ORIGINAL ARTICLE

Identification of Drug-addicted People Using Short Length of Voice Signal Through Haar and Symlet Wavelet Transform

Abstract

Recognizing and classifying signals is one of the most significant tasks nowadays. For an uncountable number of purposes, classification, pattern recognition, data pre-processing, and prediction science are used worldwide. In this work, our objective is to understand, analyze, visualize, recognize, and identify drug-addicted and non-addicted people by using their short length of voice signals through Haar and Symlet (Sym2) wavelet transform. Here, we used signals of speech at a considerable length to achieve our goal and provide opportunities for the law-and-order enforcing authority and the people who are interested in this area. We visualize each signal and analyze them using different wavelet transform to understand the similarities and dissimilarities between the voice signals. After wavelet transform, we calculate the PSNR and SNR values of the voice signals using MATLAB wavelet toolbox and try to make a decision to identifying a Drug-addicted people.

Keywords: Drug-addicted people detection, Wavelet Transform, Power spectrum, Signal to Noise Ratio (SNR), Peak Signal to Noise Ratio (PSNR)

Introduction

Now a days, drugs are a vibrant issue for the whole world. Drug addiction is an illness that affects a person. Any legal or illicit substance might cause a people to become fascinated with it. Certain drugs can lead to addiction in certain people. When an individual continuing to take the substance despite the harm it produces, addiction develops gradually. Alcohol, and marijuana are two of the most often abused narcotics in today's society. According to the Journal of Family Medicine and Primary Care, 2019 (V. M. Anantha Eashwar, 2019) alcohol consumption was responsible for 50% of deaths from liver cirrhosis, 30% of deaths from oral and pharyngeal cancers, 22% of deaths from interpersonal violence, 22% of deaths from suicide, 15% of deaths from traffic injuries, 12% of deaths from tuberculosis, and 12% of deaths from liver cancer worldwide. According to the WHO, there are 2 billion alcoholics, 1.3 billion smokers, and 185 million illegal drug users in the globe (Ming D. Li, 2010). Currently, 80 percent of tobacco users live in low- and middle-income countries (LMICs) (Maxwell Oluwole Akanbi, 2018), and by 2030, LMICs are expected to account for 80 percent of tobacco-related fatalities (Samuel Asare, 2019). Smoking and alcohol usage are responsible for 20% of tuberculosis (TB) cases globally, in India accounting for 27% of the world's TB patients in 2017 (Beena Elizabeth Thomas, 2019). In Australia, about 6,000 individuals die each year from alcohol-related disorders, with "drunk and drive" instances accounting for 30% of fatal automobile accidents (Mohiuddin, 2019). The largest incidence of alcohol use disorder (7.5%) is found in Europe, whereas the lowest is found in the East Mediterranean Regions, which include Afghanistan, Bahrain, and Egypt (V. M. Anantha Eashwar, 2019). Drug misuse is increasingly rampant everywhere: in the

home, on the streets, at work, in parks, slums, marketplaces, and even in rural and urban educational institutions. This issue has a significant impact on almost every aspect of society (Mohiuddin, 2019).
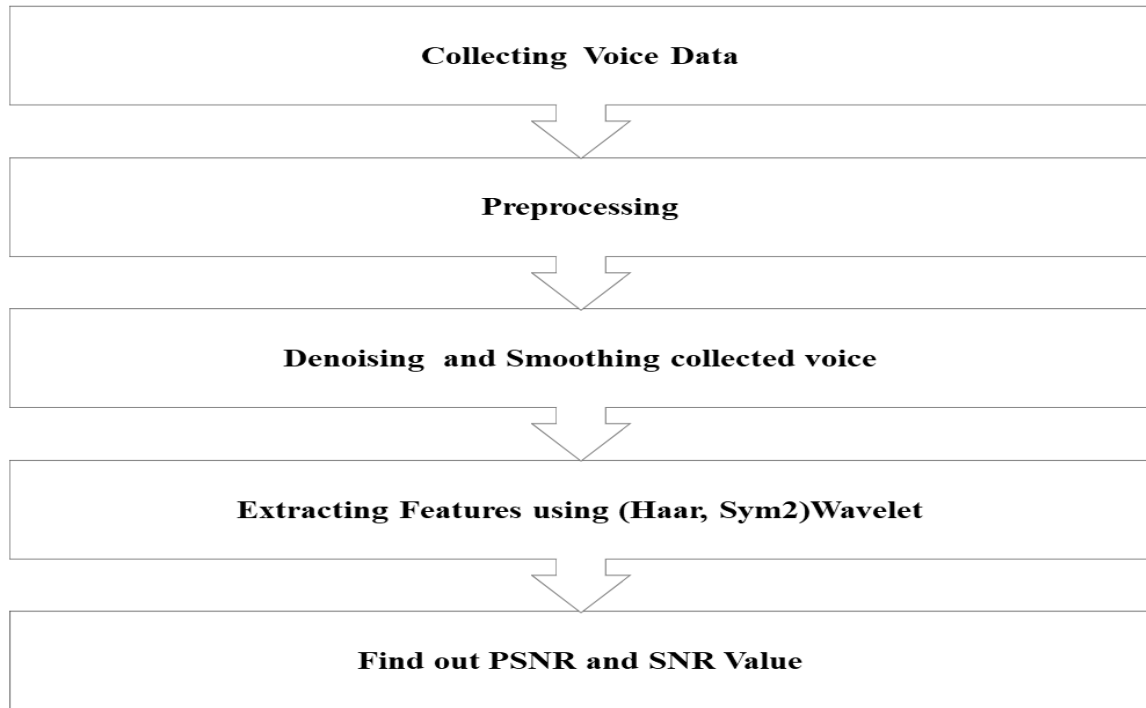
To identification of Drug-addicted people is very essential in many aspect. There are many types of test system are available in the world such as Urine drug tests, DOT drug tests, Hair drug tests, Alcohol tests (Health Street, 2022) etc. For developing and under developing countries addicted people is a major issue. Most of the country Dope tests is using for identifying drug addicted people. All the testing process are time consuming and costly. In our research we are trying to identify the addicted people fast and foremost. We assumed that if an individual continue to take drug it affects on his voice. In our research we used voice signal to identifying drug addicted people.

In this work only on two different types of drugs, which are alcohol and marijuana. Many governments all over the world permit alcohol and marijuana consumption with limitations. If anyone takes over the limit, then it is a high risk for health and also breaks down the government rules. Then it's considered an offense. For numerous grown-ups, drinking small quantities of alcohol doesn't effect serious health problems. Women who drink no further than 1 drink a day (and not further than 7 drinks per week) and men who drink no further than 2 drinks a day (and not further than 14 drinks per week) are at low threat for developing problems with alcohol use (Limit Alcohol, 2022). Grown-ups 21 or aged can fairly retain up to 28.5 grams of marijuana, as well as over to 8 grams of cannabis concentrate. However, the answer is yes, If you're wondering if you can fairly grow marijuana in California. They can have up to six live marijuana shops. Grown-ups between the periods of 18 and 20 times old can fairly buy and retain up to 8 ounces of marijuana and 12 live shops if they have a medical marijuana license attained through a croaker's recommendation (Lessem, 2020).

Wavelets are mathematical functions that divide data into multiple frequency components and analyze each component with a resolution equal to its scale. A wavelet transform is a representation of a function using wavelets. A wavelet is a mathematical function that separates a continuous-time signal or function into discrete scale components in more technical terms. A frequency range is commonly allocated to each scale component. Then, at a resolution that corresponds to its scale, each scale component may be studied. The wavelet will resonate if the unknown signal contains information of a same frequency, similar to how a tuning fork physically resonates with sound waves of the same frequency. The concept of resonance is used in many practical applications of wavelet theory. The use of wavelet methods for processing one-dimensional and two-dimensional data is highlighted in contemporary wavelet signal processing research. In 1-D wavelet signal processing, acoustic, voice, music, and electrical transient signals are common. Noise reduction, signature identification, target detection, signal and picture compression, and interference suppression are all part of 2-D wavelet signal processing (Islam, 2011).

