An Application Of Fuzzy Relation In Road Accident Details

A.Sophiya

Research Scholar, Department of Mathematics,

PRIST University, Thanjavur, Tamilnadu, India

E-mail:sophiyajohn1229@gmail.com

S.Subramanian

Professor, Department of Mathematics,

PRIST University, Thanjavur, Tamilnadu, India

E-mail:mathsspmanian@gmail.com

Corresponding author:sophiyajohn1229@gmail.com

Abstract: Fuzzy relation is the method to find the best one among a set of selected alternative. Under a fuzzy environment the, fuzzy relation enable to decision maker to choose the road accident details. In this paper, we have used the pentagonal fuzzy number matrix to select the person body conditions for maximum fatal, non-fatal, non-death, death information among the three district select in road accident statistics approximately.

Keywords: Accident data, Fuzzy relation, Fuzzy soft matrix, pentagonal fuzzy number matrix

I. INTRODUCTION:

Accidents cause injuries and deaths for many people all over the world annually creating server social and economic impacts that affect the national economy. In Egypt, vehicle accidents a major safety concern, with more than 12,000 deaths and uncounted fatal, non fatal, non death per day. Transportation system plays an important role in human life and one of the main indicators of the standard of living**.** An accident makes not only fatal but also it can change the life of person or family forever. The consequences of an accident are recurring and cause serious damage to the financial and social position of the family. Permanent disability not only results in loss of income but also damage the morale. According to statistics, more people are killed in road accidents every day than wars put together. So there is an urge to control the road accidents and deaths. Traffic accidents constitute a major issue that threatens people's lives, health and property. Children's pedestrians, cyclists and the elderly are among the vulnerable improvements in road users policies that have been reported to tackle some of the risk factors including speed reduction, drunken driving and that motorcycle helmets, seat belts and child restraints.

In India 1,47,913 person were killed in road accident during 2017. According to Ministry of road Transport and Highways, Tamil Nadu is the leading State in road Accidents during the 2017, with an accidental death of 16,157.The State Government's continued efforts through the Departments of Transport, Police, Health, Highways and Education there were reduced by 24 percent of accidental death in 2018 (12,216) compared with the previous year (16,157).An attempt was made to explore through this study the actual picture of the District wise's accident death in the state during January 2019. The highest incident number occurs from 6-9 pm .Due to heavy movement of the vehicles during this period. The second time accidents happened was 3-6 pm. In every year.

We use data from the Road Accident Data Management System for this regular road accident review in Tamil Nadu (TN,PDKI,PTKI).Even taking into account data collected from 1081 TN, PDKI, PTKI police.

II. FUZZY RELATION :

We discuss the relevance of the use of fuzzy relation in the accident details. One of the main growths of fuzzy set theory, fuzzy matrix was mainly discuses and reason with some particular from of matrix.

Fuzzy matrix F_{mn} denote the set of all m × n matrices over F. If m=n, then we write F_n. Elements of F_{mn} are called as membership value matrices, binary fuzzy relation matrices and also called the fuzzy matrices. Boolean matrices above the Boolean algebra {0.1} are special kinds of fuzzy matrices.

Fuzzy relation are fuzzy subsets of $\tilde{A} \times \tilde{B}$, that is mapping from $\tilde{A} \to \tilde{B}$. The application of fuzzy relation are widespread and important. We have considered only Binary Relation (i.e., relation between two sets) or simply 'Relation' (unary, binary, ternary,…)

Let $\tilde{A}, \tilde{B} \subseteq \mathbf{R}$ be universal set, then

$\tilde{R} = \{((\tilde{a}, \tilde{b}), \mu_{\tilde{R}}(\tilde{a}, \tilde{b})) \mid (\tilde{a}, \tilde{b}) \in \tilde{A} \times \tilde{B}\}$ is called a fuzzy relation from $\tilde{A}$ to $\tilde{B}$.

Max-min composition: Let $\tilde{R}_1(\tilde{a}, \tilde{b}), (\tilde{a}, \tilde{b}) \in \tilde{A} \times \tilde{B}$ and $\tilde{R}_2(\tilde{b}, \tilde{c}), (\tilde{b}, \tilde{c}) \in \tilde{B} \times \tilde{C}$ be two fuzzy relation. The max-min composition $\check{R}_1$ max-min $\check{R}_2$ is then the fuzzy set

$$\tilde{R}_1 \circ \tilde{R}_2 = \{[(\tilde{a}, \tilde{c}), \max_b \{\min\{\mu_{\tilde{R}_1}(\tilde{a}, \tilde{b}), \mu_{\tilde{R}_2}(\tilde{b}, \tilde{c})\}\}] \; \tilde{a} \in \tilde{A}, \tilde{b} \in \tilde{B}, \tilde{c} \in \tilde{C}\}$$

$\mu_{\tilde{R}_1 \circ \tilde{R}_2}$ is again the membership function of a fuzzy relation on fuzzy sets.

Max-prod composition and max-av composition:

Let $\tilde{R}_1$ and $\tilde{R}_2$ respectively,

$$\tilde{R}_1 \circ . \; \tilde{R}_2 = \{[(\tilde{a}, \tilde{c}), \max_b \{\mu_{\tilde{R}_1}(\tilde{a}, \tilde{b}), \mu_{\tilde{R}_2}(\tilde{b}, \tilde{c})\}] \mid \tilde{a} \in \tilde{A}, \tilde{b} \in \tilde{B}, \tilde{c} \in \tilde{C}\}$$

$$\tilde{R}_1 \circ_{av} \tilde{R}_2 = \{[(\tilde{a}, \tilde{c}), ½ \; . \max\{\mu_{\tilde{R}_1}(\tilde{a}, \tilde{b}), \mu_{\tilde{R}_2}(\tilde{b}, \tilde{c})\}] \mid \tilde{a} \in \tilde{A}, \tilde{b} \in \tilde{B}, \tilde{c} \in \tilde{C}\}$$

III. METHODOLOGY:

Approximately three Tamil Nadu district selected. Instead they selected vehicles and number of accidents and conditions for citizens. Then fuzzy relationship sub for $\tilde{A}(\tilde{a}_1, \tilde{a}_2, \tilde{a}_3 ..... \tilde{a}_n)$ for three forms of district and vehicles category $\tilde{B}(\tilde{b}_1, \tilde{b}_2, \tilde{b}_3, \tilde{b}_4, \tilde{b}_5, ... \tilde{b}_n)$ then $\tilde{C}(\tilde{c}_1, \tilde{c}_2, \tilde{c}_3, \tilde{c}_4, ...)$ is personal accident circumstances, respectively;

Road accident profile of various vehicles in overall road accident data					
Name of District	Two Wheelers	Cars	Tractors	Buses	Buy cycle
TN	1	2	0	10	5
PDKI	3	4	0	2	10
PTKI	6	0	10	4	2
Total :3	10	6	10	16	17

Data on injuries accompanied by specific injury circumstances for fatal, non-fatal, death, non-death data collected,

Accidents include vehicle type and specific incident circumstances In specifics per day				
	Fatal	Non fatal	Death	Non death
Two wheelers	6	0	2	3
Cars	2	10	5	0
Tractors	5	0	4	10
Buses	3	2	10	0
Buy cycle	0	10	0	5

Then we can also define the conditions of district and vehicles and accidents person in fuzzy matrix. First fuzzy membership function finds in all values then fuzzy relations calculated in the composition of max-prod, respectively max av composition.

The membership function also presents discrete values. Continuous operation occasionally. The membership function of a fuzzy group Ã is denoted by $\mu_{\tilde{A}} : X \rightarrow [0,1]$.

A fuzzy set's membership function has the following format Ã: X→ [0,1].Let $\tilde{R}_1$ and $\tilde{R}_2$ be two bubbling relationships. Then the sets A, B, C fuzzy and a, b, c are subsets of fuzzy sets.

Let the following matrix define $\tilde{R}_1(\tilde{a},\tilde{b})$,

	$\tilde{b}_1$	$\tilde{b}_2$	$\tilde{b}_3$	$\tilde{b}_4$	$\tilde{b}_5$
$\tilde{a}_1$	.1	.2	0	1	.5
$\tilde{a}_2$	.3	.4	0	.2	1
$\tilde{a}_3$	.6	0	1	.4	.2

Then $\tilde{R}_2(\tilde{b},\tilde{c})$ define,

	$\tilde{c}_1$	$\tilde{c}_2$	$\tilde{c}_3$	$\tilde{c}_4$
$\tilde{a}_1$	.6	0	.2	.3
$\tilde{a}_2$	.2	1	.5	0
$\tilde{a}_3$	.5	0	.4	1
$\tilde{a}_4$	.3	.2	1	0
$\tilde{a}_5$	0	1	0	.5

We will first calculate, the min-max-composition $\tilde{R}_1 \circ \tilde{R}_2(\tilde{a},\tilde{c})$:

The determination for $\tilde{a} = \tilde{a}_1, \tilde{c} = \tilde{c}_1$
will be shown in detail and left to the reader to check the total results shown in the matrix at the end of the detailed calculations.We step the min operation first in the smaller brackets of

