The Development of Completed Grey Relational Analysis Toolbox via Matlab

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ABSTRACT

The software in engineering field, even in others filed become most important and more necessary in the 21st century, although there are many toolbox, such as fuzzy, chaos,...etc., had been developed in the past, the grey toolbox still seldom and not quite completed. Therefore, in this paper, the focus is on the toolbox of grey generating, ordinal grey relational grade and cardinal grey relational grade by using Matlab, to development the completed grey relational analysis toolbox. Firstly, we preview the whole mathematical foundation of grey relational analysis in detail. Secondly, the mathematics model of grey generating (four difference types), ten kinds of grey relational grade, and two types of grey relational grades (ordinal and cardinal) are presented. Thirdly, based on the mathematics model, we use Matlab to develop the grey relational analysis toolbox. As the results, in this paper, the completed grey relational analysis toolbox, we can say this kind of completed research is the main contribution and is the first research in grey relational analysis. Also can extends in the economy in benefit, for our research, the market price of the completed grey relational analysis toolbox with our evaluation; at least will over US 1,000 dollars. We hope this completed grey relational analysis toolbox is not only to enhance the depth research of grey relation grade, buy also become a new approach for the applications in grey system theory.

Keywords: Grey relational analysis, toolbox, Grey system, Matlab.

1. Introduction

In past development of grey system theory software design, C++ and VB are multi-used, but we know that the grey relational analysis in grey system theory often contains the complex operation and the plenty of graph demonstration, so, it is difficult to design the software. Therefore, in view of the grey relational analysis, we use the Matlab to design grey relational analysis toolbox, it is not only original in grey system theory, but also have the following advantages. 1. The language is easy to be understood: The grammar of Matlab is approximate with C++, don’t have any difficulty in the writing; 2. Powerful mathematics calculation and Fig. display function. The powerful calculation and Fig. display function in Matlab can make the grey relational analysis more easy to analyze, and more easy to extend the input data. In addition, it is user-friendly for human interface[1].

In the other hand, the grey system theory has been developed over 20 years, and it has become a hot research topic in Taiwan. Observing the insight of the grey relational analysis, it is found that the grey relational analysis can be used to do the relationship analysis[2]. So, the mathematical method is preferred as the approach here. And for the research in other software computing fields, such as Fuzzy, GA and Rough Sets, they all have their own toolbox[3]. But in the past, all of them focused on the theoretical analysis; the computer-aided calculations are apparent. Besides, software plays an important role in the analysis system, because it not only causes significant effects on the operation of the analysis system, but also makes the results more convincing and more practical. Hence, a toolbox for future studies in grey relational analysis will be developed.

In this paper, first, in section 2, we list the whole mathematical foundation of grey relational analysis in detail. In section 3, the development of grey generating and grey relational grade toolbox via Matlab are presented. Also in section 4, we make some advantages and suggestions for the further research.

2. Preview of Grey Relational Analysis

2.1 Grey Generating

The word “grey generating” in the grey system theory means to add new information for the system's