CHAPTER I
INTRODUCTION

1. Rationale and background

For a number of years, the classical Shannon/Nyquist theorem has been a method of sampling for almost signal processing principles. It has been proved that the signal does not lose significant information when sampling higher than twice its bandwidth for a band-limited signal.

There is now a recent sampling theorem that is more linear structure and possible to sample less than under Shannon/Nyquist rate, called *compressive sampling* (also known as *compressed sensing*). This compressive method could recover the reconstructed signal via the convenient linear ℓ_1-minimization which is normally to recover the fault signal because of the reconstruction probability of this optimization.

Accordingly, the iterative reweighted ℓ_1-minimization that is designed to enhance the reconstructed signal by updating the weights in the objective function after ℓ_1-minimization presents the closed-exact signal with higher probability. However, there are no the automatic and smart rules to construct the weights except using the experience of trails and errors which are common faults from human intervention.

In this research, we propose a new weighting function for associated algorithms which apply histogram analysis to specify the location of weighting values automatically for each signal. The numerical experiments illustrate that the efficiency of the proposed algorithms more than compensate for the former reweighted algorithm. Examples of applications using the proposed algorithms are demonstrated for 1-dimensional signals and MRI applications. This shows that compressive sampling concepts and the proposed methods can be applied to various types of signals.

2. Objectives of the study

2.1 To study the principles of compressive sampling and reconstruction algorithms.

2.2 To study the reweighted algorithm for compressive sampling recovery.

2.3 To enhance the weighting function of reweighted algorithm for compressive sampling recovery.

3. Scope and limitation of the study

To design the weighting function and the associated algorithms to construct the weights for reweighted algorithm.

4. Anticipated outcomes

To obtain an alternative weighting function of reweighted algorithm and its associated algorithm that can apply to compressive sampling recovery and applications.