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Efficient Recognition and Improving the Performance of Automatically Classifying Audio Recordings of Bird Sound Using Machine Learning Techniques

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Abstract – As an area of interest in ecology is monitoring animal populations to better understand their behaviour, biodiversity and population dynamics. Acoustically active birds can be automatically based on their sounds and a particularly useful ecological indicator is the bird, as it responds quickly to changes in its environment. This can be done by using the method that is only for purely audio-based bird species recognition through the application of support vector machines. The deep residual neural network that has to be trained on one of the largest bird song data set in the world so as to classify bird species based on their song or sound. The existing systems on this subject has various disadvantages in term of cost, efficiency or the maintenance of their records or the data collected for the longer period of time. The proposed technique is followed by extracting cepstral features on mel scale of each audio recording from the collected standard database. Extracted mel frequency of cepstral coefficients formed a feature matrix. This feature matrix is then trained and tested for efficient recognition of audio events from audio test signals. Once the bird species is identified then it is even possible to get few features regarding that bird using this system.

1. INTRODUCTION

There are around nine thousand bird species in the entire world. Monitoring the birds by their sound is important for many, its environmental and scientific purposes. Identifying bird species based on their chirping sounds in audio recordings is an important task in wildlife monitoring of birds for which the annotation is time consuming if done manually. We also come to know the population of the species of the birds that are going to be extinct. Acoustically active animals can be automatically based on their sounds a particularly it's useful ecological indicator is the bird, as it responds quickly to changes in its environment. Automatic identification of bird species based on the chirping sounds was experimented using feature extraction method and classification based on support vector machines (SVMs). The proposed technique has followed the extraction of cepstral features on mel scale of each audio recording that are from the collected standard database. Extracted mel frequency cepstral coefficients (MFCCs) formed a feature matrix. This feature matrix was then trained and tested it for efficient recognition of audio events from audio test signals. Reliable systems that would allow large-scale bird species recognition from its audio recordings could become a very valuable tool for many researchers and governmental agencies interested in ecosystem monitoring and biodiversity preservation. Over the years, there have been numerous efforts to develop and evaluate the methods of automatic bird species recognition based on auditory data unfortunately, with over 10000 bird species in the worldwide, most experiments and competitions has seemed to be rather limited when compared to the real-world problems. Therefore, the goal of this system is to verify that whether an approach utilizing deep convolutional neural networks for identification could be suitable for audio analyzing audio recordings of birds.

2. METHODOLOGY USED

The main steps that the system will undergo is shown in the Fig.1 Scheme used in Identification of Bird Species. A user records the chirping or sound of the bird, then the recorded audio of the bird is stored in a database or any storage. In the later stages feature extraction of the audio and the creation of the feature matrix is done. The feature matrix is trained to form the class models, then the datarecorded is compared with the dataset to identify the bird. Once the input match is found with the data set then the user will be given with the bird species name along with its few features or information through web app.

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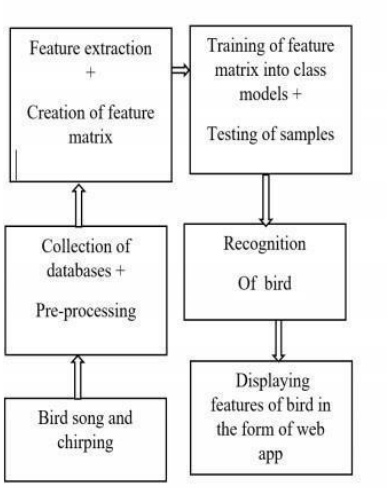

Fig.1. Scheme used in Identification of Bird Species

A. Bird Song and Chirping

Main input for this systemis sound of the birds or its chirping. Initially different bird sounds are collected and stored. This sounds are later sent for pre-processing.

B. Collection of Databases and Pre-Processing

Noise reduction techniques need to be used to remove from signal some unwanted noise components like rain, wind etc.

C. Extraction of Features and Creation of Feature Matrix

Extracting the features are foremost used features used to describe the spectrum of an sound recording in very compact yet informative manner.

