Analysis of Mamdani Method To Increase The Level Of The Advantages Of Infrastructure Development For Optimal Network

Niskarto Zendrato and M Zarlis
Faculty of Computer Science and Information Technology Universitas Sumatera Utara, Medan, Indonesia
E-mail: niskarto@usu.ac.id, m.zarlis@usu.ac.id

Abstract. Network infrastructure has an important role towards national economic development. According to data from the Director General Post and Telecommunication cellular users experienced a significant increase from year to year. Efforts to improve telecommunications services have several problems because there is a tower which disturb the comfort of the surrounding community, location who violates the rules and BTS tower that does not have permission. Location selection perspective from government and operators have differences, while the infrastructure must in a strategic location to get results optimal for improving service. Therefore, there is a need for research to formulate criteria for tower construction locations according to the level to the required optimization the method used is Mamdani to determine factor in determining the location of the tower. Then after found a factor weighting of factors was done by Mamdani's analysis. The last analysis is the formulation of criteria using Content Analysis. From the analysis 5 factors is electrical energy, the number of residents served, spatial planning, tax cost and licensing process were generated used as a determining factor for the location of tower construction BTS (Base Transmitter Station) effectiveness.

1. Introduction
The increasingly rapid development of the era triggered the government's performance in terms of equitable development in each region in Indonesia. Infrastructure development in each region is one of the government's efforts to improve the welfare of the Indonesian people. So that to see an infrastructure development in an area that is really beneficial to improve the welfare of the people around it, it is necessary to design a computer application that can analyze the benefits of infrastructure development that has been implemented in an area that is in accordance with government objectives and shows a percentage value that represents the level of prosperity of the local people after infrastructure development was carried out.

This system is an analysis of the benefits of infrastructure development based on fuzzy logic that shows the level of feasibility of infrastructure development in an area, so that it is expected to facilitate officers working to evaluate infrastructure development in an area in determining which areas can be used as development priorities and which areas need to be evaluated rebuilding the project.
The last analysis is the formulation of criteria using Content Analysis. From the analysis 5 factors were generated used as a determining factor for the location of tower construction BTS (Base Transmitter Station) at. These factors are the number of people served, spatial planning, tax costs, licensing process, availability of electrical energy. From each of these factors, obtained 3 factors with the highest weight, namely availability electrical energy, in accordance with the spatial plan, and the licensing process. These three factors are the biggest influence on the selection of tower locations. Thus, the main criteria for location are obtained the construction of the transmitter tower is available electrical energy with sufficient power for BTS towers, location must be in accordance with the spatial plan and location fulfill all licensing processes. From this study obtained that adequate electrical energy is a priority for choose the location of the BTS tower

2. Methodology

*Formation of Fuzzy Rules* After the formation of fuzzy variables and sets, the following rules are formed (see Figure 1) in accordance with the benefit analysis data.

Figure 1: Formation of the fuzzy rules

Figure 2 is a picture of the feasibility classification of the analysis of the benefits of infrastructure development consisting of 2 phases of inference derived from the input set of fuzzy values. Inference 1 is the process of determining the level of effectiveness, efficiency and benefits, then the second inference determines the feasibility classification of the results of the analysis of development benefits. Savings and output data.

Simulation of the analysis of the benefits of infrastructure development using fuzzy logic with the Mamdani method (centroid) will provide convenience for officers (users) in analyzing the results of the benefits of infrastructure development in a region and classifying it into 5 conditions. Furthermore, the system will provide several outputs to the officers (users) in the form of analysis results so that this will be an evaluation and consideration material whether the development can be continued or needs to be re-evaluated.
2.1. Membership function variable effectiveness

Membership function fuzzy. The membership function of the output of effectiveness can be seen in Figure 8, where the membership function consists of 4 conditions, namely low, medium, normal, and high. In these conditions, use the trapmf type curve for low and high conditions, while for moderate and normal conditions use the trimf type curve, namely triangle. Figure 3 until figure 7 membership function fuzzy used 5 input variable with condition namely low, normal high and very high.
3. Result And Discussion

The results of the simulation analysis of the benefits of infrastructure development using fuzzy logic with the mamdani method (centroid) are built using the fuzzy logic toolbox with GUI (Graphical User Interface) facilities so that it can be seen the following aspects of benefit inference Figure 3 used mamdani method.
data training used same data input and comparing method Mamdani and manually analysis. Based on data training data values of Mamdani

Table 1. Data training with 5 variable inputs

| Variable             | Training 1 | Training 2 | Training 3 | Training 4 | Training 5 |
|----------------------|------------|------------|------------|------------|------------|
| Electrical energy    | 43,56      | 65,56      | 29,77      | 86,68      | 86,68      |
| The number           | 88,1       | 59,52      | 31,09      | 99,52      | 99,52      |
| of residents served  |            |            |            |            |            |
| Spatial planning     | 13,12      | 34,24      | 26,06      | 56,64      | 56,64      |
| Tax cost             | 35,76      | 22,32      | 14,04      | 13,2       | 20,88      |
| Licensing process    | 47,22      | 68,65      | 34,09      | 21,83      | 40,87      |
| Effectiveness        | 60         | 17         | 15,1       | 16,6       | 15,8       |

4. Conclusion

The conclusions that can be drawn from this research are:

a. Variable effectiveness used to analyze SBT give advantages to build base on the 5 variable such as electricity energy, the number of residence service, tax cost and licensing process
b. Mamdani method good used to analyses the advantage of BTS than AHP
c. Base on training effectiveness stable on normal with value 15 until 17

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