

Provides Algorithms and Assess Models to Road Accident by Using Neuro-Fuzzy Intelligent Systems

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ABSTRACT

Road accident is an important issues that awareness and understanding of the causes of it will have effective role to increase safety and reduce human and financial losses in road transport. The road accident statistics shows that leaving the road is the highest types of road accident. Usually specialized knowledge and analysis of the causes of human error out of the road, vehicle and environmental factors will not be easy due to the complexity and uncertainty of the line and one of the causes of behavior and it is low-quality relationship. Road accident study suggests that will be discussed to the traditional analytical models in comprehensive analysis to the few. The limitations of these models, such as one-dimensional, non-effective in terms of quantitative assessment, describing the complexity of behavior and underived multiple decision making from them is clearly visible. In this research, the qualitative and quantitative assessment-derived conditioned taken steps for multipurpose decision-making in assessing road accident and ultimately develop a prediction model by using a combination of intelligent neuro-fuzzy inference to simplify the low-quality behavioral description. It should be noted that the researchers of this research despite issues such as behavioral complexity among the effective factors in the accident and lack of comprehensive statistics and information tried to apply the algorithm of performance design in this research extensible for more comprehensive analyze and multi-dimensional evaluation criteria and submit the cause of accidents by identify and full awareness of all the problems and issues according to the destitute. Surely presented prediction model and modeled it will provide the appropriate field for planning safety management in the road accident.

KEY WORDS: out of the road, intelligent systems, neural - fuzzy algorithm, model assessment road accident

1. INTRODUCTION

By studying the major transportation systems and their comparison could be realized the relatively good mobility and efficiency of road transport to meet the demand of the next phase of this method of transportation, management needs in all sub roads such as:

In safety, fleet utilization, road lines, funding, training, employing specialized personnel and maintenance lines will be buildings and fleet which we will be evaluated the safety issue. According to the data of the past 10 years, the number of out of the road in Iran constitutes about 50% of road accident. This problem is discussed a major problem in road transport. In some cases, the reasons of exit road are clear but in most events is not this simply and need to further evaluation. For example, according to the case studies and according to statistics and information, the number of road accident occurred when the vehicle stability of lines and standards are not more that to be enacted for their immune status and vice versa. We find out that will not occur an accident by studying the experiences of a number of accidents out of the road freight vehicles that not the accident, in spite of effective factors which the out of the road accidents have been more than the limits set and the standard. Although wheels of vehicles have been suspended. The mentioned factors will require the comprehensive and specialized study of subject.

In such cases, cannot fully evaluate the jobs out of the road by using simple analytical procedures based on experience or incomplete statistics.

We find out that will be carefully examined the interaction between factors in the crash like the condition of the vehicles, the road and operating conditions in assess of each incident by assess the results of accidents out of the road. It worth mention that the combination of each of these factors can lead to exit from road. The only way to reduce accidents out of the road is finding the real causes of the accidents, get the limit of each and finally, providing an analytical model of predicting disaster.

1.1. Importance of subject, Position and Problems

Today, despite many efforts to reduce accidents in the world is done and we watched accidents in addition to financial losses that will be caused loss of life and irreparable. In order to meet its many assets to improve safety standards and has been spent management of disasters. The problems of rail accidents can be refer to

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problems and issues such as one-dimensional models(quantitative), not in all circumstances affecting the quantitative evaluation , complex behavioral models in describing behavior and no inference of models for multi-pointed decision making according to the history and study of traditional analytical models. The lack of comprehensive statistics available is another issues that elimination of that will have the effective role in the evaluation. Familiarity with the structure of the neuro-fuzzy in the research, development and modeling of it will have an effective role in evaluation and predictive accident, decrease fatalities and property damage.

