APPENDICES

APPENDIX A

BACKGROUND MATHEMATICS [11]

1. Standard Deviation (SD)

Standard Deviation (SD) is: "The average distance from the mean of the data set to a point". The way to calculate it is to compute the square of the distance from each data point to the mean of the set, add them all up, divide by n-1, and take the positive square root. As a formula:

$$SD = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{(n-1)}}$$

Where:

X is referred to the entire set of number.

X_i is referred to the ith number in X. (i = 1, 2, 3,...,n)

n is referred to the number of elements in the set X.

2. Variance, s^2

Variance is the measure of the spread of data in a data set. The formula of the variance is:

$$s^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{(n-1)}$$

Where:

X is referred to the entire set of number.

X_i is referred to the ith number in X. (i = 1, 2, 3,…,n)

n is referred to the number of elements in the set X.

3. Covariance

Covariance is the measure of the spread of data in a data set between 2-dimension. If the covariance between one dimension and itself is calculated, the result is the variance. Therefore, if the covariance of the 3-dimensional data set (x, y, and z) is calculated, the result is the covariance between the x and y dimension, the x and z dimension, the y and z dimension is measured. The formula of the covariance is:

$$cov(X,Y) = \frac{\sum_{i=1}^{n}(X_i - \overline{X})(Y_i - \overline{Y})}{(n-1)}$$

Where:

X and Y is referred to the entire sets of number.

X_i and Y_i is referred to the ith number in X and Y, respectively. (i = 1, 2, 3,…,n)

n is referred to the number of elements in the set X and Y.

APPENDIX B

EIGENVECTORS AND EIGENVALUES [1, 11]

Definition: If A is an $n \times n$ matrix, then a nonzero vector $\mathbf{x}$ in R^n is called an *eigenvector* of A if A$\mathbf{x}$ is a scalar multiple of $\mathbf{x}$; that is,

$$A\mathbf{x} = \lambda\mathbf{x}$$

For some scalar λ, the scalar λ is called an *eigenvalue* of A, and $\mathbf{x}$ is said to be and eigenvector of A corresponding to λ.

Example: The vector $\mathbf{x} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ is an eigenvector of
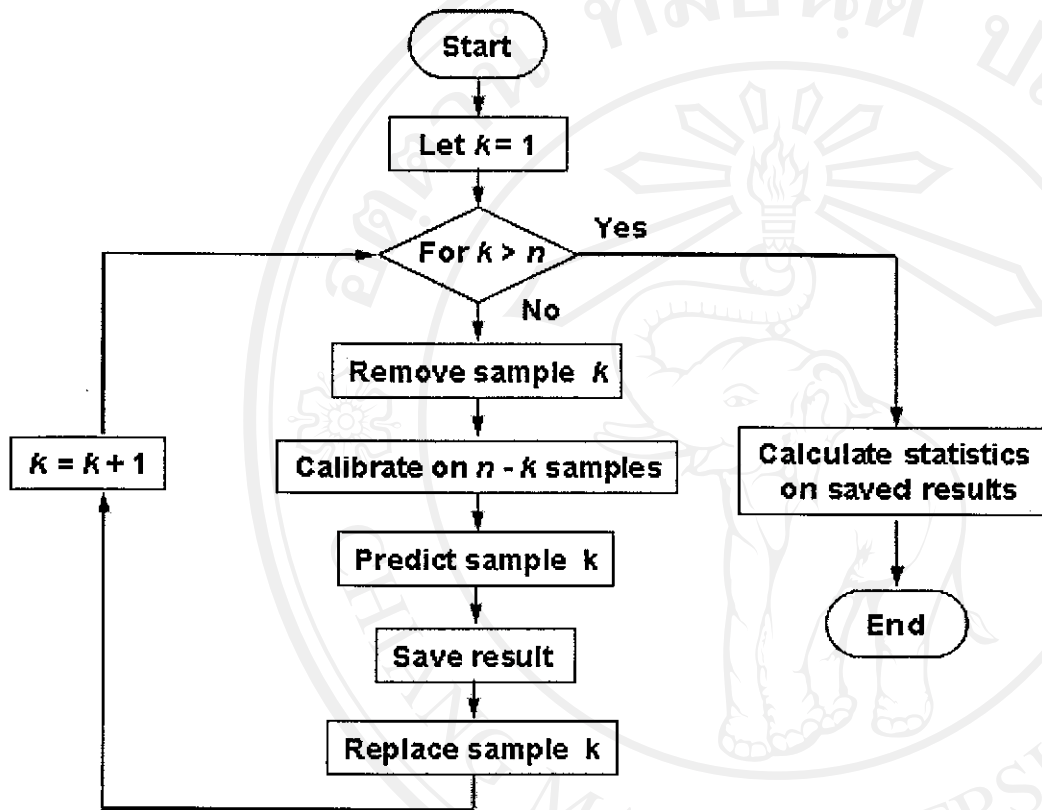
$$A = \begin{bmatrix} 3 & 0 \\ 8 & -1 \end{bmatrix}$$

Corresponding to the eigenvalue $\lambda = 3$ since

$$A\mathbf{x} = \begin{bmatrix} 3 & 0 \\ 8 & -1 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 6 \end{bmatrix} = 3\mathbf{x}$$

APPENDIX C

A CROSS-VALIDATION PROGRAM

CURRICULUM VITAE

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EDUCATION

2004-2005   Master of Science (Chemistry), Chiang Mai University

2000-2003   Bachelor of Science (Analytical Chemistry) 2nd honor, Chiang

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1997-1999   High School (Sci-math program), Yupparajwittayalai School,

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WORK EXPERIENCES

2004-2005   Undergraduate Teaching Assistant, Chiang Mai University

GRANTS/AWARDS

2004-2005 Partial support from The Postgraduate Education and Research in Chemistry Program (PERCH)

1997-2005 Full scholarship from The Development and Promotion of Science and Technology Talents Project of Thailand (DPST)

OTHER ACTIVITIES

October 2003 Participated in Let's Care Safety Camp, KU Home, Kasetsart University, Thailand

2002-2003 the President of Rotaract Club of Chiang Mai University, District 3360, Thailand

PRESENTATION

1. S. Kittiwachana, J. Jakmunee, S. Kradtap and K. Grudpan, Development of Flow Injection Analysis for Determination of Ethanol in Beverages, Oral Presentation, The 20th of The Development and Promotion of Science and Technology Talents Project of Thailand (DPST) Conference, 1-2 April 2004.

THE RELEVANCE OF THE RESEARCH WORK TO THAILAND

Nowadays, analytical chemistry is concerned in various fields such as agricultural, pharmaceutical, food and environmental. The developments of new analytical approaches with simplicity and cost effectiveness are needed for Thailand.

In this research work, some chemometrics techniques have been investigated. The studies show that they are the powerful and wonderful tools that can be used for interpreting the complicate sample data, reducing the steps and time of the experimental work as well as the cost of analysis. Applications to real samples have been demonstrated. This may be an alternative way to enhance the performance of analysis.