Research Article
Study of Consumers' Acceptance of Eco-friendly Green Food Hotels

Cheng-Ming Chang
Department of Information Management, Hwa Hsia University of Technology, Taipei 10000,
Taiwan, China

Abstract: This study is different from previous literature, as it uses AI technology, such as the artificial neural network and evolutionary computation techniques to analyze Taiwan's consumers' acceptance of eco-friendly green food hotels by sensor data mining, in order to know the characteristics of the consumption intentions of respondents. First, Grey Relational Analysis (GRA) is used to discuss the acceptance of various domains in the questionnaire and then the GRA performance values of the various domains are used for clustering analysis, in order to know the characteristics of the consumption intentions of different respondents. Finally, the evolutionary computation technique is combined with the artificial neural network to build an eco-friendly hotel acceptance detection model as reference for eco-friendly hotel operators. The findings show that, in the hotel operators' view, increasing the room rate of eco-friendly green food hotels can be accepted by consumers; the consumers agree with the subject of resource recovery; government bodies shall subsidize hotel operators in promoting eco-friendly green food hotels, thus, contributing to the promotion of eco-friendly green food hotels.

Keywords: Clustering analysis, eco-friendly hotel, grey relational analysis, sensor data mining

INTRODUCTION

As the energy savings and carbon reduction works can be implemented in different directions, this study aims at eco-friendly green food hotels in order to know the consumers' acceptance and characteristics of eco-friendly green food hotels and to provide reference for Taiwan's hotel operators and government bodies' administration. Taiwan has many literatures regarding eco-friendly green food hotels (Lee and Gan, 2007; Gunter, 2005; Jones, 2002; Rana and Sharma, 2014). This study uses Grey Relational Analysis (GRA) to discuss the performance value of the consumers' acceptance domain of eco-friendly green food hotels, with the performance value of the acceptance domain of hotel operators' willingness to promote eco-friendly green food hotels and the performance value of consumers' acceptance domain of environmental protection through a questionnaire; and then uses the performance values of GRA of various domains for clustering analysis. The characteristics of different respondents' consumption intentions are observed in the clustering analysis results and basic data questions.

This study is different from previous literature, as it uses AI technology, such as the artificial neural network and evolutionary computation techniques to analyze Taiwan's consumers' acceptance of eco-friendly green food hotels by sensor data mining, in order to know the characteristics of the consumption intentions of respondents. First, Grey Relational Analysis (GRA) is used to discuss the acceptance of various domains in the questionnaire and then the GRA performance values of the various domains are used for clustering analysis, in order to know the characteristics of the consumption intentions of different respondents. Finally, the evolutionary computation technique is combined with the artificial neural network to build an eco-friendly hotel acceptance detection model as reference for eco-friendly hotel operators. The findings show that, in the hotel operators' view, increasing the room rate of eco-friendly green food hotels can be accepted by consumers; the consumers agree with the subject of resource recovery; government bodies shall subsidize hotel operators in promoting eco-friendly green food hotels, thus, contributing to the promotion of eco-friendly green food hotels.

RESEARCH METHOD

As the K means clustering analysis is common analysis techniques, readers can refer to related literature, as this study only introduces infrequent Grey Relational Analysis. Deng (1982), from the Huazhong University of Science and Technology, proposed the grey system, which is a new theory characterized by fully analyzing limited data to predict future values. GRA is one of the grey system analysis methods, which analyzes development trends according to the proximity of various factor sequence curve shapes. GRA is a multifactor statistical analysis method that uses grey

correlation grades to describe the strength, size and order of factors, as based on the sample data of the various factors. If the trends of variation (direction, size and speed) of two factors reflected by the sample data are basically consistent, their correlation grade is relatively high; otherwise the correlation grade is low. The advantages of this method include clear clues, reduces losses resulted from information asymmetry to a great extent, requires less data and has less workload. Regarding its major defects, as the optimum values of various indices must be determined, if subjectivity is too high, the optimum values of some indices are difficult to determine. At present, GRA has been extensively applied to various domains (Pan, 2010; Wang, 2006; Lin, 2004).

Empirical analysis:

Sample data: There were 100 questionnaires sent out with three domains, including the performance values of consumers' acceptance domain of eco-friendly green food hotels (X1), the acceptance domain of hotel operators' willingness to promote eco-friendly green food hotels (X2) and the consumers' acceptance domain of environmental protection (X3) and there are 34 questions including basic data. This section uses GRA to analyze the acceptance performance value of the three domains and regards this performance value as the independent variable of the acceptance performance

Table 1: Descriptive statistics of 5 independent variables

Variables	X1	X2	X3	X4	X5
Max.	1.000	1.000	1.000	6.000	5.000
Min.	0.570	0.573	0.571	1.000	1.000
Avg.	0.781	0.739	0.816	1.890	3.050
Std	0.113	0.109	0.118	1.326	1.062
No	100	100	100	100	100

detection model, which is combined with monthly average income (X4) and monthly average outlay (X5) in the basic data questions and there are five independent variables. The descriptive statistics are as shown in Table 1.

