Detection of Birds Chirping Using Machine Learning

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***ABSTRACT*-*Human era can perceive all the sounds and differentiating them from their source. But many times, it is difficult to recognize the types of a source. The chirping of birds is one such audio sound existing in our natural surroundings which is not easy to differentiate and hence a software-based product will help to overcome this limitation of human era. Research on different kind’s Eco environmental sounds will be beneficial in the study of the wildlife and their evolution with time. Based on such research, development of an automatic system for bird species identification from their sounds made in field conditions could be very useful. Wild birds are the spirit of nature, knowing wild birds and protecting them is a very important task of the education for*** environment ***and biodiversity. Identified bird by its voice is important for scientific and technological activities.***

**I.INTRODUCTION**

There are around nine thousand bird species in the world. Monitoring the birds by their sound is important for many environmental and scientific purposes. Identifying bird species based on their sound in audio recordings is an important task in wildlife monitoring 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. Reliable systems that would allow large-scale bird spices

recognition from audio recordings could become a very valuable tool for researchers and governmental agencies interested in ecosystem monitoring and biodiversity preservation. Over the years, there have been numerous efforts to develop and evaluate methods of automatic bird species recognition based on auditory data. Unfortunately, with over 10000 bird species worldwide, most experiments and competitions seemed rather limited when compared to the real-world problems. Therefore, the goal of this system is to verify whether an approach utilizing deep convolution neural networks for identification could be suitable for audio analysing audio recordings of birds.

The main work of this project is to develop a methodology for the system that could automatically recognize bird species or even individual birds by their sounds. It becomes easy for a common man or bird watchers to easily recognize the bird. Once the bird name is identified then one might feel like knowing few features of that identified bird. So, opening an application or a search engine might seem a time-consuming process, thus this system will help the users to get few information or features of that identified bird using a web application.

* 1. **PURPOSE**

Automatic identification of bird species based on the chirping sounds of birds was experimented using feature extraction method and classification based on support vector machines (SVMs). The proposed technique followed the extraction of each audio recording from the collected standard database. System should be trained and tested for efficient recognition of audio events from audio test signals.

So, the main purpose of developing this system is that

•It would help in identifying the birds from their sound.

•It would help in getting few main features of that bird.

**1.2 PROBLEM STATEMENT**

The main aim of this system is to help in identifying the birds based on their sound or songs using the concept of Machine Learning

Identifying bird manually based on their sound seemed to be a difficult task and time consuming. More human resources were required to do this task and it was not efficient. Therefore, this proposed system helps user to identify birds with less time and is efficient.

**1.3 SCOPE**

Machine learning for bioacoustics is an emerging ﬁeld of research. The recent depletion in animal species has mandated the need to preserve ecosystem biodiversity. An effective tool of tracking animals and understanding biodiversity using sensors such as microphones, which leads to data in audio signal form. Bird identiﬁcation is a standard problem to ornithologists that, over the years, have produced a detailed taxonomy of bird species.

In recent years the recognition of birds in the ﬁeld can be made indirectly from its audio recorded songs, using intelligent recording devices. This is an interesting form to monitor the bird fauna of a region, nowadays a well-established way to measure the quality of our living environment.

Recognition of voice other than birds will be difficult as we are training this system for purpose of serving clients with clarity issues of bird species. There are possibilities in degradation of the performance if massive data sets will be used. If the inputs collide with each other than this system fails to provide the actual output.

**1.4 OBJECTIVE**

The objective of this project is

•To reduce the need of volunteers in biological project.

•To help bird watchers in identifying birds.

•To identify and count birds in a specific area.

•To estimate long-term population trends.

## II.LITREATURE SURVEY

The songs of the birds have vocalizations which are usually very long and they have many kinds of notes which are in sequence. The most commonly used technique for bird sound processing is energy-based time-domain approach which is reliable for single bird’s samples with low noise. In the case of multiple bird’s sounds in noisy environments, two-dimensional time–frequency-based segmentation is used. The most widely used features to describe bird’s sounds are linear predictive coefficients (LPC) and Mel-frequency cepstral coefficients (MFCCs) which are also prevalent in other areas of signal processing. These are few references of many papers in recent years which have addressed the fundamental problem of automatic bird species identification (ABSI) using signal processing and machine learning techniques and techniques adapted to find solution.

Bird Species Recognition Using Unsupervised Modelling of Individual Vocalization Elements” has investigated acoustic modelling for recognition of bird species from audio field recordings. First, the acoustic scene is decomposed into isolated segments, corresponding to detected sinusoids. