



Analysis of Defence Persons Duty Time Using Fuzzy Matrix

Research Article*

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Abstract: In this paper we use Fuzzy Matrix to analyze the defence persons how alternatively spending the time securing the duty of their given task as defensive position to save our nation. The land saved by Army, the sea boundaries saved by Navy, and the space by Air force. This objective was shown by graphical method. In this paper we come to know how defence persons sacrificing their life for the people of India.

Keywords: Fuzzy matrix, CETD matrix, ATD matrix.

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1. Introduction

Although the origins of the theory of matrices can be traced back to the 18th century and although it was not until the 20th century that it had become sufficiently absorbed into the mathematical mainstream to warrant extensive treatment in textbooks and monographs. When one contemplates the history of matrix theory, the name that immediately comes to mind is that of Arthur Cayley. In 1858 Cayley published A memoir on the theory of matrices. Every nation depends upon two important matters, Agriculture and strength of Defence forces. In agriculture most of the formers were irrigating their fields using rain water and then river, bore wells, etc. due to the monsoon changes now-a-days rainy season not supporting the formers. But the supporting by the government the formers were fulfilling our nation needs as per requirement. In second important things is strength of defense forces. While they were doing their duty properly by day and night. Now we are gathering the information of the solders attitude may be classified as daily, alternate days, weekly once and monthly once using fuzzy matrix.

2. Application of CETD Matrix

The defense persons how frequently spending their time alternatively securing the post may be classified as under,

- 1) Daily
- 2) In alternative days
- 3) Weekly once
- 4) Monthly once

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The above attributes are taken as the rows of the matrix. Based on their duty time. We classified three categories as Army, Air force, and navy. 4×3 initial raw matrix called Time Dependent matrix (TD) was formed.

Duty (Day and night)	Army	Air force	Navy
Daily	108	102	106
Alternate days	42	38	40
Weekly once	25	20	22
Monthly once	22	19	21

The initial raw data matrix has been converted into the Average Time Dependent matrix (ATD) (a_{ij}) by dividing each entry with the total of the corresponding column

Duty (Day and night)	Army	Air force	Navy
Daily	0.54	0.56	0.56
Alternate days	0.21	0.21	0.21
Weekly once	0.12	0.11	0.11
Monthly once	0.11	0.10	0.11

The average (μ_{ij}) and standard deviation (σ_j) of every column were worked out as follows:

Average(μ_j)	0.245	0.245	0.2475
Standard deviation(σ_j)	0.2014	0.3736	0.2135

Using the average (μ_j), standard deviation (σ_j) and a parameter α from the interval $[0, 1]$, a fuzzy matrix called the Refined Time Dependent matrix (RTD) was formed. The RTD matrix with entries e_{ij} , where $e_{ij} \in \{-1, 0, 1\}$ was formed using the formula.

If $a_{ij} = \mu_j - \alpha * \sigma_j$ then $e_{ij} = -1$

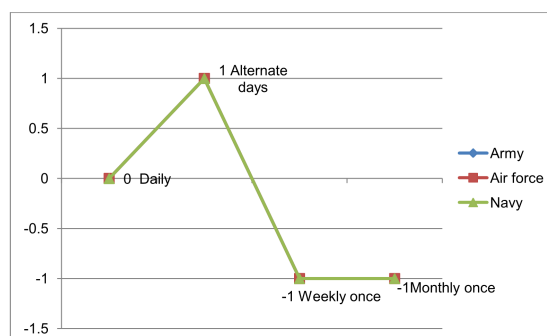
else if $a_{ij} \notin \{\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j\}$ then $e_{ij} = 0$

else if $a_{ij} \in \{\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j\}$ then $e_{ij} = 1$

where a_{ij} 's are entries of Average Time Dependent matrix. By varying the parameter $\sigma[0, 1]$, any number of Refined Time Dependent Data matrices can be obtained. Three of such matrices obtained were as follows;

RTD Matrix for $\alpha = 0.25$ Row Sum Matrix

$$\begin{pmatrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ -1 & -1 & -1 \\ -1 & -1 & -1 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 3 \\ -3 \\ -3 \end{pmatrix}$$



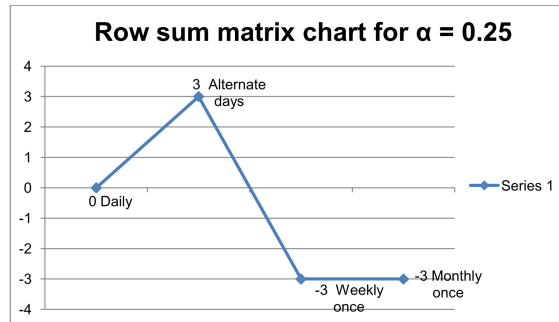


Figure 1. Graph of RTD matrix for $\alpha = 0.25$

RTD Matrix for $\alpha = 0.50$ Row sum matrix

$$\begin{pmatrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ -1 & 1 & -1 \\ -1 & 1 & -1 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 3 \\ -1 \\ -1 \end{pmatrix}$$