$\tilde{R}_1 \circ \tilde{R}_2 = \{[(\tilde{a},\tilde{c}), \max_b \{\min\{\mu_{\tilde{R}_1}(\tilde{a},\tilde{b}), \mu_{\tilde{R}_2}(\tilde{b},\tilde{c})\}\}]\ \tilde{a} \in \tilde{A}, \tilde{b} \in \tilde{B}, \tilde{c} \in \tilde{C}\ \}$:

Let $\tilde{a} = \tilde{a}_1, \tilde{c} = \tilde{c}_1$,and $\tilde{b} = \tilde{b}_j$, j=1,2,……,5:

$\min\{\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_1), \mu_{\tilde{R}_2}(\tilde{b}_1,\tilde{c}_1)\} = \min\{.1,.6\} = .1$

min{ $\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_2)$, $\mu_{\tilde{R}_2}(\tilde{b}_2,\tilde{c}_1)$}=min{.2,.2}=.2

min{ $\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_3)$, $\mu_{\tilde{R}_2}(\tilde{b}_3,\tilde{c}_1)$}=min{0.5 }=0

min{ $\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_4)$, $\mu_{\tilde{R}_2}(\tilde{b}_4,\tilde{c}_1)$ } =min{1,.3}=.3

min{ $\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_5)$, $\mu_{\tilde{R}_2}(\tilde{b}_5,\tilde{c}_1)$ }=min{.5,0}=0

$\tilde{R}_1 \circ \tilde{R}_2\,(\tilde{a}_1,\tilde{c}_1) = ((\tilde{a}_1,\tilde{c}_1),\ \mu_{\tilde{R}_1\circ\tilde{R}_2}(\tilde{a}_1,\tilde{c}_1)) = ((\tilde{a}_1,\tilde{c}_1),\max\{.1,.2,0,.3,0\}) = ((\tilde{a}_1,\tilde{c}_1),.3)$

By comparison with the above estimate, we now evaluate the membership scores for all pairs

$(\tilde{a}_i,\tilde{c}_j)$, i=1,2, ... ,3, j=1,2, ... ,4 and arrive at the

$\tilde{R}_1 \circ \tilde{R}_2$:

	$\tilde{c}_1$	$\tilde{c}_2$	$\tilde{c}_3$	$\tilde{c}_4$
$\tilde{a}_1$	.3	.5	1	.5
$\tilde{a}_2$	.3	1	.4	.5
$\tilde{a}_3$	.6	.2	.4	1

Composition of max-min for max-min accidents in fatal, non-fatal, death, non-death details in road accidents per day.

For the max-prod, we obtain

$\tilde{a} = \tilde{a}_1, \tilde{c} = \tilde{c}_1$, $\tilde{b} = \tilde{b}_i$, i=1,…..,5 :

$\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_1) \cdot \mu_{\tilde{R}_2}(\tilde{b}_1,\tilde{c}_1)$ =.1·.6= .06

$\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_2) \cdot \mu_{\tilde{R}_2}(\tilde{b}_2,\tilde{c}_1)$ =.2·.2=.04

$\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_3) \cdot \mu_{\tilde{R}_2}(\tilde{b}_3,\tilde{c}_1)$ =0· .5 =0

$\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_4) \cdot \mu_{\tilde{R}_2}(\tilde{b}_4,\tilde{c}_1)$ =1·.3=.3

$\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_5) \cdot \mu_{\tilde{R}_2}(\tilde{b}_5,\tilde{c}_1)$ =.5·0=.0

