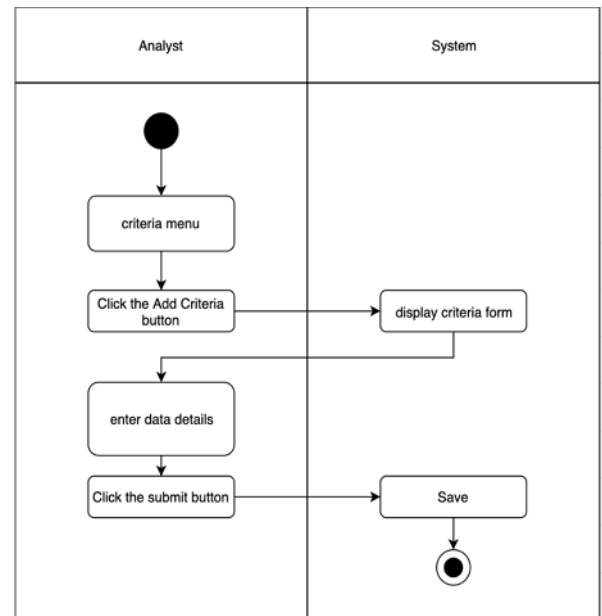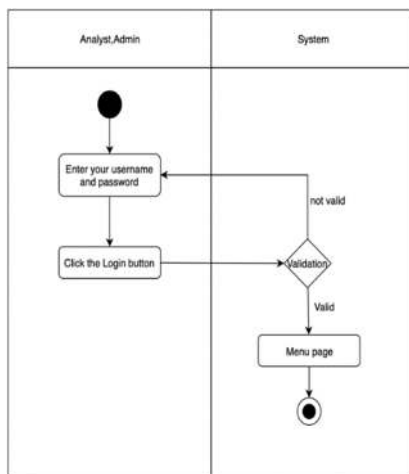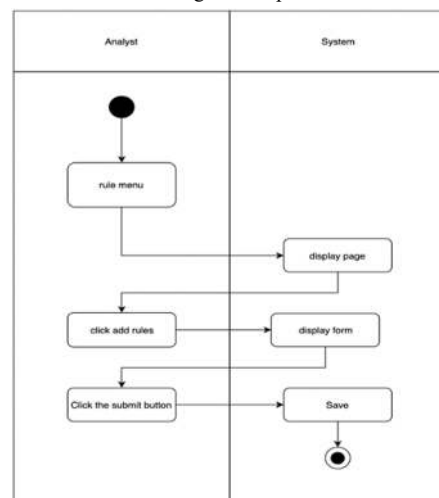

Figure 6. Input Variable

Figure 7. input data rules

IV. CONCLUSION

From the discussion and review of the employee recruitment decision support system model, conclusions can be drawn including:

- This decision support system can help and make it easy in the assessment process to determine the location of housing so that it can make a selection of the test results tested, by recommending a location that is well in accordance with the criteria and weight values that have been determined

- Decision support systems with the Fuzzy method can produce a system that can manage data and carry out calculations so that it can increase the effectiveness and efficiency in the decision-making process of the housing location selection process.

- Decision support systems using the FUZZY method have been proven to be used to conduct assessments to determine residential locations with an accuracy of up to 80% based on accuracy testing.

- From the results of this research that has been done it will be faster to get information on the location assessment that will be used as housing.

REFERENCES

[1] Juan, Y. K., Kim, J. H., Roper, K., & Castro-Lacouture, D. (2009). GA-based decision support system for housing condition assessment and refurbishment strategies. Automation in Construction, 18(4), 394-401.Kusumadewi, S., Purnomo, H. 2010. Aplikasi Logika Fuzzy untuk Pendukung Keputusan Edisi 2. Graha Ilmu. Yogyakarta.

[2] Baars, Kemper.2006. Management Support with Structured and Unstructured. Data. Information Systems Management

[3] Mulliner, E., Smallbone, K., & Maliene, V. (2013). An assessment of sustainable housing affordability using a multiple criteria decision making method. Omega, 41(2), 270-279.

[4] Zadeh, L. A. (2015). Fuzzy logic—a personal perspective. Fuzzy sets and systems, 281, 4-20.

[5] Memon, K. H., & Lee, D. H. (2018). Generalised kernel weighted fuzzy C-means clustering algorithm with local information. Fuzzy Sets and Systems, 340, 91-108.

[6] Alves, M. C., Lima, B. S., Evsukoff, A. G., & Vieira, I. N. (2009). Developing a fuzzy decision support system to determine the location of a landfill site. Waste Management & Research, 27(7), 641-651.

[7] Heizer, Jay dan Barry Render. (2015), Operations Management (Manajemen Operasi), ed.11, Penerjemah: Dwi anoegrah wati S dan Indra Almahdy, Salemba empat, Jakarta.

[8] Al-Qutaish 2010 Al-Qutaish, Rafa, E. "Quality Models in Software Engineering Literature: An Analytical and Comparative Study." Journal of American Science, vol. 6 (2010): 166-175.

[9] Kahraman, C., Ruan, D., & Doğan, I. (2003). Fuzzy group decision-making for facility location selection. Information sciences, 157, 135-153.

[10] Natividade-Jesus, E., Coutinho-Rodrigues, J., & Antunes, C. H. (2007). A multicriteria decision support system for housing evaluation. Decision Support Systems, 43(3), 779-790.