



Implementation of Fuzzy Logic Using Mamdani Method to Determine The Quantity of Bag Production (Case Study In Roman Indah Padang Bag Factory)

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ABSTRACT

Roman Indah bag Factory is a bag manufacturing company that receives orders from customers every month. Fuzzy Logic is used to define the production known so far, so that the preferred result can be used as a basis for manager's decision. In the calculation process, Fuzzy Logic Mamdani requires maximum and minimum production data, maximum and minimum demand data, and maximum and minimum inventory data. Fuzzy logic is able to map an input into an output without factor factors. Fuzzy logic is used to create a model of a system that is able to determine the quantity of production. the factors that affect the quantity of production. Fuzzy logic is called the old new logic because the science of modern fuzzy logic and methodological was discovered only a few years ago, in fact the concept of fuzzy logic itself has been in us for a long time. Mamdani method is the most common method when it comes to fuzzy methodology. Mamdani method uses a set of IF-THEN rules derived from experienced operators/experts. The Mamdani model is often known as the Max-Min model. By using Mamdani method in Roman Indah handbag factory can assist in the efficiency of time and labour, because using Mamdani method can calculate the amount of production in the next month, so from the results can be derived consideration material decision by the manager, whether in determining raw materials, promotion, bag model, consumer, HR, etc. so that more company profits.

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1. Introduction

Research using fuzzy logic has been explored by researchers with various problems, including research on the application of fuzzy logic to predict the height of roof fall in coal mines [5], where predicting the height of roof fall can reduce the risk of accidents and increase safety for miners at work.

Fuzzy logic has also been used in the health field, in cancer prediction using fuzzy logic [12]. Here, patient risk can be reduced by using numerical (quantitative) techniques in medicine and health care. In this study, fuzzy logic can determine the type of cancer and the risk to the patient and make an early diagnosis. Fuzzy Logic has also been used to interpret thyroid blood tests using the Mamdani method. Fuzzy set theory

provides mathematical tools to perform approximate reasoning processes when the available information is uncertain, incomplete, inaccurate, or unclear [4].

Research on the fuzzy system for estimating exchange premium costs using Mamdani inference: Mexican Derivatives Market [7], which explains the cost of exchange premiums, using the Mamdani-based inference system Fuzzy Logic to provide managers with supportive tools for implementing financial risk management strategies with the aim of minimizing exchange risk. Fuzzy Logic has also been used in the development of rainfall prediction models in Nigerian countries [2].

Another application of fuzzy logic is the calculation of the number of folding gate productions using fuzzy logic in PT. Jihan Jaya [6]. And fuzzy logic with Mamdani method, namely Mamdani Rule-type Fuzzy Logic Model for predicting silica thickness including concrete using non-destructive testing results [14].

2. Research Method

The research methodology is a step that needs to be done in order to make the preparation of the research easier and also to be used as a guide for the researcher in conducting the research. The methodology used in the preparation of this study is presented in a framework, which is described in this chapter. The form of framework description in this study begins with problem identification, problem analysis, goal setting, literature study, data collection, data analysis, implementation, and testing. The stages of the framework are designed to make the research purposeful and to achieve the objectives set in this study. The purpose of this study is to analyze the calculation results using the fuzzy Mamdani method in determining the amount of bag production that the company will market to consumers based on known demand and supply. This framework presents the steps taken to solve the problems under discussion. The framework of this study can be described in the following figure :

