

**COMPARISON OF *DEMPSTER-SHAFER* AND *CERTAINTY FACTOR*  
METHODS IN DIAGNOSING CAR DAMAGE**

*As A Requirement To Complete  
Strata-1 Education Program at the Informatics Engineering Department  
Faculty of Computer Science, Sriwijaya University*



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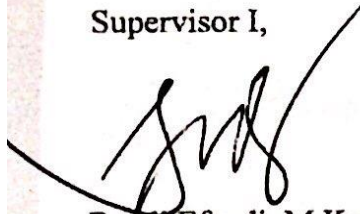
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## **MOTTO AND SUBMISSION**

“Live like a crow, fly freely everywhere. Instead of being a bird in a cage, being a crow is much better”

I present this paper to: :

- Allah SWT
- My Family
- My Supervisor and Examiner
- My Bestfriends
- My Almamater

## COMPARISON OF *DEMPSTER-SHAFER* AND *CERTAINTY FACTOR* METHODS IN DIAGNOSING CAR DAMAGE

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### ABSTRACT

Diagnosing car damage is a complicated thing for workshop mechanics who have not had much experience in diagnosing car damage, especially time issues. *Dempster-shafer* is a method used to determine the level of certainty of the symptoms given by the user where each symptom has a density probability value. *Certainty Factor* is where this method is used to overcome certainty difficulties and symptoms of damage in the process of diagnosing car damage. From the test results, there is a difference in the percentage value of the diagnosis of damage from these two methods. The results of the diagnosis of damage using the *Dempster-shafer* method obtained an accuracy value is 90.66%, while the *Certainty Factor* method obtained an accuracy value is 96%. So it can be concluded that the *Certainty Factor* method is better at diagnosing car damage than the *Dempster-Shafer* method.

Keywords: *Dempster-Shafer*, *Certainty Factor*, Expert System, Comparison, Car Damage

# **PERBANDINGAN METODE *DEMPSTER-SHAFER* DAN *CERTAINTY FACTOR* DALAM MENDIAGNOSA KERUSAKAN PADA MOBIL**

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## **ABSTRAK**

Mendiagnosa kerusakan mobil menjadi hal yang rumit bagi para montir bengkel yang belum banyak pengalaman dalam mendiagnosa kerusakan mobil, terutama masalah waktu. *Dempster-shafer* merupakan metode yang digunakan untuk mengetahui tingkat kepastian dari gejala-gejala yang diberikan *user* dimana masing-masing gejala terdapat nilai *probabilitas densitas*. *Certainty Factor* yaitu dimana metode ini digunakan untuk mengatasi kesulitan kepastian dan gejala-gejala kerusakan dalam proses mendiagnosa kerusakan mobil. Dari hasil pengujian, terdapat perbedaan nilai persentase hasil diagnosa kerusakan dari kedua metode ini. Hasil diagnosa kerusakan menggunakan metode *Dempster-shafer* diperoleh nilai akurasi sebesar 90.66%, sedangkan metode *Certainty Factor* diperoleh nilai akurasi sebesar 96%. Sehingga dapat disimpulkan bahwa metode *Certainty Factor* lebih baik dalam mendiagnosa kerusakan pada mobil dibandingkan metode *Dempster-Shafer*.

Kata kunci: *Dempster-Shafer*, *Certainty Factor*, Sistem Pakar, Perbandingan, Kerusakan Mobil

## FOREWORD



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## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 Introduction**

This chapter discusses the background of the problem, the formulation of the problem, the purpose and benefits of the study, the problem boundaries and the systematic writing. This chapter will provide a general explanation of the entire study.

#### **1.2 Background Problems**

Today many people have private vehicles such as cars. Cars have an important role in land transportation, but most people can only use them and do not know about the damages that occur when the car has problems. The role of the car workshop is needed to repair the damage to the car. But there are not a few car repair mechanics that take a long time to diagnose damage to a customer's car especially if the damage is severe.

Therefore we need a system that helps the role of the car workshop in handling car damage cases, where the system can diagnose the damage to the car accurately and quickly so that the solution to the problem is based on the symptoms of damage. The system applied is an expert system. Expert systems are intelligent computer-based systems used in solving problems that can only be done by experts / experts in a field. With this system the general public can do calculations like an expert (Kusumadewi, 2003).

