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Research paper

The uses of fuzzy logic method for finding agriculture and livestock value of potential village

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Abstract

This paper presents the potential owned by the Bulurejo village in the field of Agriculture and Livestock field. The authors conducted a study to determine the outcomes of potential Bulurejo village based on criteria such as potential in the field of agriculture, field of large cattle and small livestock and poultry using fuzzy logic method. So from the results of these studies there are results of the value of 74.29 which is included in the potential of a good village. The application of fuzzy logic method in determining the potential value of the village in accordance with the criteria has been successfully established, so that the fuzzy logic method is suitable for the calculation of the search results from the potential of Bulurejo village.

Keywords: *fuzzy logic; agriculture; livestock; potential village.*

1. Introduction

1.1 Background

Information and Communication Technology is a requirement that has been considered the principal for now. Especially in the field of governance to improve the quality of work processes and provide efficient and effective services in order to attract investment to the community to promote the potential of the village thus placing a village in the position of the village advanced in developing the potential empowerment of the village. E-government in government is expected to improve the quality of work and service to the community.

In the process of designing this system apply fuzzy logic method in case study of village potency information. It is based on the lack of information to this dive community, where many people are asking about the potential of Bulurejo village and they can only know from information that is not necessarily true, even if they will verify the truth of the information they must go directly to the office of Bulurejo village. It will take a long time and is not practical. Thus, in the wake of a potential information system in which the village is also applied fuzzy logic method.

The system to be built is fuzzy database system, because in the process of taking information the village potency using fuzzy logic and using database in storing and retrieving the potential information of village data. The model used in this fuzzy database is the Mamdani model, which still uses a standard database relation, with more emphasis on fuzzy usage on some fields in the existing tables of the database and easier in computation. This research is inspired by researchers [1-26].

1.2 Problem Formulation

Based on the background that has been described above, then obtained two problem formulas are:

1. How to make a search application data and information quickly and accurately to the potential of Bulurejo village?
2. How to apply fuzzy logic approach in searching the potential information of Bulurejo village?

1.3 Limitation Problems

The limitations of the problem in this study are as follows:

1. The research used is fuzzy logic approach to draw conclusion.
2. Criteria determination is the potential in the field of Large Livestock, Small Livestock, Poultry, Agriculture.

1.4 Objectives and Benefits of Research

The purpose of this research is as follows:

1. Realizing the government data processing system and the potential of better Bulurejo village.
2. To produce a computerized system to process data quickly and accurately.

2. Literature Review

2.1 Fuzzy Logic

Fuzzy logic is the development of fuzzy set theory which is initiated by Prof. Lotfi Zadeh from the University of California USA, in 1965. Fuzzy logic differs from ordinary digital logic, where the usual digital logic recognizes only two states: Yes_No or ON_OFF or Hight_Low or "1" _ "0" while fuzzy logic mimics the way of human thinking by using the concept of the pseudonym of

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a value dani 0 continuously until the value of one. Fuzzy logic is a good way to map an Input space into an Output space.
Fuzzy logic has several characteristics: fuzzy set and membership characteristics. In boolean logic, an individual is ensured as a member of a single set, whereas in a fuzzy set an individual can enter on two different sets. How big its existence in the set can be seen from the value of its membership.

2.2 Fuzzy Mamdani

The Mamdani method is often known as the Max-min method. This method was introduced by Ebrahim Mamdani in 1975.

1. Max Method (Maximum)
The fuzzy set solution is obtained by taking the maximum value, then using it to change the fuzzy area, and applying it to the output using the OR (union) operator. In general can be written:

μsf [xi] = max (μusf [Xi], μkf [Xi])

By: μsf [Xi] = membership value fuzzy solution until rule to I μkf [Xi] = fuzzy membership value fuzzy rules to i

2. Additive Method (Sum)
The fuzzy set solution is obtained by binding the bounded sum to all fuzzy region outputs generally written:

μsf (xi) = min (1, μsf (xi) + μkf (xi)

with:
μsf [Xi] = the value of the membership of the solution fuzzy until the rule to i

μkf [Xi] = consecutive membership value fuzzy rules to i

3. OR Probabilistic Method (probor)
The fuzzy set solution is obtained by doing the product of all fuzzy area outputs.
Generally written:

μsf (xi) = (μsf (xi) + μkf (xi)) - (μsf (xi) * μkf (xi))

with:
μsf [Xi] = membership value fuzzy solution until rule i

μkf [Xi] = fuzzy membership value rule to i

2.3 E-Government

E-government is all actions in the public sector (both central and local) that involve information technology and communication with the aim of optimizing the efficient, transparent and effective public service process, has become an important part of the effort to establish good governance in Indonesia. The importance of E-government is at least caused by three factors.

1. Electronic communication between the public and the public sectors offers both new forms of participation and interaction.
2. Cyber space in public services facilitates the removal of bureaucratic structures and the classical process of convoluted service.
3. E-government can also offer localized information.

