1. INTRODUCTION

Sound classification and sound processing are two of the most basic and essential areas in mechanics. The popularity of voice analysis is increasing, especially considering the size and diversity of data collected with the development of the internet and information systems. The presence of mobile phones is visible to almost everyone, showing that voice and video recording has become more accessible. With the increasing interest in sound analysis over the years, its use has become widespread in many different fields such as disease recognition (Badem, 2019), warning recognition (Çalik et al., 2015), vehicle recognition (George et al., 2013) event recognition (Mesaros, Heittola & Virtanen, 2016), gun recognition (Khan, Divakaran & Sawhney, 2009). In general, sound analysis consists of collecting a data set, establishing a classification process, separating the data set into training and test, extracting features, selecting features, representing the selected features for the classifier, applying the classifier algorithm, and evaluating the performance of the classifier model. One of the essential elements in sound classification is the removal of features (Liang & Nartimo, 1998). As a result of changing the methods used, sound classification success can be improved. Many different methods such as SVM (Wang et al., 2006), kNN (Chen et al., 2015), multilayer perceptron (Gupta, et al., 2007), random forest (Togneri, Sohel & Huang, 2017), decision tree (Romero, Luque & Carrasco, 2017) are used in sound classification.

2. CONTRIBUTIONS

When building seafaring vessels, one of the most essential issues is ensuring that the vessel makes as low a noise as possible. This is because ship detection is one of the crucial methods for safety. This importance is better understood when we consider that submarines try to recognize other vehicles only from the sound they make. Although the engine characteristics of each of the watercraft differ, there are efforts to reduce the noise made by the engines. Failure of these engines to meet specific noise standards can cause adverse effects on marine organisms and may produce underwater acoustic radiation that can damage the marine ecological balance (Williams et al., 2015; Farcas, Thompson & Merchant, 2016). Each ship has its own characteristic sound and it can be quite challenging to distinguish these sounds by the human ear. By using the unique sounds/noise of the ship, the ship detection model can be created and these sounds can be utilized as identification data of the ships like biometrics. In addition, knowing the usual typical sound of the ship can alert engineers to the existence of a possible malfunction if an unusual sound is heard. Overall, our main contributions to this field are:

· There are many vehicles which are used on a daily basis, and these vehicles must be identified in some way. The two most used identification methods are image processing and signal processing. Sound processing is one of the signal processing methods, and it is especially valuable for use on ships. We collected a ship sounds dataset to create a testbed for vehicle sound identification and classification.

· LBP is one of the most frequently used feature generators for images, but the 1D-BP has not been as widely used as LBP, though it has variable merits for signal processing. Therefore, a high accurate ship detection method is presented using 1D-BP feature generator.

3. DATASET

Sounds made by different types of ships were downloaded onto YouTube using videos that are open to everyone. These files obtained on different dates were downloaded, and sections were produced for 2 seconds for each ship type. In this way, a total of 1025 files were obtained. Firstly, each audio file was converted to a wav file format. And then, the sounds were carefully listened to in order to ensure that there were no different sounds or noises within the file. It was carefully checked to ensure that the same sound did not repeatedly continue during the fragmentation of the audio files. The WavePad Sound Editor program was used for all these processes. The audio files are stored at https://websiteyonetimi.ahievran.edu.tr/_Dosyalar/Genel/5aa50bab-f769-4aad-bca4-9a160cae898b-b265eb3e-d962-46ee-998b-e28ebf8894ed.rar for use by other researchers. In Table 1 below, the details of the number of sounds formed are listed.