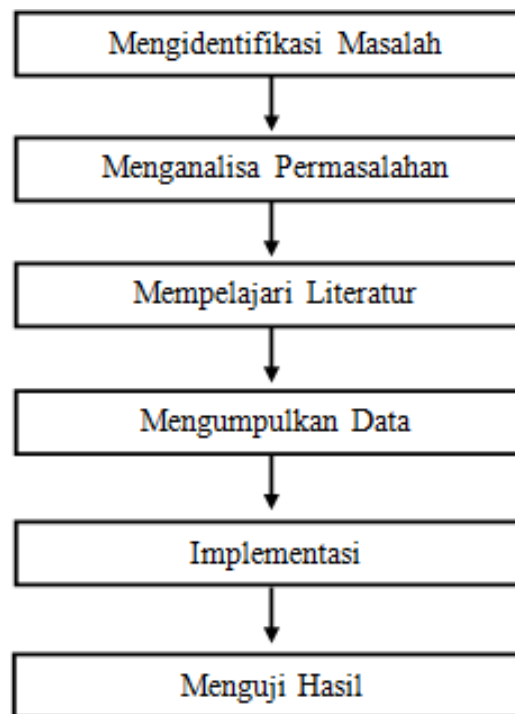


Figure 2.1 Research Framework

3. Result and Discussion

The testing phase is a phase that is performed to show that any process implemented in the Matlab application can run well and is capable of producing the desired results. The purpose of this test is to calculate the computation results precisely and accurately.

3.1 Matlab Display

The Matlab display is the view that first appears at the time the application is run. To open the FIS Editor, then we have to type "fuzzy" in the Command Window. The initial view of Matlab can be seen in figure 3.1:

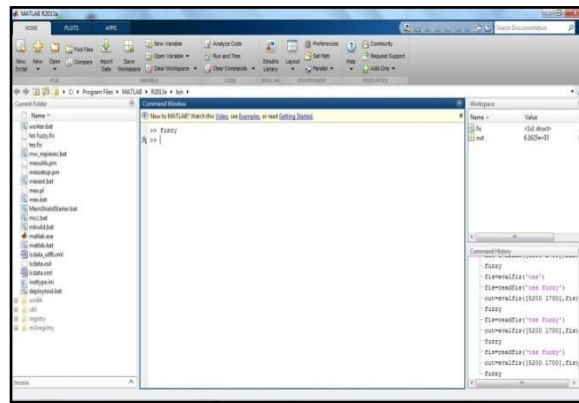


Figure 3.1 Matlab Initial Display

In figure 3.1 can be seen the Command Window screen, where we can type commands to open the FIS Editor window.

3.2. FIS Editor Display

The FIS Editor display is where we specify the Inputs, Outputs, and Methods to be used in the calculation process. The FIS Editor view can be seen in figure 3.2:

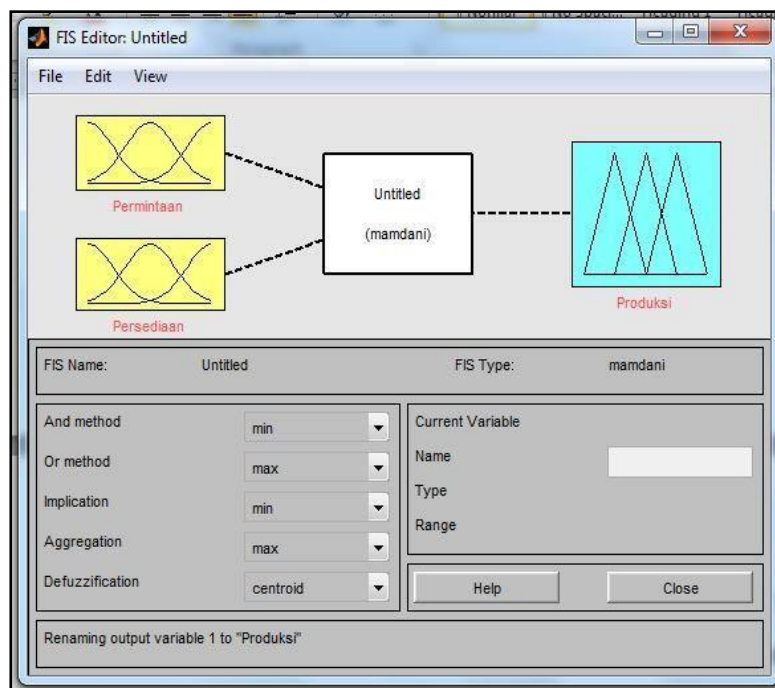


Figure 3.2 FIS Editor Display

Figure 3.2 shows the FIS Editor display. In the FIS Editor we can add Input or Output variables and specify the method to be used. Each variable we can set its name according to the data that has been obtained.