2.4 Website

Website can also be interpreted as a collection of pages displaying text data, still or moving image data, sound animation data, video or a combination of all, both static and dynamic that form a series of buildings interconnected where each is connected to the network pages.

2.5 Potential

Potentials owned by the village Bulurejo include:
1. Agriculture
In the agricultural sector Bulurejo village is said to be very much, with a land area of 30 ha, which usually planting rice during the rainy season and after the harvesting community usually Bulurejo reprocess their land.
2. Large Livestock and Small Livestock
Bulurejo village has the potential of livestock that includes large livestock and small livestock which is mostly done by the community.
3. Livestock Poultry
In addition to small cattle and large Bulurejo village also has poultry farms that are managed by some communities.

3. Analysis and Design

3.1 System Analysis

The purpose of this system analysis is to know what things will be analyzed by the system. The first step that will be done is the data collection of any potential that is owned by the Bulurejo village by going directly to the office of Bulurejo village to get detailed information.

3.2 Determination Analysis of Bulurejo Village Potential Value

This analysis is conducted to obtain information in accordance with the potential owned by the Bulurejo village also in accordance with what is managed or developed by many of its own community, so that people can know the truth of the information. So in this case study the potential potency of the village to be set is potential in the field of small cattle, large livestock, poultry, and agriculture.
For the variable value Potential Villages have the Weight and criteria of the fuzzy numbers divided into 4 parts as shown in Table 1.

Table 1: Weight and criteria of the fuzzy numbers

Criteria Value	Fuzzy Sets	Weight Value
Value 0 - 90	Medium weighing	0 – 20
	Many Fuzzy	10 – 40
	Very Many	30 – 60
	Very Much	50 – 90

The Little Fuzzy set has a weight value (0 - 20) with an equivalent degree less at 10, if the seminal value of the variable is high and exceeds 10 the closer, the Fuzzy set is less represented by the left shoulder, as follows:

$$\mu\text{Medium Weighing}\,[X_1] = \begin{cases} 1\,; X_1 \leq 10 \\ \dfrac{10 - X_1}{5}\,; 10 \leq X_1 \leq 20 \\ 0\,; X_1 \geq 0 \end{cases}$$

For the Fuzzy set Medium weighing the value (10 - 40) with the highest medium degree of value is at 25, if the value of the variable is higher and exceeds the value of 25 then the more closely approximates. The fuzzy set is often implemented with the membership function as follows:

$$\mu\text{Many Fuzzy}\,[X_1] = \begin{cases} 0\,; X_1 \leq 10 \text{ or } X_1 \geq 40 \\ \dfrac{X_1 - 10}{15}\,; 10 \leq X_1 \leq 25 \\ \dfrac{40 - X_1}{15}\,; 25 \leq X_1 \leq 40 \end{cases}$$

Many Fuzzy sets have a weighting value (30 - 60) with membership degrees Many of the highest values are at 45, if the value of the variable is higher and exceeds the value of 45, the closer is very much.

The Fuzzy Set of Many as follows;

$$\mu\text{Very Many}[X_1] = \begin{cases} 0\,; X_1 \le 30 \text{ or } X_1 \ge 60 \\ \dfrac{X_1 - 30}{15}\,; 30 \le X_1 \le 45 \\ \dfrac{60 - X_1}{15}\,; 45 \le X_1 \le 60 \end{cases}$$

Meanwhile, for the Very Many Fuzzy set has the weight of the value (60 - 90), the degree of membership is very much the highest value is found at 70, if the value is less than 70 then approaching Many.

The fuzzy set is very much presented with the right shoulder as follows;

$$\mu\text{Very Much } [X_1] = \begin{cases} 0\,; X_1 \le 50 \\ ; 40 \le X_1 \le 60 \\ 1\,; X_1 \ge 60 \end{cases}$$

3.3 Example of application of fuzzyfication in the program

The potential output of Bulurejo village as a whole is potential in agriculture or food crops 60, Large Livestock 65, Small Livestock 75, and Poultry 80.

1. Agriculture = 60

$$\mu\text{Medium Weighing } [60] = \frac{10 - X_1}{5} \begin{cases} 1\,; X_1 \le 10 \\ ; 10 \le X_1 \le 20 \\ 0;\ X_1 \ge 0 \end{cases}$$

$$\mu\text{SMany Fuzzy } [60] = \begin{cases} 0\,; X_1 \le 10 \\ \dfrac{60 - 10}{15}\,; 10 \le 25 \text{ or } 50 \ge 60 \\ \dfrac{60 - 40}{15}\,; 25 \le 65 \\ = 1{,}33 \end{cases}$$

$$\mu\text{Very Many } [60] = \begin{cases} 0\,; X_1 \le 30 \text{ or } X_1 \ge 60 \\ \dfrac{60 - 30}{15}\,; 30 \le X_1 \le 65 \\ \dfrac{60 - 60}{15}\,; 65 \le X_1 \le 60 \\ = 0 \end{cases}$$

$$\mu\text{Very Much } [60] = \frac{X_1 - 50}{20} \begin{cases} 0\,; X_1 \le 50 \\ ; 60 \le X_1 \le 60 \\ ; X_1 \ge 90 \end{cases}$$