An expert system is a system full of elements of uncertainty and obscurity. Methods that can work in uncertainty include Dempster Shafer (Arthur, and Glenn 1976) and Certainty Factor (Shortliffe B, 1975). Both methods have different settlement processes and concepts, but the information that will be taken into account has similarities, as in each piece of information the two methods have an assessment taken from the beliefs or hypotheses of an expert. Therefore the Dempster-Shafer method with Certainty Factor is worthy to be compared with each other in order to know the difference.

In previous studies, research with different objects but with the same method, namely, Comparative Analysis of the Dempster-Shafer Method with the Certainty Factor Method in the Diagnosis of Childhood Diseases. In this study the method was compared quantitatively, namely the Confusion Matrix theory taken from the calculation results of the occurrence of disease symptoms and assessed based on the beliefs of expert knowledge. So that the accuracy value can be produced that is 94.44% in the Dempster-Shafer method and 96.03% in the Certainty Factor method (Emanuel, 2006). Subsequent research, Analysis of Comparison of Expert Systems with Certainty Factor Method with the Dempster-Shafer Method in Rabbits. The purpose of this study tried to analyze the comparison of the results of the diagnosis of expert systems of rabbit disease by using the Certainty Factor method and the Dempster-Shafer method by comparing the suitability of the diagnosis results between the system and the diagnosis of an expert so that it can be known which method is better in diagnosing rabbit disease. Based on the test results with the level of accuracy,

obtained the results that the accuracy value of the Certainty Factor method is 80% while the accuracy of the Dempster-Shafer method is 85% so it can be concluded that the Dempster-Shafer method is better than the Certainty Factor method in diagnosing rabbit disease (Ricky, Hengky, and Helen 2017).

Based on the explanation that has been explained, then in this final project the author wants to compare the Dempster-Shafer and Certainty Factor methods in diagnosing car damage to find out which method has better accuracy with the same amount of input through the symptoms of car damage.

### **1.3 Problem Statements**

The problem formulation discussed in this study are as follows:

1. How to compare the accuracy of car damage between the Dempster-Shafer method and Certainty Factor?
2. Which method is the best in diagnosing car damage?

### **1.4 Research Objectives**

The purpose of this study is as follows:

1. Comparing the value of the accuracy of the diagnosis of car damage between the Dempster-Shafer method and Certainty Factor to find out which method is better in diagnosing damage.
2. Providing diagnostic results namely the name of the damage, the percentage value of the diagnosis of damage and the correct and correct solution regarding the damage to the car.

### **1.5 Benefits of Research**

The benefits of this study are:

1. Simplify and speed up the user in the process of diagnosing damage to the car.
2. Can be a reference for further research on expert systems.

### **1.6 Limitation of Problems**

The limitations of this research problem are as follows :

1. The symptoms used in this study are 21 car symptoms and damage discussed in this study, there are 5, namely Accu Low, Starter Motor, Ignition Coil Circuit, Leakage on Fuel Systems, and ISC Valve Circuit.

### **1.7 Writing Systematics**

The systematic writing of this thesis is as follows :

## **CHAPTER I INTRODUCTION**

This chapter discusses the background of the problem, the formulation of the problem, the purpose and benefits of the study, the problem boundaries and the systematic writing. This chapter will provide a general explanation of the entire study.

## **CHAPTER II. THEORETICAL STUDY**

This chapter will discuss the theoretical basics used in research, such as expert system definitions, characteristics of expert systems, advantages and

disadvantages of expert systems, Dempster Shafer method and Certainty Factor, damage to cars, and car components.

### **CHAPTER III. RESEARCH METHODOLOGY**

This chapter will discuss the stages that will be carried out in this study. Each research stage plan is described in detail by referring to a framework. At the end of this chapter contains scheduling of planning in the implementation of research.

### **CHAPTER IV. SOFTWARE DEVELOPMENT**

This chapter will discuss the design and implementation environment of the comparison of the Dempster-Shafer method and Certainty Factor in diagnosing damage to the car, the results of the execution, and the results of testing.

### **CHAPTER V. RESEARCH ANALYSIS**

In this chapter will be discussed about the results of research trials, the results of testing the Dempster-Shafer method and Certainty Factor in diagnosing damage to the car, calculating the accuracy and analysis of the research.

### **CHAPTER VI. COVER**

This chapter will discuss conclusions and suggestions.

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