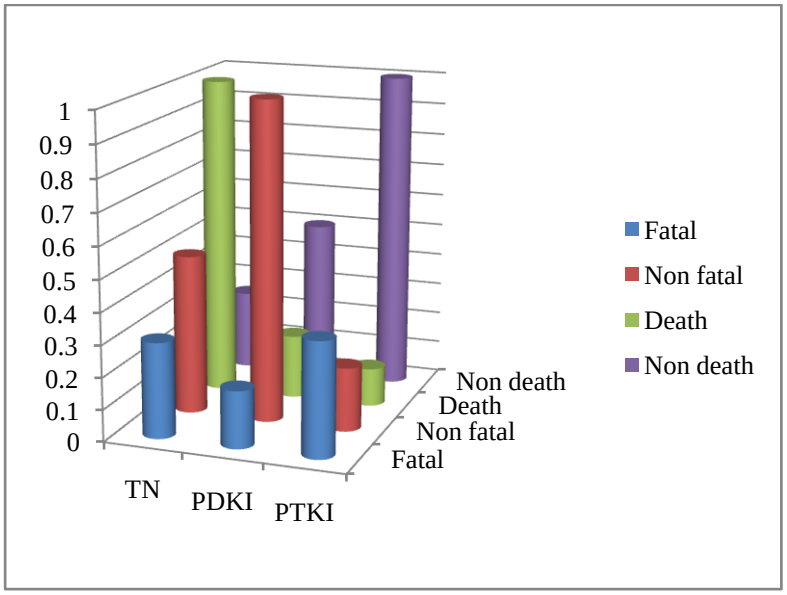
Hence

$\tilde{R}_1 \circ \tilde{R}_2(\tilde{a}_1,\tilde{c}_1)=((\tilde{a}_1,\tilde{c}_1),(\mu_{\tilde{R}_1\circ\tilde{R}_2}(\tilde{a}_1,\tilde{c}_1))) = ((\tilde{a}_1,\tilde{c}_1),\max\{.06,.04,0,.3,0\})= ((\tilde{a}_1,\tilde{c}_1),.3)$

After the number of multiplication computations resulting, we get

Ř$_1$°. Ř$_2$:

	$\tilde{c}_1$	$\tilde{c}_2$	$\tilde{c}_3$	$\tilde{c}_4$
$\tilde{a}_1$	.3	.5	1	.25
$\tilde{a}_2$	.18	1	.20	.5
$\tilde{a}_3$	.36	.2	.12	1



The max-av composition finally yields

i	$\mu(\tilde{a}_1,\tilde{b}_i)+\mu(\tilde{b}_i,\tilde{c}_1)$
1	.7
2	.4
3	.5
4	1.3
5	.5

Hence

½.max$_b$ { $\mu_{\tilde{R}_1}(\tilde{a}_1,\tilde{b}_i)+\mu_{\tilde{R}_2}(\tilde{b}_i,\tilde{c}_1)$ }= ½.(1.3)=.65

$\tilde{R}_1 \circ_{av} \tilde{R}_2$:

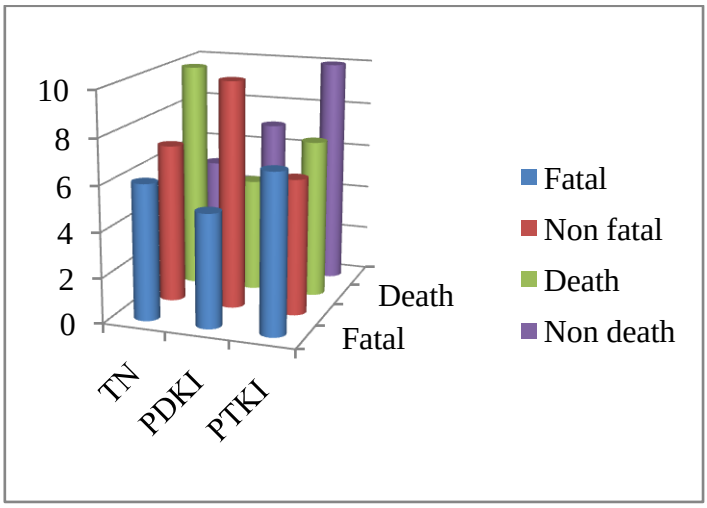
	$\tilde{c}_1$	$\tilde{c}_2$	$\tilde{c}_3$	$\tilde{c}_4$
$\tilde{a}_1$	.65	.75	1	.5
$\tilde{a}_2$	.5	1	.5	.75
$\tilde{a}_3$	.75	.6	.7	1

The cumulative state of individual injuries is estimated for fatal, non-fatal, death and non-death.

IV. RESULTS:

- The highest road accidents were reported in 2019
  Total area of road accidents recorded in three district values.

District	Fatal	Non fatal	Death	Non death
TN	6	7	10	5
PDKI	5	10	5	7
PTKI	7	6	7	10



- Non-fatal 23 and non-death 22 in the name of three districts, around accidents and death 22 and fatal 18.
- Major and fatal accidents are caused by both wheelers and vehicles.

V. CONCLUSION:

The main reason for accidents is speeding, loading in good carriages, carrying people in carriages of goods, using mobile phones while driving, driving drunk, jumping red light. So do avoid all of this. Original driving care Licenses are compulsory. The vehicle population continually growing year after year. Effective enforcement of drunken driving by police and transport officials will reduce then number of crashes. It's very important because some students in college use drunken regularly. My research paper on features is roughly cause for accident. Then the ongoing efforts on this line will lead India to overall accidents and safeguard its state-owned human capital.

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