3.3 Membership Function Editor Display

In the Membership Function Editor display we can change the name of membership, then input the Maximum and Minimum data of each Variable, and set the value of the Membership Parameter. Membership Function Editor display can be seen in figure 3.3:

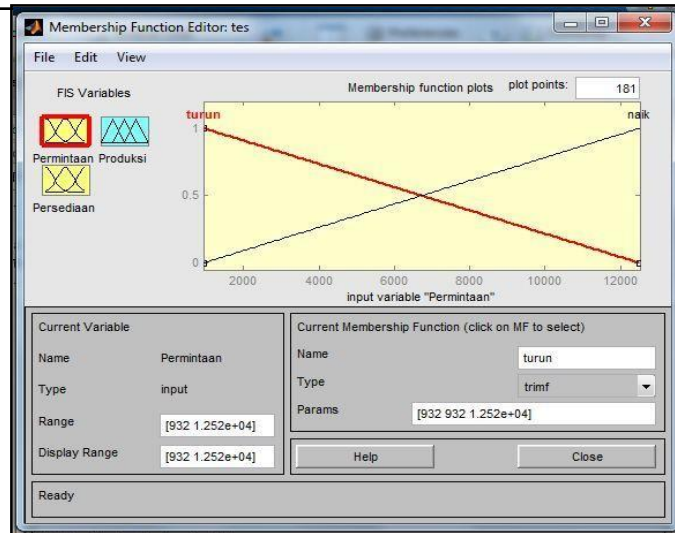


Figure 3.3 Membership Function Editor Display

On the figure above, we can set the Range, Name, and Membership Parameters.

3.4 Rule Editor Display

The Rule Editor display is the window where we create rules for the process of searching for Fuzzy Mamdani results. The Rule Editor display is opened by clicking Edit-add Variable-Rules. The Rule Editor display can be seen in figure 3.4:

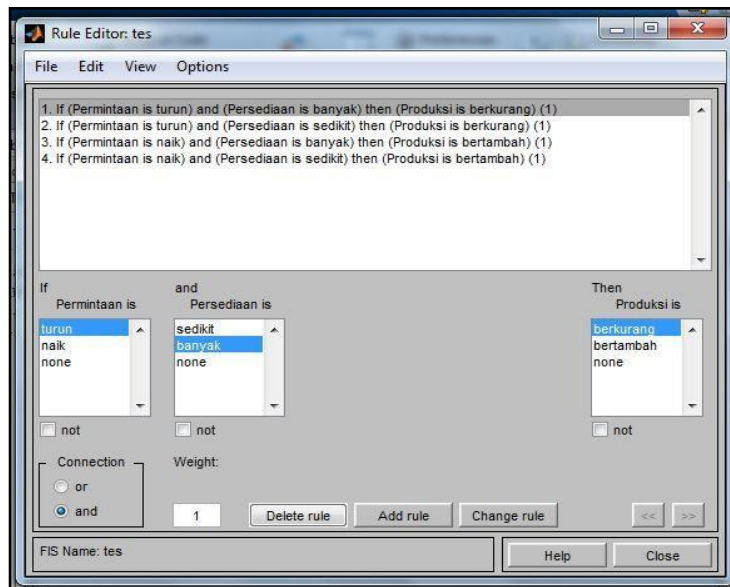


Figure 3.4 Rule EditorDisplay

3.5 Rule Viewer Display

The Rule Viewer display is a window where we can see an overview of the Inference graph based on the Rules already created. The rule viewer display can be seen in figure 3.5:

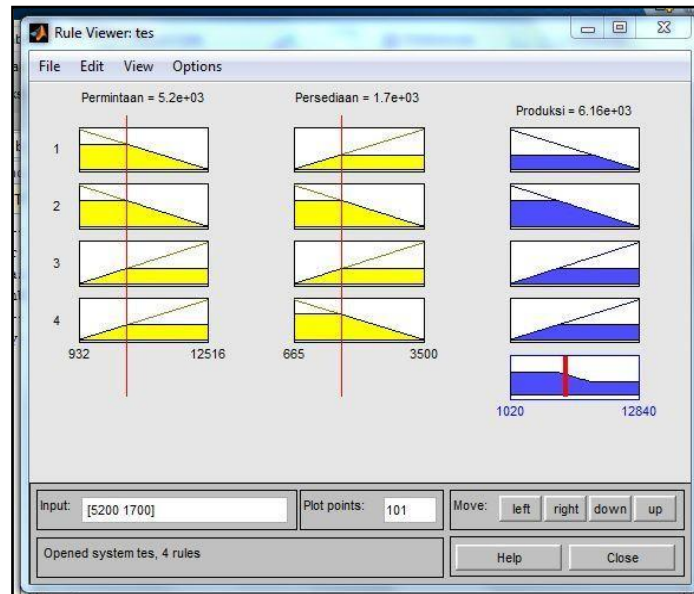


Figure 3.5 Rule ViewerDisplay

In figure 3.5, you can see an overview of the inference chart of each Rule. In the Rule Viewer window we can arrange inputs according to the previously known demand and supply values (case: [5200 1700]), then a picture of the combined results of the Linear Curve will appear. Then we save the worksheet by clicking File-Export-To File, create a file name then Save.

3.6 Command Window Display for Reading FIS Files

In this display we can see the process of invoking fis file data that we have saved before. The Command Window display for reading FIS Files can be seen in figure 3.6:

```

>> fuzzy
>> fis=readfis('tes fuzzy')

fis =

    name: 'tes fuzzy'
    type: 'mandani'
  andMethod: 'min'
  orMethod: 'max'
 defuzzMethod: 'centroid'
  impMethod: 'min'
  aggMethod: 'max'
    input: [1x2 struct]
    output: [1x1 struct]
     rule: [1x4 struct]

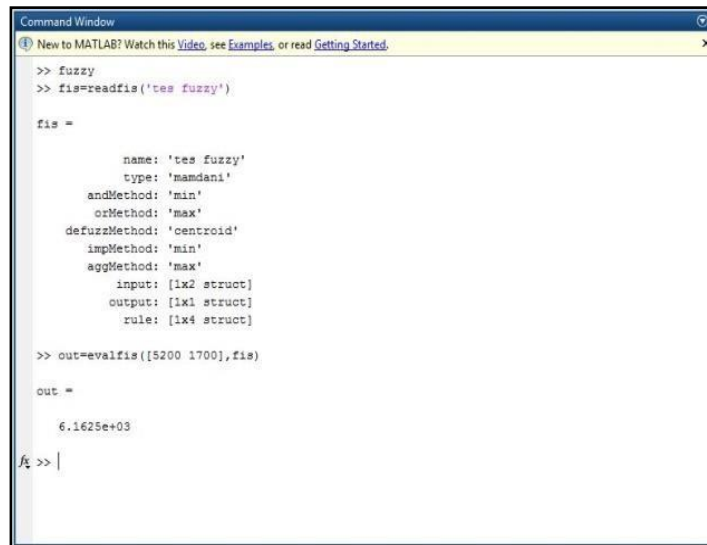
fi >> |