On this basis, provide an analytical model to predict disasters requires the knowledge of the details of each accident and awareness of details accidents. Non-performance of this important subject is a fundamental issue and problems that met the intelligent model of accident analysis with failure. Generally, disasters and natural disasters, sabotage and acts of sabotage, the defects and shortcomings of components and vehicles in road, negligence, neglect of human resources-related and lack of understanding of safety culture and system limitations can cause an accident. In this regard, safety in the transportation obtained with a combination of appropriate technology, application of laws and regulations for the design, implementation, maintenance and repair of the components and the like of the vehicle and proper utilization of them and also using the use of expert force and eligible trained. The errors of human resources has always been the cause of more than half of all road accidents according to records accidents and if indirect role of human factors to be considered, the rate will be higher. The roads and cars are next in rank.

Causes of out of line accidents

1. Not closing safety belt
2. Too fast driving for conditions
3. unchecked of back of truck
4. Fast cause of weather
5. Driving distraction
6. Speed

Risk factors of human error and operating

Knowledge of the risk factors of human error and operation will play an important role in the choice of model variables. We can see that the high percentage of road accidents in the country cause to human error factors by studing accident statistics. Human error as the main cause of road accidents in the country is effected to the various factors such as physical and mental effects, psychological and behavioral, economic, environmental, facilities, health and recreational services and cultural-education factors. These factors effect on the incidence of accidents in various dimensions directly and indirectly. According to the statistics of accidents and the role of the above, it could be considered the role of effective factors in an error such as experience, age and education, etc. Age is a determining factor in the ability of persons in doing suitable affairs. The physical ability and mental strength analysis and reaction to the dramatic decrease in the time of the incident with increasing age. One the one hand, the resistance decreases in hard work conditions, increase fatigue and also increase the incident of accident. In contrast, the more experience, the level of knowledge and surrounding is more and less likely to cause an accident. On the other hand the higher the education level, the more extensive view of the conditions generally and the risk of error and accident listed lower.

	Frequency	Percent	Percent Cumulative
Fatigue and sleepiness	9351	3.9	3.9
Defects effectively	66	.0	3.9
Weakness due to old age	46	.0	3.9
Drug abuse	397	.2	4.1
Ignoring the rules	155454	64.5	68.6
Alcohol	58016	24.1	92.6
Rushed unnecessary	3588	1.5	94.1
Failure to pass others share Tshys	1368	.6	94.7
Lack of familiarity to the road	2058	.9	95.5
Intentional violation	219	.1	95.6
Other states	3957	1.6	97.2
No	6632	2.8	100.0
Total	241152	100.0	

Table 1. Degree of drivers who have had an accident in 1390 in Iran.

2. Prediction Models:

In general, predictive models can be divided into three models of qualitative, quantitative and intelligent combination of quantitative - qualitative models. Quality models divided to groups such as Delphi, credit groups methods and techniques based on past information and Quantitative models divided to groups such as the simple average method, simple moving average, weighted moving average, exponential, uniform and double view consistent. The rapid development of science in the 80's, the meta-combined analytical method was proposed by QIAN Xueseng. In fact, his system is combination system of man - machine that consisting of

experts, data, information and computer system. Based on observational data, the intelligent combination of quantitative-qualitative models is made by using a variety of new ways, mathematics and computer. In assess of out of road accident that is based on smart technology, the key issue is that how the major causes of out road accidents analysis by intelligent methods and how to combine intelligence beyond all existing analytical methods.

Intelligent analysis of events

The intelligent information processing technology presented as an appropriate solution to analyze the events that acts based on the essential knowledge and computational intelligence due to the application of artificial intelligence and computational intelligence in the recognition and diagnosis of faults, predictive, etc.

In this study, they try to use fuzzy logic and neural networks to analyze the low - quality out road accident with regard to the causes of accidents and according to the successful application of artificial intelligence techniques for the detection of defects and try to predict.