Methodology

For this research, we are using the voices of those people who have taken over the legal limit of alcohol, marijuana, or both more than 25 years. The individual people's voice data is collected from YouTube and converted to audio mp3 format. We take 16 non-addicted people's voices and 16 addicted people's voices. We take only five seconds of each voice's speech. Then we process the raw data using denoising and smoothing the collected voice data, we transform it through Haar and Sym2 wavelet. We analyze the power spectrum of the transformation. Then calculate the PSNR and SNR values using MATLAB toolbox. The summary of the methodology in block diagram:

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┌─────────────────────────────────────────────────┐
│            Collecting  Voice Data                │
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                        ⇓
┌─────────────────────────────────────────────────┐
│                 Preprocessing                    │
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                        ⇓
┌─────────────────────────────────────────────────┐
│       Denoising  and Smoothing collected voice   │
└─────────────────────────────────────────────────┘
                        ⇓
┌─────────────────────────────────────────────────┐
│   Extracting Features using (Haar, Sym2)Wavelet  │
└─────────────────────────────────────────────────┘
                        ⇓
┌─────────────────────────────────────────────────┐
│          Find out PSNR and SNR Value             │
└─────────────────────────────────────────────────┘
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Result and Discussion

The result discussion part we divide it into two parts:

a) Using power spectrum graph, b) Using PSNR and SNR values.

a) Using power spectrum graph

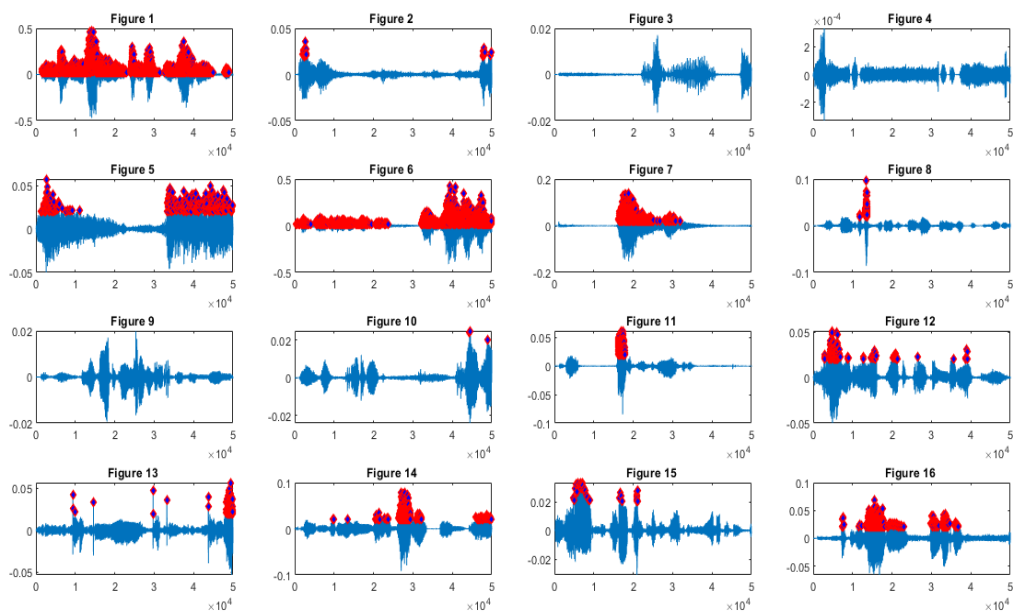 **i) Power spectrum graph of addicted people's voice:**

Haar Wavelet:

Fig-1: Power spectrum graph using Haar wavelet at level 2
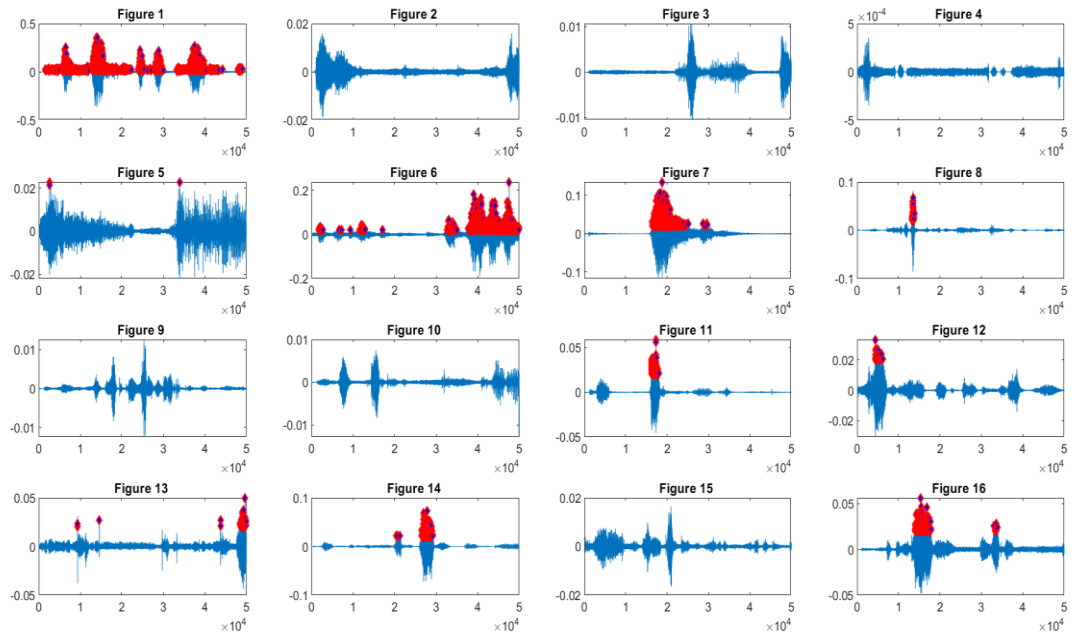
Sym2 Wavelet:

Fig-2: Power spectrum graph using sym2 wavelet at level 2

ii) Power spectrum graph of non-addicted people's voice:
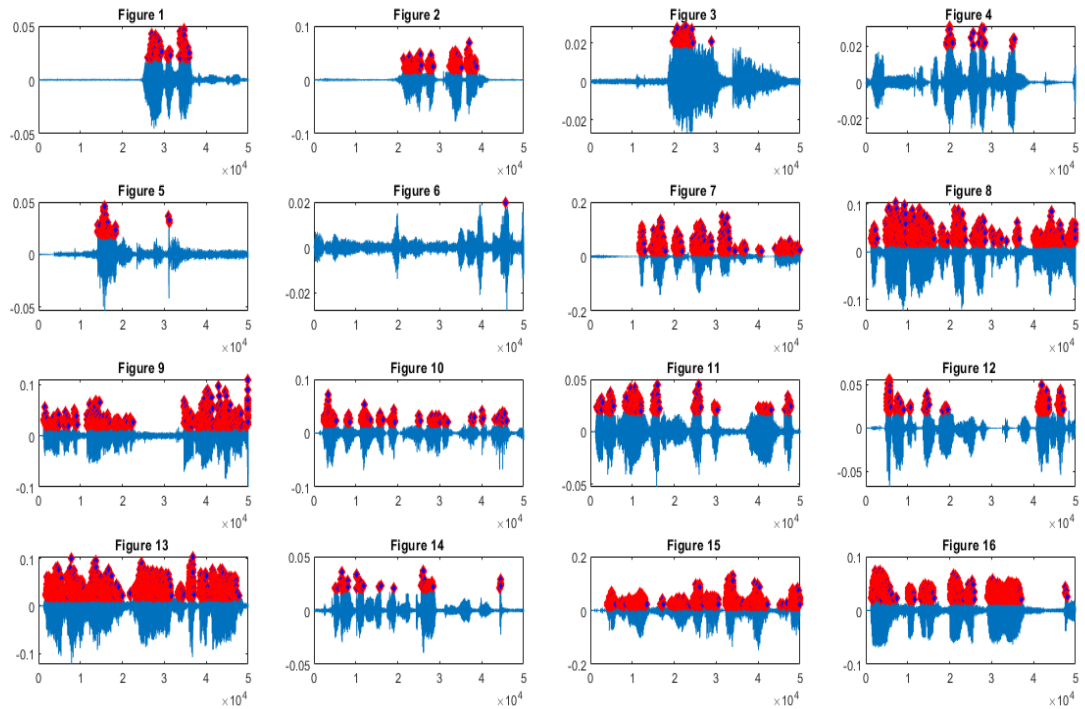
Haar Wavelet:

Fig-3: Power spectrum graph using Haar wavelet at level 2
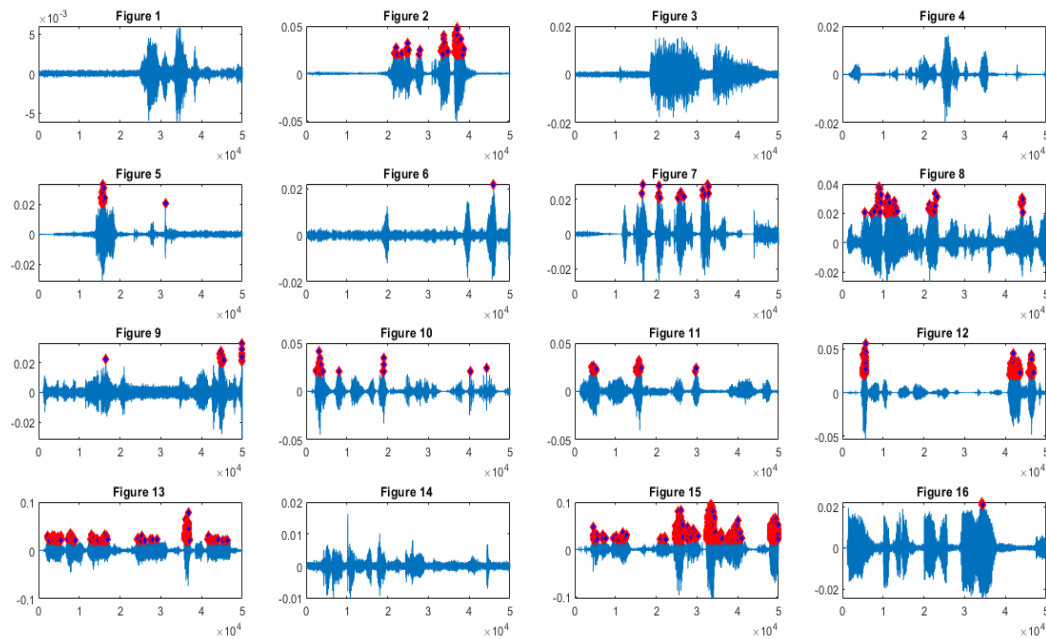
Sym2 Wavelet:

Fig-4: Power spectrum graph using sym2 wavelet at level 2

From Fig.1-4, x-axis and y-axis are represent respectively frequency (Hz) and power spectrum (dB). For the same frequency of both cases, we see that non-addicted people's power spectrum has a symmetric limit corresponding to each other, but addicted people's power spectrum has no symmetric limit corresponding to each other. For addicted people, the width of the frequency is relatively small at the point where the highest peak points (which is denoted as the red color) of the coefficient are found, but for non-addicted people, the frequency is much wider and the maximum peak point density is much higher. In comparing Haar and sym2 wavelet, Haar wavelet is given better result.

b) Use of Calculating Peak Signal to Noise Ratio (PSNR) and Signal to Noise Ratio (SNR) values

Table

Name of Wavelet	people	PSNR Value	SNR Value
Haar	Addicted	36.60-37.10	25.20-26.30
	Non-addicted	34.70-35.20	21.40-22.30
Sym2	Addicted	34.50-35.90	22.30-23.70
	Non-addicted	32.25-33.90	19.10-20.80

From the Table,

i) in case of PSNR values by using Sym2 wavelet are lower than Haar wavelet for non-addicted people.

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So, for identification of addicted people by using PSNR values it is better to use Sym2 wavelet than Haar wavelet.

ii) in case of SNR values by using Haar wavelet are higher than Sym2 wavelet for non-addicted people.

So, for identification of addicted people by using SNR values it is better to use Haar wavelet than Sym2 wavelet.

Conclusion

Nowadays identify drug-addicted people by the dope test which is very expensive and time-consuming process. To identify the addicted people fast and foremost our proposed technique is eraser than any other technique.

Limitation

- ➢ Only worked with male voices
- ➢ 16 drugs-addicted and 16 non-addicted people's voices are used in the research
- ➢ People must speak under normal circumstances
- ➢ There is an obligation to take the voice in English

Future Works

The following ideas can be recommended for future research:

- ➢ If possible, work with women's voices
- ➢ If possible, try to take other language speech

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