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APPLICATION OF FUZZY MATRICES IN TESTING THE PURITY OF GOLD AND SILVER

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ABSTRACT

Fuzzy matrices are used in various real life applications. One such would deal with the measurement of thin areas. This paper deals with the discovery of both gold and silver by using fuzzy matrices. Both of these elements are gradually separated from other impurities and other metals before they are checked. Fuzzy matrices offer a wider scope of dissection and analysis of a metal's purity.

Keywords: Fuzzy Matrix, Purity, Gold, Silver, Pure Metals.

I. INTRODUCTION

The world of numbers is vast and intangible to the very extent that there's still more to decode after infinity. Fuzzy matrices fall into this volume with their decimal values ranging between $[0,1]$. These matrices are real numbers that are necessarily intuitive and certain. This paper explores fuzzy matrices and its relationship with the measurement of finite gold standard. It is to be noted that these matrices have the capability to trace values of both small and large units in terms of operation and research.

If the diagonal elements of a fuzzy matrix are fuzzy one numbers and the off-diagonal elements are fuzzy zero numbers, then the fuzzy matrix is called a fuzzy identity matrix. The adjoint of a matrix is defined only for square matrices. In the world where gold standard is usually derived in terms of grams and carats, this paper explores the various possibilities and properties with which the thickness and the weight of gold can be calculated through fuzzy matrices.

II. Preliminary

Here we recall some preliminary definitions regarding the topic.

Definition 2.1

Fuzzy Matrix

Let F_{mn} denote the set of all $m \times n$ matrices over F , if $m = n$, in short, we write F_n are called membership value matrices, binary fuzzy relation matrices (or) in short, fuzzy matrices.

Definition 2.2

Purity and uses of gold

The general usage of gold is least presumed to be calculated through gold coins, but history goes back to the times when gold was used by kings and emperors for various purposes. It is evident that royalty only used pure gold to make their weapons and ornaments. The purity of gold was measured by melting it, letting toxins and other materials seep out from its surface.

Definition 2.3

Measuring the purity of silver by using fuzzy matrix

Purity of silver is also measured in the same way one measures gold, silver has notable contributions in jewelry making, popular culture and antiquity and other traditional artifacts. Silver is often blended with copper or gold, its luster makes for a fine upper layer for mirrors and other metals. There was even a time when silver was used more than gold for various purposes.

Definition 2.4

Measuring the purity of gold by using a fuzzy matrix

Fuzzy matrices choose the type of carat as the first step. The ratios of gold and other metals are taken in ratios, putting them as rows and columns respectively. The percentage of other metals mixed with gold is also calculated in fuzzy matrices.



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**Definition 2.5****Silver and uses**

Silver is widely used in a number of places, fine silver is usually used in small jewelry, silver sets and mortar vehicles. Fine silver is also used in solar energy systems in certain places. Sterling silver contains more than 90 percent of pure silver which can also be found in a fuzzy matrix.

III. Algorithm**Case(i)**

Calculate The Fuzzy Matrix \tilde{G} refers Gold

Case(ii)

Calculate The Fuzzy Matrix \tilde{S} refers Silver

Case(iii)

Calculate The Fuzzy Corresponding Matrices \tilde{G} and \tilde{S}

Case(iv)

Calculate $\tilde{P} = \tilde{G} \overset{\circ}{\underset{\text{avg}}{\tilde{S}}}$

Case(v)

Calculate $\widetilde{P}_{\text{AVG}} = \frac{1}{2}(\text{Max}(\mu_{\tilde{G}} + \mu_{\tilde{S}}))$

IV. Case Study

The values of gold are taken as 18,22 and 24 carats respectively to be put inside the fuzzy matrices. Three kinds of silver are used in this case, Fine silver, sterling silver and silver coins. The purity of both gold and silver are efficiently discovered by applying them in a fuzzy matrix. The density of the metal is also found out easily in this method. This paper explains that the purity of gold and silver can be calculated by fuzzy matrices in the same way they are traditionally weighed.

STEP:1

$$G = M \begin{matrix} K_1 & K_2 & K_3 \\ \begin{bmatrix} 0.755 & 0.916 & 0.99 \\ 0.25 & 0.083 & 0.01 \\ 0.154 & 0.156 & 0.193 \end{bmatrix} \end{matrix}$$

STEP:2

$$S = \begin{matrix} P & M & D \\ \begin{matrix} F_1 \\ S_2 \\ C_3 \end{matrix} & \begin{bmatrix} 0.99 & 0.001 & 0.1049 \\ 0.925 & 0.70 & 0.1025 \\ 0.075 & 0.30 & 0.1031 \end{bmatrix} \end{matrix}$$

STEP:3

Compute the corresponding Matrices \tilde{G} and \tilde{S}

$$\tilde{P} = \frac{1}{2} (\text{Max}(\mu_{\tilde{G}} + \mu_{\tilde{S}}))$$

Applying it

$$\tilde{P} = \frac{1}{2} \begin{matrix} P & M & D \\ \begin{bmatrix} 0.99 & 0.99 & 0.99 \\ 0.99 & 0.70 & 0.25 \\ 0.99 & 0.70 & 0.193 \end{bmatrix} \end{matrix}$$

STEP 4:

$$\tilde{P} = \frac{1}{2} [\mu_{\tilde{G}} \mu_{\tilde{S}}]$$



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$$\begin{matrix} L \\ = W \\ H \end{matrix} \begin{bmatrix} 0.49 & 0.49 & 0.49 \\ 0.49 & 0.35 & 0.12 \\ 0.49 & 0.35 & 0.096 \end{bmatrix}$$

It Clearly shows the above Matrix Highest Purity of Gold and Highest Purity of Silver are also same in Fuzzy Matrix

Conclusion

Thus, fuzzy matrices trace the boundaries of units which are not clear at a first glance. Certain units in numbers such as age aren't usually generalized since the terms young and old are subjective to individuals. Fuzzy matrices deal with even the smallest units with such intricacies as one can observe from the above references and ideas. Fuzzy matrices are proven to be fairly productive in a lot of other numerical operations that are distinctive and varied in nature.

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