GRA: This study used the Matlab software, by Wen *et al.* (2006) for GRA, to analyze the longitudinal acceptance performance of grey relation for consumers.

Acceptance of eco-friendly green food hotels (X1), acceptance of hotel operators' willingness to promote eco-friendly green food hotels (X2) and consumers' acceptance of environmental protection (X3). The analysis results are as shown in Fig. 1.

The thick dotted line in the Fig. 1 is the standard sequence and the fine line is the inspected sequence. The closer the inspected sequence fine line is to the standard sequence of the thick dotted line, the larger the performance value. The analysis results show that there are 80 respondents with the best acceptance in the
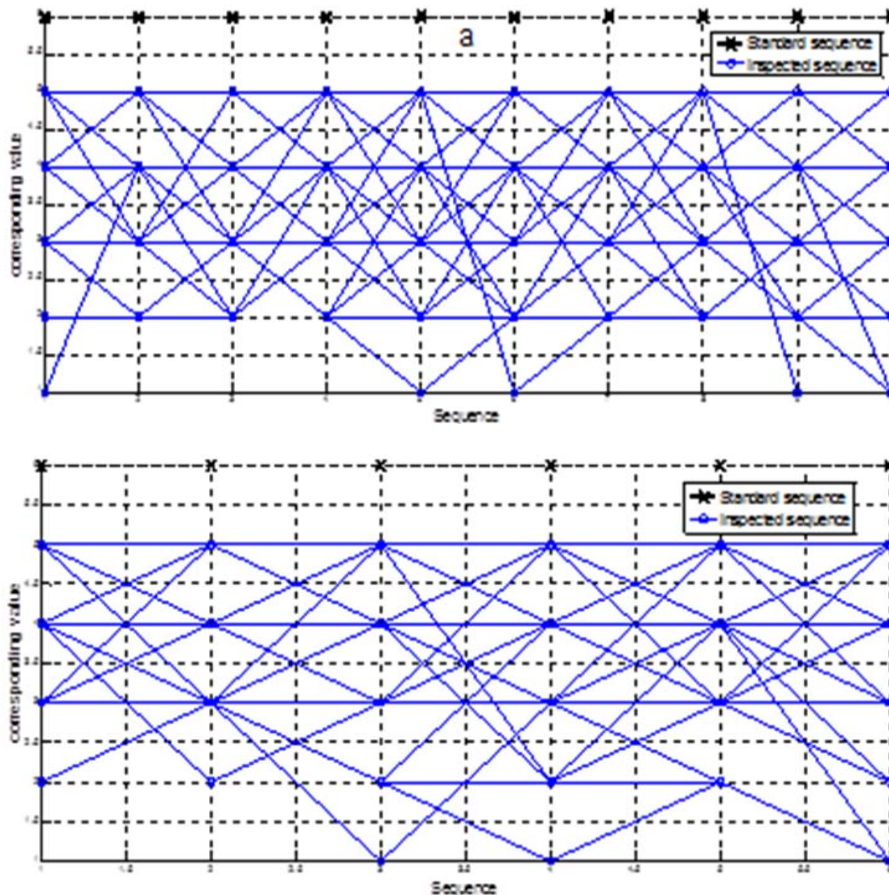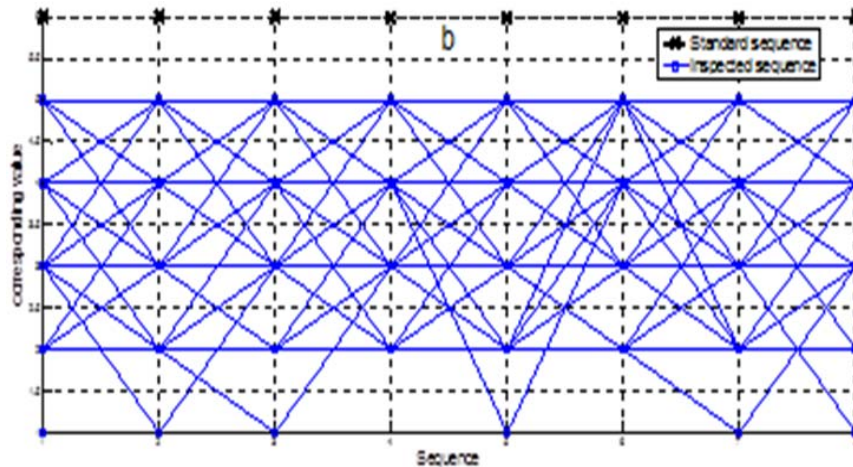
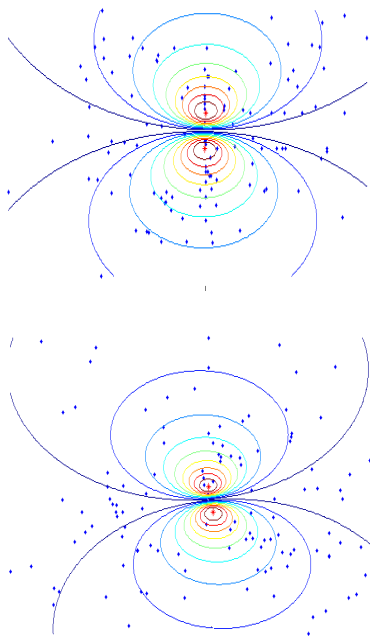Fig. 1: Acceptance performance analysis results of three domains