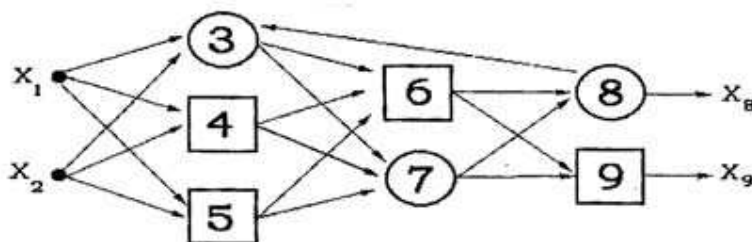
Neural networks and analyzing accident

The neural networks are built inspired by the performance of the human brain. The brain is a very complex non-linear and parallel data processing system that has been established from structural units on the name of the nerve cells or neurons.

This neurons or nerve cells are made from many connections. The artificial neural network do not need a mathematical model. These networks hoard experience such as the human and then extend this experience. Today, many of these networks are used to solve problems such as forecasting, estimation, pattern recognition, classification and clustering. In general, neural networks can be considered as a black box that receives input and made by using combination functions and transfer output. There run is over 3 training stages, generalized (experiment) and performance. Artificial neural networks are used for many as a multi-purpose processing, forecasting, learning memory and so on. According to the proper application of neural networks in information processing can be easily used them for diagnosis assessed issue, analyze and classification, selected composition, training patterns and etc.

Out-of-line analysis based on fuzzy logic

Theory of fuzzy sets is a theory to act in conditions of uncertainty. This theory is capable to classify many of the concepts and systems changes that are inaccurate and ambiguous and provide the basis. This theory is a generalization of the theory of ordinary or natural expansion that agree with language and natural understanding of humans. The important factor of theory is that can be expressed the model of human thought and their experience in fuzzy set theory and was easy the diagnosis and reasoning of a complex decision considering the assessment phase. The recognition of fuzzy sets is knowledge of the theory of fuzzy logic in which explains the degree of function, communication between members and the collection. In fact, fuzzy logic allows members to belong to a set in the intermediate state. Comparative networks can be called as cloud of complex neural networks. In general, an adaptive network is a network that consists of a number of nodes which have been connected to each other through directional connections. Each node represents a processing unit and connections between nodes show the the communication between connected nodes in which some or all nodes are comparative. In Figure 1 shown an example of an adaptive network with two inputs and two outputs that a feedback connection form a circular path in the network.



Finally, a fuzzy inference system used with two inputs and one output Z. SOGINO is a first set of rules of Fuzzy as follows:

Rule 1: if x is A1 and y is B1 then $f1 = p1x + q1y + r1$

Rule 2: if x is A2 and y is B2 then $f2 = p2x + q2y + r2$

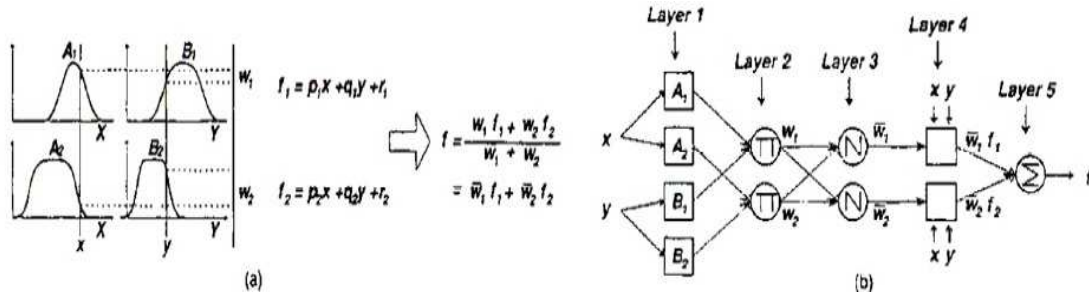


Figure 2-a mechanism argument for this model shows SOGINO. ANFIS architecture in Figure 2-b are shown where the nodes of per layer have similar functions.

Smart use of neural networks for processing of BAA Model comes after obtaining data and information and processing done by using neural networks. MATLAB software is used for this purpose. At this stage, after determining the structure of the neural network to train and test our action network. All of statistics of accidents divided into two general categories, 206 accident for training and 100 accident for network testing. Networks inference neural - fuzzy neural network will see after reviewing the results that was only a small number of output values and this model can not be deduced for humans that used for eliminate this problem of fuzzy neural network in the laws and extracted rules from quantities number. However, the rules can be easily aware from presented the structure of quantities numbers and take necessary measures to reduce human errors and increasing the safety factor. The structure of the neural network and fuzzy neural network presented in Figures 5 and 6.