```

Figure 3.6 Command Window Display for Reading FIS Files

3.7 Command Window Display for Production Result Calculation

In this display we can see the process of calculating the Number of Production, by entering the Demand and Supply values that will be searched for in the Command Window. The Command Window display for The Calculation of Production Results can be seen in figure 3.7:



```

Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.

>> fuzzy
>> fis=readfis('tes fuzzy')

fis =

    name: 'tes fuzzy'
    type: 'mamdani'
    andMethod: 'min'
    orMethod: 'max'
    defuzzMethod: 'centroid'
    impMethod: 'min'
    aggMethod: 'max'
    input: [1x2 struct]
    output: [1x1 struct]
    rule: [1x4 struct]

>> out=evalfis([5200 1700],fis)

out =

    6.1625e+03

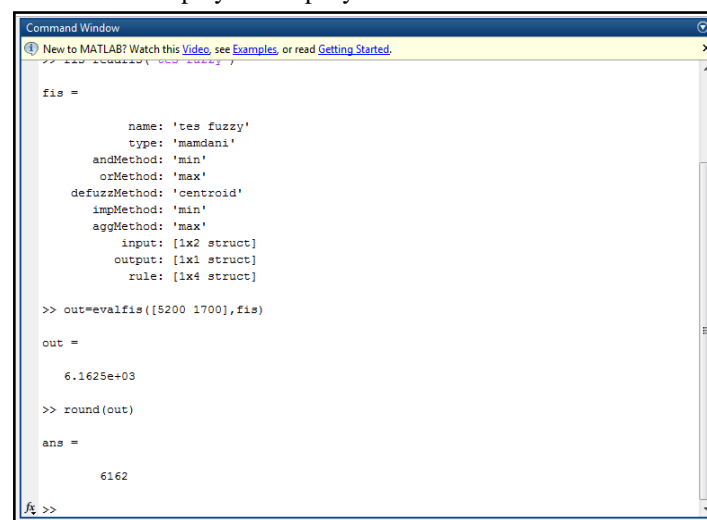
fx >>

```

Figure 3.7 Command Window Display for Production Result Calculation

3.8 Command Window Display to Simplify Results

In this display we can see the process of simplifying the results of the calculation of the Number of Production, the Command Window Display to Simplify the Results of the Number of Production can be seen in figure 3.8:



```

Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.

fis =

    name: 'tes fuzzy'
    type: 'mamdani'
    andMethod: 'min'
    orMethod: 'max'
    defuzzMethod: 'centroid'
    impMethod: 'min'
    aggMethod: 'max'
    input: [1x2 struct]
    output: [1x1 struct]
    rule: [1x4 struct]

>> out=evalfis([5200 1700],fis)

out =

    6.1625e+03

>> round(out)

ans =

    6162

fx >>

```

Figure 3.8 Command Window Display to Simplify Results

In figure 3.8 we can see the result of simplification of the calculation of the Number of Production, where from the result obtained is $6.1625e + 03$ then simplified by typing `round(out)` in the Command Window. Then the simple result of the number of Production is 6162. So, based on the search results using Matlab, the predicted results of the number of Production for the next month at the Roman Indah Bag Factory are: 6162 Pieces of Bags/Month.

4. Conclusion

Based on the preceding theory and discussion, the following conclusions can be drawn:

1. Mamdani's fuzzy logic process has been understood and is understood in determining the amount of bag production.
2. The analysis of Mamdani's existing fuzzy logic system was able to determine the quantity of bag production, where the number of bag production determined for the next month is 6162 units per month.

3. The calculation results of the production quantity using MatLab are consistent with the actual production data. The comparison of the actual production results with the MatLab results is 5894 : 6162, and then the percentage of yield is 95.65%.
4. The concept used in the MatLab application could solve the problem in determining the amount of bag production in Roman Indah Padang bag factory.
5. Using MatLab application, Mamdani's fuzzy logic concept can be applied in determining the number of bags produced in Roman Indah Padang Bag Factory.
6. Testing the fuzzy logic Mamdani's method using MatLab has made it possible to quickly and accurately determine the number of bags produced.

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