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The effect of land use on the occurrence of road accidents in Ghaemshahr city

1st **Rozita Saki** 2nd **Farhad Mehryari** 3rd Ali Asghar Aleshikh

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Rozita Saki

Abstract

In this paper that supported by the Office of Planning and Teaching of Road Maintenance and Transport Organization of Iran to examine the relationship between land use and the occurrence of road accidents in northern Iran (Ghaemshahr city).

Large number of human casualties and injuries in road accidents in Iran reflect the fact that road safety has become a major problem. In this study, combining below information layers:

1-Land use

2- Accident data

3-The geometric characteristics of the road

Primary data were prepared using Geographic Information System (GIS). At this stage, the necessary corrections and spatial analysis were performed on the data. Then data were imported MATLAB software.

Using fuzzy logic toolbox in MATLAB software the relational model was implemented, The end result of this study showed that the training locations, intersections, repair shops and urban areas have more accidents.

Key words: land use - Fuzzy logic - Spatial Analysis - GIS - MATLAB Software - relational model

1. Introduction

Traffic crashes cause deaths, injuries, pain, disabilities, lost productivity, grief, material damage, and transportation decisions can affect personal safety (risk of being attacked) and aerobic fitness. Changes in travel patterns affect traffic risk and public health in many ways .

Land use patterns affect per capita automobile travel (Land Use Impacts on Transportation). Automobile-oriented land use patterns tend to increase per capita automobile travel, which tend to increase traffic crashes and causalities.

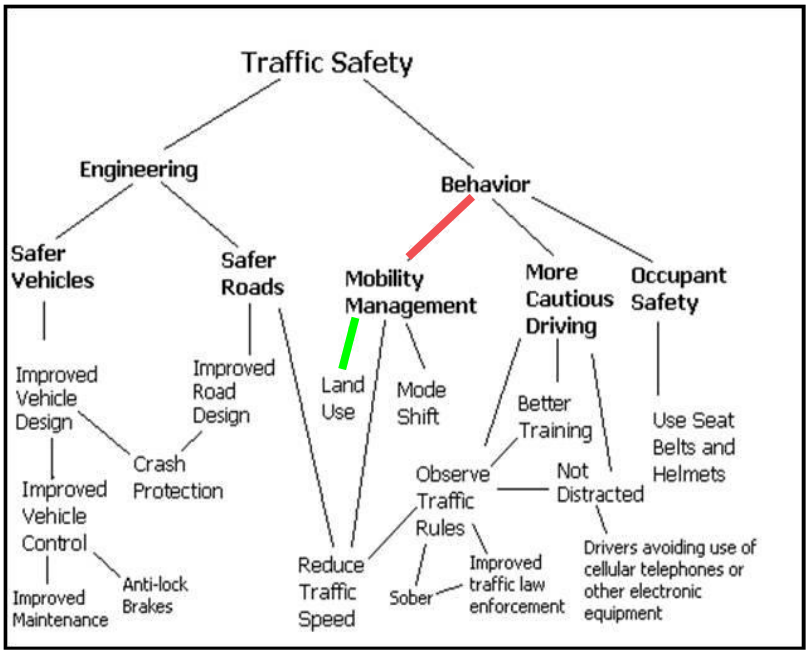


Figure1. This figure illustrates the relationships among various traffic safety factors. (Victoria Transport Policy Institute,2011)

2.Data and Material

In this paper focus study on possible contributing factors in a set of local criteria observed for each kilometre of main road studied. The study was conducted in the Road Maintenance and Transport Organization of Iran which is considered to find the relationship between 60 criterias of land use and road accidents.

According to simulation with Matlab, the evaluation system of observed criteria is implementing a set of fuzzy rules by using membership functions. Therefore, the evaluation system can the ability to adapt and automatic learning and presents a very important step like a treatment system spatial concentrations of accidents to improve the level of road safety.