D. Training of the Feature Matrix into Class Model and Testing of Samples

A feature is an private measurable property or characteristic of a phenomenon being observed. Feature extraction that starts from an initial setof measured dataandbuilds features intended to be informative and non-redundant, facilitating the next learning and generalization steps, and in some cases resulting in better human interpretations. In later stages testing of samples is completed.

E. Recognition of Bird

After pre-processing and classification of the bird sound recorded it is compared with the data set. If dataset contains the input, then match is found else not found. Once the bird sound match is found with the dataset, details are shown to user through a web application.

3. RESULT AND DISCUSSION

Acoustically active animals can be automatically based on their sounds a particularly it's useful ecological indicator is the bird, as it responds quickly to changes in its environment. Automatic identification of bird species based on the chirping sounds was experimented using feature extraction method and classification based on support vector machines (SVMs). The proposed technique has followed the extraction of cepstral features on mel scale of each audio recording that are from the collected standard database. Extracted mel frequency cepstral coefficients (MFCCs) formed a feature matrix. This feature matrix was then trained and tested it for efficient recognition of audio events from audio test signals. Reliable systems that would allow large-scale bird species recognition from its audio recordings could become a very valuable tool for many researchers and governmental agencies interested in ecosystem monitoring and biodiversity preservation. Over the years, there have been numerous efforts to develop and evaluate the methods of automatic bird species recognition based on auditory data unfortunately, with over 10000 bird species in the worldwide, most experiments and competitions has seemed to be rather limited when compared to the real-world problems.

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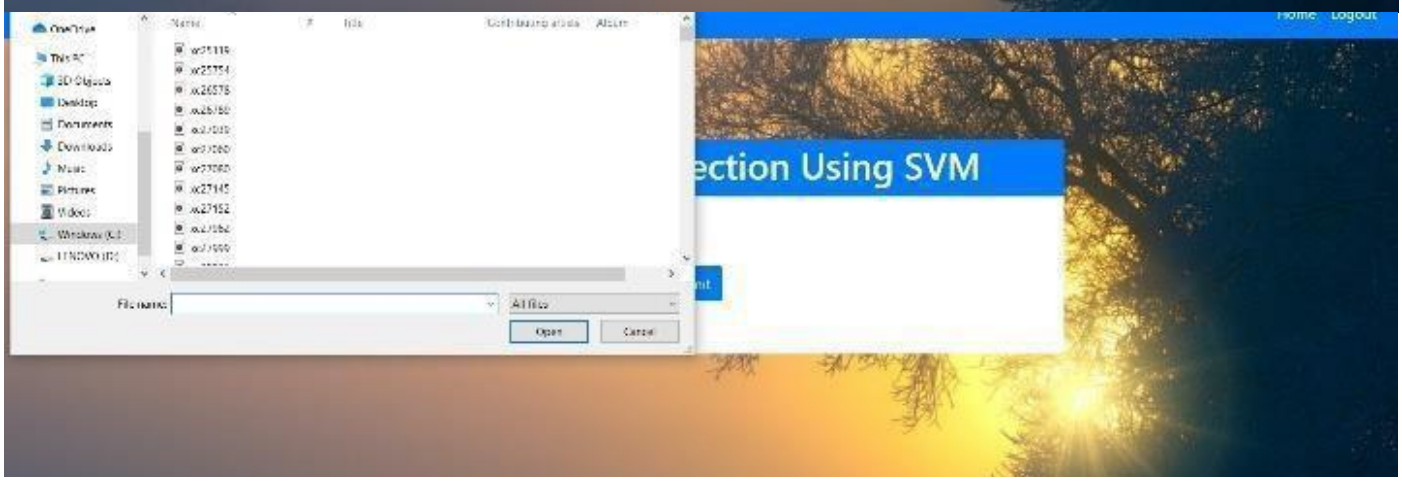

4. CONCLUSION AND FUTURE WORK

In this system we have presented a method of automatically classifying audio recordings of bird sound. We have used machine learning techniques and the number of recordings of bird sound for improving the performance of the identification tasks.

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In future, we can improve this system by adding more bird audio data to existing dataset to identify more number of birds. System accuracy can be improved by adding more audio files for each existing bird category. We can develop an Android/IOS application to upload bird song and to get result.

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