



## ANALYSIS OF LARYNX DISEASE USING DYNAMIC TIME WARPING ALGORITHM

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### ABSTRACT

It is well known that most Laryngeal Diseases cause changes in speech. The most dangerous disease is Larynx Cancer. The best method to prevent this is to diagnose in a non invasive method and treated in the early stages. Acoustic voice analysis is the best and non-invasive method for evaluation and detection of Laryngeal Diseases.

In this paper a wide variety of voice samples, including words, and sentences compiled from a set of people Who is effected with laryngeal diseases are collected. using multiple sound recordings of a single subject to find out the central tendency and dispersion metrics which improves generalization of the predictive model. Similarity between two voice samples is found using Dynamic Time wrapping algorithm. Chebyshev filter is used to extract the features of the voice and use SVM for the classification.

**Key words:** chebyshev filter, Dynamic Time Wrapping algorithm, Laryngeal diseases, SVM Classification

### 1. INTRODUCTION

The larynx is the voice box located at the top of the windpipe. The larynx is an organ in your throat at the front of your neck. This organ is about 2 inches (5 centimeters) wide, which is about the size of a lime. Voice box is the common name for Larynx. It has a vocal cords which is formed with two bands of muscle. The cartilage of the larynx is sometimes called the Adam's apple. The larynx has three main parts, the top part of the larynx is the supraglottis .The middle part is the glottis where the vocal cords are located. The bottom part is the sub glottis. It connects to the windpipe (trachea).Cancer of the larynx occurs most often in people above the age of 55 years. People who stop smoking can reduce their risk of cancer of the larynx. Painless hoarseness can be a symptom of cancer of the larynx[5]. The larynx can be examined with laryngoscope which is a type of a viewing tube. Treatment of cancer of the larynx depends on the

location and size of the tumor as well as the age and health of the patient. The common way of treating the cancer of the larynx is with radiation therapy or surgery. Chemotherapy is used for cancers that have spread

Dynamic Time Warping algorithm is used to measure the similarity between two sequences which may vary in terms of time or speed. Similarity of walking pattern can be detected when a person is walking slowly or even the same person is walking fast manner.

DTW can be applied to data which may be audio, video and graphics.DTW can be used to analyze any data that can be converted into linear representation.

It is well know that most laryngeal diseases cause changes in speech. Analyzing the voice of a person will help us to find whether the person is affected by laryngeal disease or not. There is no significant voice analysis method available for laryngeal disease. Diagnosis of the disease using the voice sample of the person is a cost effective and effective way. The diseases can be diagnosed from the remote location itself. The patient do not need to go a long distance for the diagnosis purpose.

### 2. METHODOLOGY

#### 2.1 Collection of Voice Data From The Patient

The first step of the process is collecting voice data from the patient. The patient may be from a remote location at that time to collect and store the data from a remote location. This paper use some simple English words as the testing sample. Since there are many uttering sound and gaps while we talk a long sentence or paragraph we are considering single words. This single words will increase the efficiency of the system by reducing the noise as well as reducing the time consumption. In order to increase the efficiency more record the same persons voice for more than five times so that it is easy to find out the average value of the voice features [3].

Collected voice samples are stored in a database for comparison and further analysis process. Some basic information about the patient is also collected along with the voice sample.

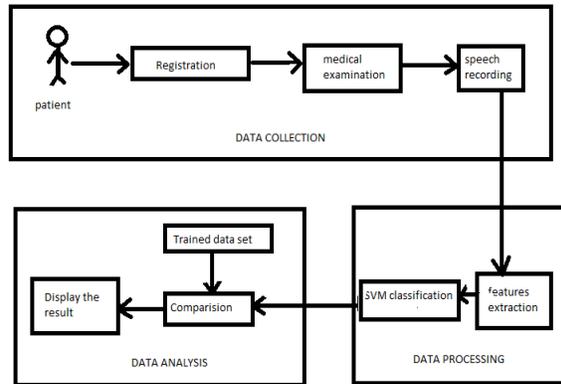


Figure 1: Architecture of collection and analysis of dataset for laryngeal diseases

## 2.2 Analyze The Data Using MATLAB

MATLAB is the software that is used in order to analyze the voice sample. There are several methods to find whether a person is affected by larynx disease or not but they are time consuming since the patient should wait in hospitals for a long time. There is a significant amount of change in a person's voice when he is effected by larynx disease.