Furthermore, in this paper introduced the Geographic Information System (GIS) in the idea of a spatial visualization of black spots, and proposed a solution to mitigate the measurable risk of accidents. The results show that the system developed can be used as a tool for the identification of fatalities of road environment on a sustainable road safety.

Fuzzy Logic Toolbox

I can create and edit fuzzy inference systems with Fuzzy Logic Toolbox software. I can create these systems using graphical tools or command-line functions, or I can generate them automatically using either clustering or adaptive neuro-fuzzy techniques.

The toolbox also lets run stand-alone C programs directly. This is made possible by a stand-alone Fuzzy Inference Engine that reads the fuzzy systems saved from a MATLAB session.

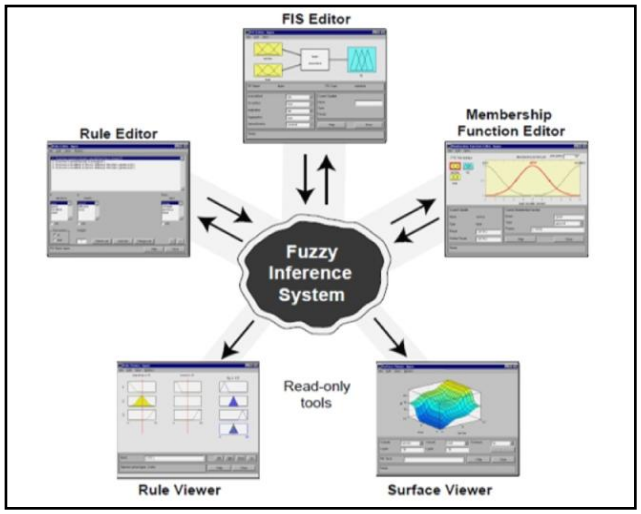


Figure2. This figure illustrates the fuzzy inference system (fis)

Fuzzy logic is conceptually easy to understand. The mathematical concepts behind fuzzy reasoning are very simple and intuitive approach without the far-reaching complexity.
Fuzzy logic can model nonlinear functions of arbitrary complexity. The diagram displayed at the below shows the inputs, outputs, and a central fuzzy rule processor.

3. Research Methodology

The classical set theory used in conventional GIS software imposes artificial precision on inherently imprecise information about the real world and fails to model the way of human thinking about the real world.
Fuzzy logic offers a way to represent and handle uncertainty present in the continuous real world. Extending GIS with fuzzy set theory assist the GIS user to make decisions using experts' experiences in the decision-making process.
Experts' experiences and human knowledge described in natural languages can be captured by fuzzy if-then rules. Therefore, decision-makers can express their constraints through the use of natural language interfaces. A GIS with fuzzy set theory enable decision-makers to express imprecise concepts that are used with geographic data. The capacity of taking linguistic information from decision-makers permits the decision-maker to more easily develop the criteria and softens the constraints and goals in order to find suitable sites. In addition, decision-maker has no longer need to produce maps for each criterion.
Moreover, all locations in the input space are mapped to a degree of suitability using property values of locations and rules defined by the decision-maker.
Therefore, values of locations in the fuzzy output map derived from fuzzy inference process can be available in orderly manner. Note that Boolean result contains only a set of 1 and 0 values. Another advantage of fuzzy inference is that fuzzy result of a decision-making process provides a set of locations whose attribute values partially satisfy the constraints posed by the user.
The proposed system provides not only a powerful tool to the GIS user to make decisions in vague concepts but also the system has easy to use graphical user interfaces which enable even a newcomer to fuzzy set theory to define rules without necessarily knowing all the underlying concepts of the fuzzy set theory, is not dedicated to a specific GIS problem, covers the most commonly used membership functions, provides different inference methods and aggregation methods, has different operators for set operations

(i.e., conjunction and disjunction operators) offers different defuzzification methods, and is rich with the number of possible designs . This richness of the system allows GIS users to approximate various complex ill-defined problems in decision-making processes and classification.