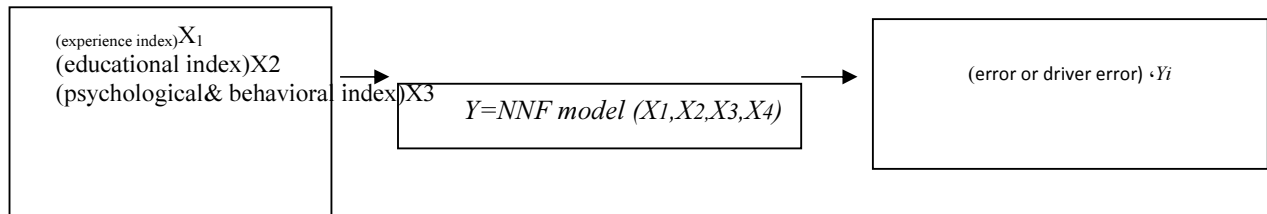


Figure 5. The structure of the neural network (Quantative- NNF)

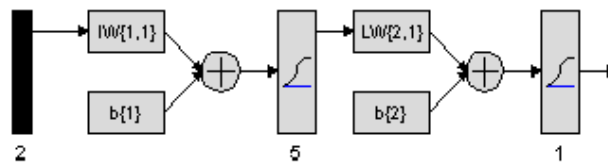


Figure 6. view the network of built model

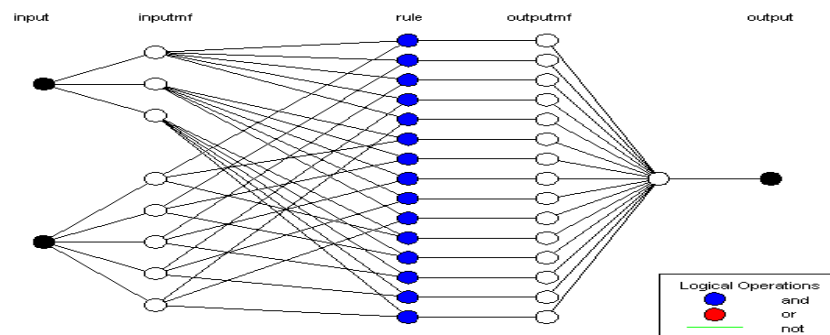


Figure7. The final model structure based networks

3. Summary and conclusions:

As stated that the aim of this study was to evaluate the ability of the new methods, neural networks - fuzzy analysis of accidents road (case study out of the road) and in the form of an analytical model (forecast). In fact, the appropriate background and framework are available by intelligent structure for the development and completion of the model. Thus, we can deduce by analyzing the results that out-of-line analysis is a quantitative - qualitative analysis and using the neural-fuzzy methods are better than neural networks. In addition, the assessment of convergence of input and output values with fuzzy logic is better expressed as the structure of the discrete values is 0 or 1. In fact the linguistic concepts is provided the possibility of extracting a plausible model of the output values by using Neural- Fuzzy Networks and according to inclusion of conditional rules. A plausible model of the output values is provided by studying the history of the traditional models of analyzing the out of line that can be realized the problems and weaknesses such as: one-dimensional models, the lack of effective circumstances in quantitative and qualitative evaluation, complexity of these models in the behavior description and no inference of them for making multi-purpose decision. The structure of neural networks and neuro-fuzzy was used for solve problems and improvement of them.

Finally, it is recalled that according to the statistical limitation what is presented in this study provide algorithm processing and construct a predictive model by using neural intelligent analytical methods and neuro - fuzzy. Certainly the imitation of the structure of the neural-fuzzy and develop a national plan and considering the combinations of all effective factors out of the road will result to a complementary model comprehensive analysis of accidents (forecast).

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