The main features that change is his frequency and pitch range. Taking these two parameters into consideration it is easy to find out whether the person is effected by the disease or not. Since we are using voice sample as the testing parameter this can be done in remote method itself.

Chebyshev filtering method is used to extract the features of the input voice sample. Chebyshev type 2 or inverse filtering process is used for the extraction of pitch and frequency of the given voice sample[4]. The extracted features are compared with the voice sample that is already stored in the database.

Dynamic Time Wrapping algorithm is used in this module. This algorithm helps to find the similarity between two voice samples. The sequences are "warped" non-linearly in the time dimension to determine a measure of their similarity independent of certain non-linear variations in the time dimension. The time series classification often use sequence alignment method. DTW measures a distance-like quantity

between two given sequences, but it will not guarantee the triangle inequality to hold.

Dynamic Time Wrapping algorithm will help us increase the efficiency of the system by finding out whether the same persons voice is recorded as different voice sample as a mistake.

## 2.3 Preparation of Training Data Set

This is one of the important phase of this process. Store some model voice sample in a data base so that only it can compare the input voice data with this data. The filtered signal should be error free so that only it can easily compare the voice data with the training set data. The training data set will consist of disease effected persons voice. Storing more than one training set data will increase the efficiency of the system[2]. When there are more training data set time to produce the result will also high.

First select the voice sample to be tested from the database so that it can choose that data from the list of voice sample that is displayed on the screen which are directly accessed from the database. The chosen data sample should be now compared with a training set data which is probably the disease effected persons voice sample [1]. Store more than one data set in the data base as a training set data since that only can increase the efficiency of the system. When the amount of training set data is increased it will lead to the inefficiency of the system since the comparison process will take a long time. Same inefficiency problem will happen when a long sentence or paragraph as the training set data due to the high time consumption to extract the features.

As the input voice sample of the training set data also should be filtered and error free. It should extract the two features pitch and frequency as the input data set to easily do the comparison.

## 2.4 Comparison Of Voice Sample

In this part comparison of two voice sample which is the input voice sample and the training set data. SVM classification method is used to compare the two voice sample.

In machine learning, support vector machines are supervised learning models with associated learning algorithms that is used to analyze data and recognize the patterns, used for classification and regression analysis [6]. Taking a set of input data and predicts, for each input, which of two possible classes forms the output, making it a non-probabilistic binary linear classifier is the basic SVM. A set of training examples, each marked as belonging to one of two categories, an SVM training

algorithm builds a model that assigns this into one category or the other.

When the frequency and pitch of the voice sample given as the input and the training set data is similar then person is effected by laryngeal diseases .When they are similar the system will produce a message which shows that the person is effected by laryngeal disease otherwise it will display message box which says that the person is not effected by the disease.

### 3. IMPLEMENTATION

First, store the voice sample of a person to whom to be tested. The voice sample that is chosen should be a single word in order to avoid the gap and uttering sounds that may produce while recording a paragraph or long sentence.

Second, filter the input voice sample in order to extract the features of the input voice sample. Features using here to analyse are pitch and frequency which is the key features to analyse the disease of the person.Chebyshev filter is used for the filtering process Chebyshev 2 or inverse chebyshev filter is used in this filtering method

Third, store a training set data which should be a disease affected voice and the one used to compare In order to get maximum efficiency compare the input signal with more than one training set data.SVM classification is used in order to compare the input signal and the training data set.

If the input signal frequency and pitch matches with the training data set means it display a message which shows that the person is affected by the voice signal if not means it shows a message which says that the person is not affected by the disease.

### 4. CONCLUSION

Voice dataset can be used as an important parameter for the analysis to find out whether the person is effected by the disease or not. Pitch and frequency are the two important parameters that is used for the comparision.Since it require only the voice sample of the person this testing can be done in remote method.

The voice sample chosen should be a small word in order to increase the efficiency of the system. When a paragraph or a sentence is used there will be lot of uttering sounds and gaps that will increase the rate of noise. Chebyshev filter is used to filter the features such as frequency and pitch. There should be a training data set to compare the input data. The training data set

should be a disease effected persons voice sample. In order to increase the efficiency of the system use more than one voice sample in the training data set.

### 5. FUTURE ENHANCEMENTS

In the future, we plan to examine the areas that were not fully discussed in this project. We are planning to include the other features of the voice sample rather than the pitch and frequency so that the system performance can be increased further.

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