Fig. 2: Clustering analysis results of respondents' acceptance characteristics

domain of consumers' acceptance of eco-friendly green food hotels; the 17th respondent has the best acceptance in the domain of consumers' acceptance of environmental protection. Afterwards, the transverse acceptance performance of grey relation is analyzed for the three domains, in order to determine which of the domain questions has the maximum acceptance. The analysis result shows that, the 5th question in the domain of consumers' acceptance of eco-friendly green food hotels (higher invested cost of eco-friendly green food hotels) has the optimal acceptance, meaning the government shall moderately subsidize eco-friendly green food hotels when promoting eco-friendly green food hotels; the 7th question in the domain of hotel operators' acceptance of willingness to promote eco-

friendly green food hotels (eco-friendly green food hotels can gain higher profit) has the optimal acceptance, meaning in the general hotel operators' view, increasing the room rate of eco-friendly green food hotels can be accepted by consumers; the 4th question in the domain of consumers' acceptance of environmental protection (consumers shall recover resources) has the maximum acceptance, meaning the consumers affirm resource recovery. The aforesaid analysis results can be reference for government departments.

Clustering analysis: This study used K means clustering analysis to analyze consumers' acceptance of eco-friendly green food hotels (X1), consumers' acceptance of environmental protection (X3) and hotel operators' acceptance of willingness to promote eco-friendly green food hotels (X2), in order to learn the respondents' acceptance characteristics. The analysis results are as shown in Fig. 2.

The two graphs of Fig. 2 show that the clustering results are classified into two types. The upper graph is the clustering result of variables X1 and X3; according to the basic data questions, one type is that persons with high incomes and high education levels have high acceptance of eco-friendly green food hotels and environmental considerations; the other type is that the persons with low incomes and low education levels have relatively lower acceptance of eco-friendly green food hotels and environmental considerations. Thus, government bodies shall strengthen the environmental protection education of common people and attempt to increase the income and education background of common people. The lower graph is the clustering result of variables X2 and X3. According to the basic data questions, one type is that persons with higher outlay and ages have low acceptance of hotel operators' willingness to promote eco-friendly green food hotels and environmental considerations; the other type is that the persons with lower outlay and ages think the hotel

operators have higher acceptance of willingness to promote eco-friendly green food hotels and environmental considerations. Therefore, the government bodies shall strengthen environmental protection education for seniors and attempt to subsidize hotel operators in promoting eco-friendly green food hotels, thus, contributing to the promotion of eco-friendly green food hotels.

CONCLUSION

This study differs from previous literature regarding eco-friendly green food hotels, as we use artificial intelligence technologies to analyze the characteristics of respondents' acceptance of eco-friendly green food hotels. According to GRA, the government shall moderately subsidize eco-friendly green food hotels when promoting eco-friendly green food hotels; the hotel operators believe that increasing the room rate of eco-friendly green food hotels can be accepted by consumers; and consumers are affirmative to resource recovery. In addition, according to the clustering analysis, government bodies shall strengthen the environmental protection education of common people and attempt to subsidize hotel operators to promote eco-friendly green food hotels.

REFERENCES

Deng, J., 1982. The control problems of grey system. Syst. Control Lett., 5: 288-294.

Gunter, H., 2005. Following the LEEDer. Hotel Motel Manage., 220: 42-43.

Jones, P., 2002. The orchid hotel. Tourism Hosp. Res., 3: 277-280.

Lee, M.T. and C.C. Gan, 2007. The research of tourist willingness to pay for green building hotel in Kenting National Park. Chung Hua J. Architect., 3: 21-14.

Lin, S.Y., 2004. Evaluation of business reputation in information service industry-an application of grey relational analysis. J. Inform. Technol. Soc., 2: 79-95.

Pan, W.T., 2010. The use of genetic programming for the construction of a financial management model in an enterprise. Appl. Intell., 36: 271-279.

Rana, A. and A. Sharma, 2014. Optimization of radial basis neural network by mean of amended fruit fly optimization algorithm. J. Comput. Math. Sci., 5: 262-272.

Wang, Y.J., 2006. Applying grey relation analysis to find the representative indicators of financial ratios for evaluating financial performance of container shipping companies on Taiwan. Maritime Quart., 15: 1-17.

Wen, K.L., S.K. Chang-Chien, C.K. Yeh, C.W. Wang and H.S. Lin, 2006. Apply MATLAB in Grey System Theory. Chuan Hwa Book Co., Ltd., China.