**1. INTRODUCTION**

Since the last century several techniques were used for identification and recognition purposes. These techniques are: Iris, Face Recognition, Fingerprint, Voice Recognition, etc. And each of these techniques has number of applications.

Speech Recognition (SR), also known as Automatic Speech Recognition (ASR) or computer speech recognition, is the process of converting a speech signal to a sequence of words, by means of an algorithm implemented as a computer program [1], and it is used to distinguish the utterance that spoken by individuals, which is differ from Speaker Recognition that is used for distinguishing individuals by identifying them from their voices.

Speech recognition system is divided into two main stages, the first one is used to extract the features from the voice signal of a word, and the second stage is used for patterns classification. Features extracting is a very important process because it is the first step in the system and the recognition rate of the system depends on the data that extracted from the signal voice, so good features must extracted from the signal. Good features mean a big difference between the classes, and a more flexibility for the class itself because there is no 100% matching between the utterances of the same word even if they were from the same person.

The methods that are used to extract the features include, Linear Predictive Coding (LPC), Mel Frequency Cepstral Coefficients (MFCC), Spectrogram, Fast Fourier Transform (FFT)...etc., and for patterns classification, some algorithms are used for this purpose like Euclidean Squared Distance, Hidden Markov Model (HMM), vector quantization, or Artificial Neural Network (ANN). In this thesis, Isolated Words Speech Recognition system was developed, and three techniques were used for feature extraction. These techniques are LPC, MFCC, and Spectrogram. Each of these techniques was used alone, and each of them has results, they implemented on MATLAB program and they combined on one Graphical User Interface (GUI) as a popup menu and the user will choose the technique that he wants to recognize a word. The algorithm that was used for recognition is ANN, and the used network is forward propagation network. If there is matching between the trained word and the tested word, the word will be sounded and the spelling of this word will be written on the command window of MATLAB, but if there is no matching between them, a message box will appear to inform the user that there is no matching between the two words.

Many researches were made on speech recognition, and the different techniques and algorithms were used for this purpose. Mel Frequency Cepstral Coefficients (MFCC) and a vector quantization algorithm, Discrete Wavelet Transform (DWT) & Linear Predictive Coding (LPC), Hidden Markov Model and Linear Predictive Coding (LPC), Hidden Markov Model and Neural Networks, Fast Fourier Transform (FFT) and Fuzzy matching method, LPC and Euclidean Squared Distance, LPC and Artificial Neural Network (ANN).

In this thesis analysis of speech recognition techniques has been done. The speech recognition system using MFCC, LPC and Spectrogram has been developed. Thesis includes introduction, four chapters, conclusion, references and appendices.

Chapter 2 is devoted to the some applications of speech recognition. The chapter describes types of speech, then a brief on basic speech signal properties, and finally how speech is produced.

Chapter 3 describes the structure of a speech recognition system, and then feature extraction methods that used in this thesis were explained in details.

In Chapter 4 artificial neural networks that used in pattern matching was explained in brief, basics of ANN contains fundamentals of ANN, models of neuron, topologies and structures of ANN, Feed-Forward neural networks, and backpropagation algorithm had been described in this chapter.

Chapter 5 contains developed system of Isolated Words Speech Recognition that designed in this thesis based on three techniques (LPC, MFCC, and Spectrogram) for feature extraction and an ANN method for pattern matching, using MATLAB program. The system is designed using Graphical User Interface (GUI). The results that have been derived using word data sets have been presented. Based on Recognition Rate (R.R) the comparative analysis is given using the above given three methods.

Chapter 6 contains the conclusions that contain important results obtained from the thesis.

Finally, Chapter 7 contains the references that used in this thesis.

Appendices include listing of the program used in the thesis.