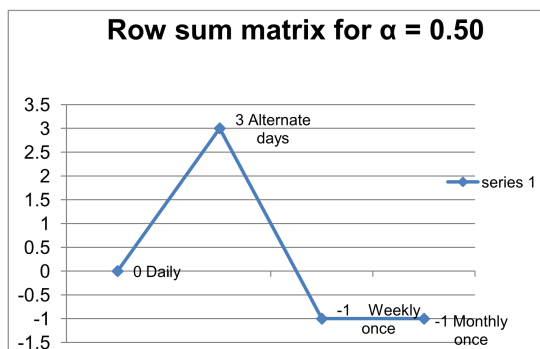
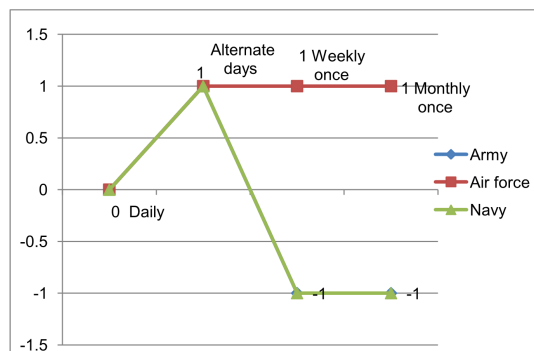
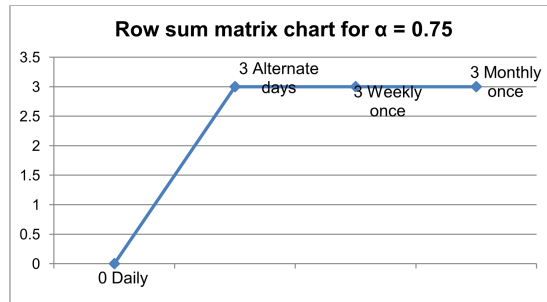
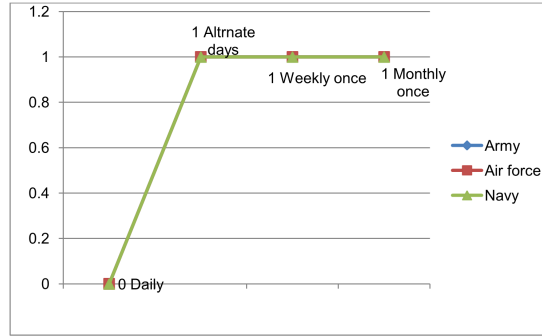


Figure 2. Graph of RTD matrix for $\alpha = 0.50$

RTD Matrix for $\alpha = 0.75$ Row sum matrix

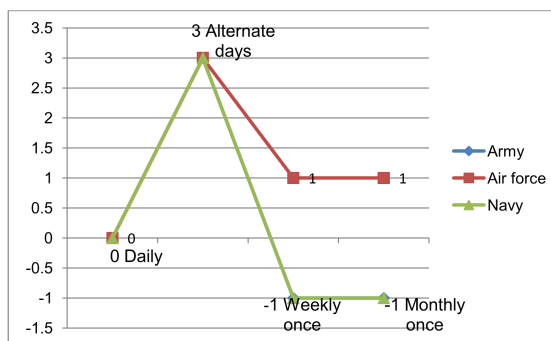
$$\begin{pmatrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 3 \\ 3 \\ 3 \end{pmatrix}$$



By combining all the three matrices, the Combined effect Time Dependent Data Matrix (CETD matrix), which gives the cumulative effect of all these entries, was obtained as follows;

CETD Matrix Row sum matrix

$$\begin{pmatrix} 0 & 0 & 0 \\ 3 & 3 & 3 \\ -1 & 1 & -1 \\ -1 & 1 & -1 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 9 \\ -1 \\ -1 \end{pmatrix}$$



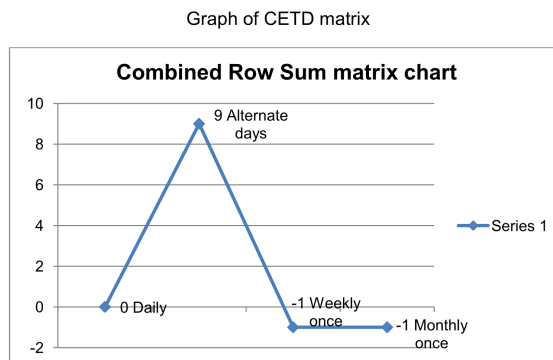


Figure 3. Graph of CETD matrix

3. Conclusion

The above attitude gathering shows for $\alpha = 0.25$ three forces are alternatively spending their duty time. Which will be useful for their proper duty. The graph $\alpha = 0.50$ also shows that they spending the duty time for alternative days. The graph $\alpha = 0.75$ shows the three forces were spending the same time that is alternative days. Thus used to maintain their duty time properly by day and night in alternative days only.

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