2. Large Livestock = 65

$$\mu\text{Medium Weighing } [65] = \begin{cases} 1\,; 65 \le 30 \\ \dfrac{30 - 65}{5}\ ;\ 30 \le X_3 \le 10 \\ 0;\ X_3 \ge 0 \end{cases}$$

$$\mu\text{Many Fuzzy } [65] = \begin{cases} 0\,; X_3 \le 30 \text{ or } X_3 \ge 30 \\ \dfrac{X_3 - 30}{15}\,; 30 \le X_3 \le 45 \\ \dfrac{65 - 65}{15}\,; 45 \le X_3 \le 30 \\ = 0 \end{cases}$$

$$\mu\text{Very Many } [65] = \begin{cases} 0\,; 65 \le 40 \text{ or } X_3 \ge 60 \\ \dfrac{65 - 40}{15}\,; 40 \le X_3 \le 40 \\ \dfrac{60 - 65}{15}\,; 40 \le X_3 \le 60 \end{cases}$$

$$\mu\text{Very Much } [65] = \begin{cases} 0\,; X_3 \le 40 \\ \dfrac{X_3 - 40}{20}\,; 40 \le X_3 \le 55 \\ 1; X_3 \ge 55 \end{cases}$$

3. Small Cattle = 75

$$\mu\text{Medium Weighing } [75] = \begin{cases} 1\,; 75 \le 20 \\ \dfrac{20 - 75}{5}\ ;\ 10 \le X_3 \le 10 \\ 0;\ X_3 \ge 0 \end{cases}$$

$$\mu\text{Many Fuzzy } [75] = \begin{cases} 0\,; X_3 \le 20 \text{ or } X_3 \ge 30 \\ \dfrac{X_3 - 20}{15}\,; 20 \le X_3 \le 15 \\ \dfrac{60 - 75}{15}\,; 15 \le X_3 \le 30 \end{cases}$$

$$\mu\text{Very Many } [75] = \begin{cases} 0\,; 75 \le 20 \text{ or } X_3 \ge 60 \\ \dfrac{75 - 20}{15}\,; 20 \le X_3 \le 40 \\ \dfrac{60 - 75}{15}\,; 40 \le X_3 \le 60 \end{cases}$$

$$\mu\text{Very Much } [75] = \begin{cases} 0\,; X_3 \le 40 \\ \dfrac{X_3 - 40}{15}\,; 40 \le X_3 \le 55 \\ 1; X_3 \ge 55 \end{cases}$$

4. Poultry 80

$$\mu\text{Many Fuzzy } [80] = \frac{10 - x_1}{5} \begin{cases} 1\,; X_1 \le 10 \\ ;\ 10 \le X_1 \le 20 \\ 0;\ X_1 \ge 0 \end{cases}$$

$$\mu\text{Very Many } [80] = \begin{cases} 0\,; X_1 \le 30 \text{ or } X_1 \ge 60 \\ \dfrac{80 - 30}{15}\,; 30 \le X_1 \le 45 \\ \dfrac{60 - 80}{15}\,; 45 \le X_1 \le 60 \\ = 3{,}33 \end{cases}$$

$$\mu\text{Very Much } [80] = \frac{X_1 - 50}{20} \begin{cases} 0\,; X_1 \le 60 \\ ; 80 \le X_1 \le 60 \\ 1; X_1 \ge 60 \end{cases}$$

3.4 Reasoning (Inference)

At this stage a rule-rule determination of the fuzzy logic system, rules (implementations) can be established to represent relations between input and output. The operator used to combine the input rule is the operator and that describes the input output is IF - THEN.

If (Agriculture is Medium) and (Cattle is a lot)

α - potential village results = μPAPmedium ∩ μTUmany

= μPAPmedium (60) ∩ μTU many (80)

= min (1.33; 3.33)
= 1.33

3.5 Defuzzification

This stage is also called the input and process confirmation stage. This assertion is a vague set obtained from the composition of vague rules, while the resulting output is a number in the domain of the fading set.
Results rule as above data is;

$$z = \frac{60.1{,}33 + 80.3{,}33}{1{,}33 + 3{,}33}$$

$$z = \frac{79.8 + 266{,}4}{4{,}66}$$

$$z = \frac{346{,}2}{4{,}66}$$

$$z = 74{,}29$$

So from the above experiments there is a value of 74.29 which is included in the potential of a good village.

4. Conclusion

From the results of research that has been done the authors conclude that the application of fuzzy logic method in determining the potential value of the village in accordance with the criteria has been successfully established, so that the fuzzy logic method is suitable for the calculation of the search results from the potential of Bulurejo village. In making the e-Government Information System in Bulurejo village there are still many things that must be developed, such as:

1. The need to increase the potential of the village well in order to achieve a better standard of living in the presence of web-based application system.
2. In order to improve the provision of information quickly and accurately then e-Government web admin is required to always update.
3. Need to be socialized to the community, so that the system has been built beneficial.

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