4. Results and Analysis

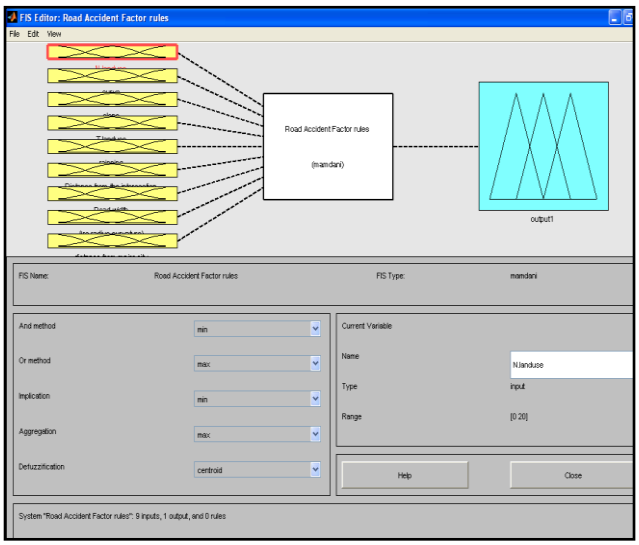
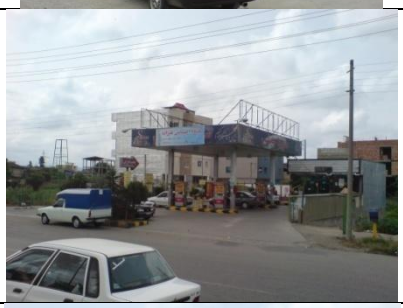


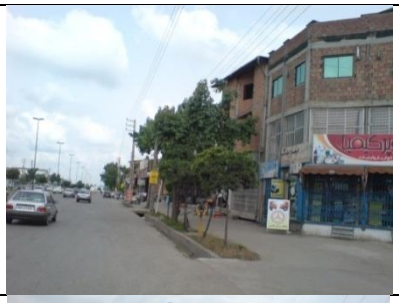
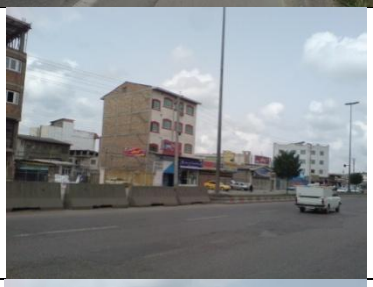
Figure3. This figure shows the FIS Editor GUI tool allows to edit the highest level features of the fuzzy inference system.

5. Conclusions

After displaying geographic data structure array with lines representing roads. In the shapefile, the road coordinates have been pre-projected to the Ghaemshahr-Banol Plane system (in meters), so the shapefile is imported into a mapstruct.in the 63 sections ,finded 20snitces very hazard sections. AS below table(1) The results of 12 different areas in the following table was dangerous.

table(1) The results of 12 different areas in the following table was dangerous

Photos	**Risk Percentage**	**Location**	Section No.
	%40	Pedestrians crossing	-45-8-3 -32-66 48-23
	%70	Road near the school.	-66-45 -47-34 49
	%45	Place to stop vehicles	-63-23 34-28
	%30	Place to stop vehicles by the inhabitants of the shoulder	-45-25 56
	%60	Construction of unauthorized access	-55-50 -32-63 -64-55 -19-34 17
	%50	Ilegal structures at the edge of the road	-56-32 -10-17 5-13

	%43	Structures very close to the road	-24-23 -34-25 -37-36 -45-56 -43-46 -65-32 -54-64 57-56
	%35	No Soil shoulder	-24-23 -26-25 -57-56 -59-58 60
	%46	No access	-26-23 -64-60 65
	%50	Lack of road safety signs	-13-12 -15-14 -17-16 19-18
	%66	Low-density urban areas	-24-23 26-25
	%60	Repair shops	-13-12 -47-45 -56-55 -65-58 66

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