CHAPTER 1

Introduction

There are many problems in the world such as social sciences, engineering, economic and the physical science deal with equations relating two sets of variables that is $ax = b$ when b and x are variables and a is constant. Expressing b in terms of x, is called a linear equation. The word *linear* is used here because the graph of the equation $ax = b$ is a straight. Similarly, the equation

$$a_1x_1 + a_2x_2 + \cdots + a_nx_n = b \tag{1.1}$$

express b in terms of variables $x_1, x_2, ..., x_n$ and the known constants $a_1, a_2, ..., a_n, b$ is called linear equation.

A solution to a linear equation is a sequence of n number $s_1, s_2, ..., s_n$ which has the property that (1.1) is satisfied when $x_1 = s_1, x_2 = s_2, ..., x_n = s_n$ are substituted in $a_1x_1 + a_2x_2 + \cdots + a_nx_n = b$.

More generally, a system of n linear equations in n unknowns $x_1, x_2, ..., x_n$ or simply a linear system, is a set of n linear equations each in n unknowns. A linear system can be conveniently denoted by

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n &= b_1 \\ a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n &= b_2 \\ \vdots \qquad \vdots \qquad\quad \vdots \quad &\quad \vdots \\ a_{n1}x_1 + a_{n2}x_2 + \cdots + a_{nn}x_n &= b_n. \end{aligned} \tag{1.2}$$

A solution to a linear system is a sequence of n number $s_1, s_2, ..., s_n$ which has the property that (1.2) is satisfied when $x_1 = s_1, x_2 = s_2, ..., x_n = s_n$ are substituted in (1.2).

The system of linear equation (1.2) can be written in the matrix form as follows: $AX = B$ when

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1j} & \cdots & a_{1n} \\ \vdots & & \vdots & & \vdots \\ a_{i1} & \cdots & a_{ij} & \cdots & a_{in} \\ \vdots & & \vdots & & \vdots \\ a_{n1} & \cdots & a_{nj} & \cdots & a_{nn} \end{bmatrix}, \qquad X = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}, \quad B = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}.$$

There are several methods for solving system of linear equations such as Gaussian Elimination, Gauss-Jordan Elimination, using $X = A^{-1}B$, Cramer's rule and LU-Decomposition.

Determinant of matrix plays an important role for finding inverse of matrix and it can be used for finding a solution of linear equations such as the Cramer's rule.

In 2014, Jafree et al.[5] introduced algorithms for finding determinant of matrix by reducing the size of the matrix and inverse of matrix by constructing the dictionary of matrix. These algorithms can reduce a number of computations comparing with the old methods.

In this thesis, we modify the method introduced by Jafree et al.[5] for solving a system of linear equations and show that a new algorithm can be applied for solving a system of linear equations, and by using this method, it can reduce a number of computation when comparing with old methods.

This thesis consists of 3 chapters. Chapter I is an introduction. The basic concepts and preliminaries is in Chapter II. The main results of the thesis contains in Chapter III.