



Neutrosophic Environment for Traffic Control Management

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Abstract

Neutrosophic along with its environment development over the past decades. Neutrosophic environment is apply to various applications in logic, statistics, algebra, neural networks and several other fields. Neutrosophic sets has been presented to handle the indeterminacy in real-world decision-making problem. Real world problems have some kind of uncertainty in nature and one of the influential problem in environment. Neutrosophic environment results are apply to a new dimension in traffic control. Neutrosophic is the vital role on traffic flow control. It is deal with membership, non membership and also indeterminacy of the data as well. The advantage of the neutrosophic environment is to find the optimized result of the system choosing the best alternative. In this paper, traffic flow control is analyzed under neutrosophic environment using MATLAB.

Keywords: Traffic flow, Neutrosophic environment, Neutrosophic network

1. Introduction

If the number of vehicles are increased and having lower phase of highways then there will be a traffic congestion problem. The general factors for traffic problems are density of the vehicles, human behavior, traffic light system and social behavior. The complex and changing traffic situations cannot be dealt by conventional traffic control methodologies or control systems. Analyzed the Parametric and nonparametric traffic volume forecasting[1]. Deals with Spectral and cross-spectral analysis of urban traffic flows [2]. To introduced the traffic forecast using simulations of large scale networks[3]. Analyzed the multivariate state space approach for urban traffic flow modeling and prediction[4]. Introduced Interval neutrosophic Sets and Logic[5]. Introduced A unifying field in logic. Neutrosophy: Neutrosophic probability, set, logic[6]. Analyzed A Bayesian Network Approach to Traffic Flow Forecasting[7]. Introduced a novel Fuzzy Neural Approach to Road Traffic Analysis and Prediction[8]. Introduced the Type-2 fuzzy logic approach for short term traffic forecasting[9]. Analyzed the Ensemble learning approach for freeway short-term traffic flow prediction[10]. Introduced the Fuzzy Neural Network model Applied in the Traffic Flow Prediction[11]. Introduced an Aggregation Approach to Short-Term Traffic Flow Prediction[12]. Predicting traffic flow, speed, length of the queue and travel time are necessary for the transportation management applications

[13]. Predicting and modeling traffic flow has drawn attention from literature as it is very important for formatting intelligent transportation system theoretically and practically. The area of transportation studies has attracted interest among the researchers [14]. Fuzzy logic is a powerful tool to used in unncertainties in measurements and information used to calculate the parameters; here the membership value for a particular traffic state is not a crisp value Any number of intersections and lanes can be handled using fuzzy and interval fuzzy logic in traffic control management. Generally there are two types of signal control available, namely, fixed time control (the traffic conditions are fixed) and adaptive time control (the traffic conditions may be refined over a period of time control [15-16]. Introduced an intelligent Traffic Light Control System for Isolated Intersection Using Fuzzy Logic[17]. The complex and changing traffic situations cannot be dealt by conventional traffic control methodologies or control systems

If the number of vehicles are increased and having lower phase of highways then there will be a traffic congestion problem. The general factors for traffic problems are density of the vehicles, human behavior, traffic light system and social behavior. The complex and changing traffic situations cannot be dealt by conventional traffic control methodologies or control systems.

As the flow of traffic varies from hour to hour in morning and evening. Especially during office timing the traffic flow will be high in general. The one of the advantage of fuzzy logic is, there is a possibility of computing with words [18].

Neutrosophic logic was proposed by Smarandache can express determinate as well as indeterminate of the information by neutrosophic numbers. Solving traffic flow problem is a difficult one for certain parameters as the real-time situations are uncertain in nature and can be solved easily by considering neutrosophic logic [19]. Introduced a Traffic signal control using fuzzy logic[20]. Deal with Interval neutrosophic multiple attribute decision-making method with credibility information[21]. An Improved score function for ranking neutrosophic Sets and Its Application to decsion making process Fuzzy and neutrosophic logic are playing a vital role in dealing with uncertainties. Introduced the traffic control management in triangular interval type-2 fuzzy and interval neutrosophic environments [26-34]. Introduced the traffic control management using Gauss Jordan method under neutrosophic Environment[35].

2. Definition

Neutrosophic number

Neutrosophic linear equations and solving method for traffic flow control under neutrosophic number ($z=a +bI$) environment. A system consists of linear equations (LEs) can be solved . By finding an augmented matrix form the given system, one can find the inverse of the matrix and using MATLAB.

3. Applications

At Analyze of traffic flow

The roads are considering as Road1, Road2, Road3 and Road4. FIGURE 1 shows the traffic flow on the four roads. Here z is a neutrosophic variable, and y_1 , y_2 and y_3 are the unknown variables. In this junctions falsity considered as zero. Where I is the indeterminacy of the traffic flow.

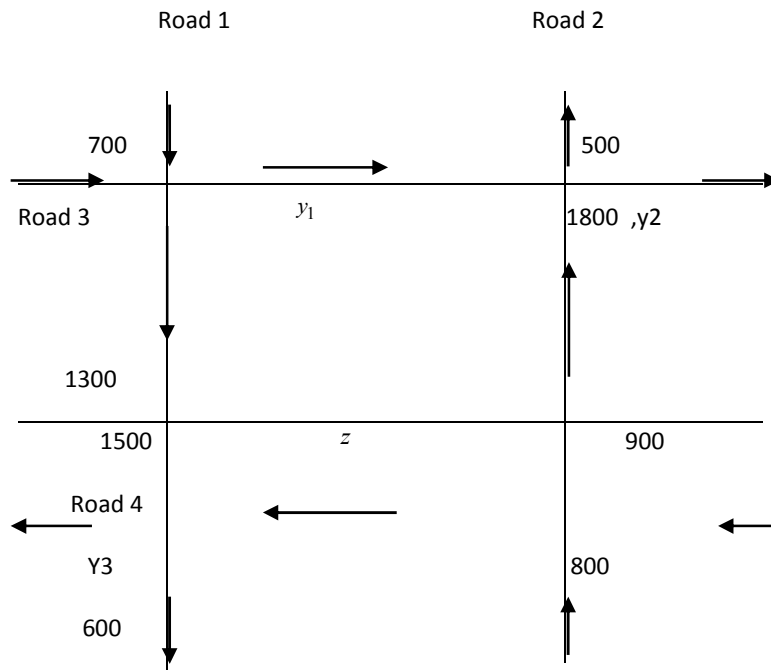


FIGURE 1. The traffic flows of four roads

The traffic in the junction as follows:

$$2000 = y + z$$

$$2300 = y_1 + y_2$$

$$1700 = y_2 + y_3$$

$$2100 = y_3 + z$$

Rewrite the equation as,

$$y_1 = 2000 - z$$

$$y_1 + y_2 = 2300$$

$$y_2 + 2y_3 = 3800 - z$$

Based on, $z = 500 + I$, the system can also be described by the following three NLEs:

Then, the neutrosophic equations are:

$$y_1 = 1500 - I$$

$$y_1 + y_2 = 2300$$

$$y_2 + 2y_3 = 3300 - I$$

Thus, the neutrosophic matrices are:

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 2 \end{bmatrix}, \quad Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

$$B = \begin{bmatrix} 1500 - I \\ 2300 \\ 3300 - I \end{bmatrix}$$

For the system consists of NLEs, apply the MATLAB software, shown in the following program and the solution of the system is :

For the system consists of NLEs, apply the MATLAB software, shown in the following program

```
clc
```

```
syms I;
```

```
a=[1 0 0;1 1 0;0 1 2]
```

```
b=[1500-I;2300;3300-I]
```

```
[v,j]=jordan(a)
```

```
j=inv (v)*a*v
```

```
y=a\b
```

Output of the program are as follows:

```
a=[1 0 0;1 1 0;0 1 2]
```

```
b=[1500-I;2300;3300-I]
```

```
[v,j]=jordan(a)
```

```
y=a\b
```

$$Y = \begin{bmatrix} 1500 - I \\ I + 800 \\ 1250 - I \end{bmatrix}$$

The values of Y are NNs.

In some of the real-time situations, when $I \in [0, 100]$ is the possible range, the solution of the system is:

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} [1400, 1500] \\ [800, 900] \\ [1150, 1250] \end{bmatrix}$$

Corresponding to the possible traffic flow $z = [200, 250]$

Thus the ranges of the three traffic flows are

$$y_1 = [1400, 1500]$$

$$y_2 = [800, 900]$$

$$y_3 = [1150, 1250]$$

In table 1 represent the various range of indeterminacy.

TABLE 1. Traffic flows according to various ranges of Indeterminacy

I	z	y_1	y_2	y_3
$I = 0$	200	1500	800	1250
$I \in [100, 200]$	[300, 400]	[1300, 1400]	[900, 1000]	[1050, 1150]
$I \in [200, 300]$	[400, 500]	[1200, 1300]	[1000, 1100]	[950, 1050]
$I \in [300, 400]$	[500, 600]	[1100, 1200]	[1100, 1200]	[850, 950]
$I \in [400, 500]$	[600, 700]	[1000, 1100]	[1200, 1300]	[750, 850]

In table 2 shows that the advantages and disadvantage in fuzzy and Neutrosophic traffic control management.

Table :2 Comparison of Traffic Control Management using Crisp , Fuzzy and Neutrosophic

Traffic Control Management	Advantages	Limitations
Crisp	Traffic density for all fixed time period.	- It is not possible to act in varying traffic density. - Not able to solve quickly in uncertainty behaviour
Fuzzy	- Traffic density in different time can be consider. - Intelligent - Act the best security	- Not able to use in stability. - Not able to use flexibility. - Not able to use in on line planning.
Neutrosophic	Deals not only uncertainty but also indeterminacy due to unpredictable environmental disturbances	Not able to calculate the error.

4. CONCLUSION

Traffic control management is an essential task which insure the safty of the people . In this paper, fundamental concepts of traffic control have been reviewed. Triangular and Trapezoidal Fuzzy numbers are widely used in many of the real world problems as it deals with the problems which having less number of membership values with covering the linguistic parameters of the system effectively. Traffic flow management has been analyzed with respect to various

ranges of indeterminacy under neutrosophic environment using MATLAB program Also compared the traffic control management for crisp sets, fuzzy and neutrosophic.

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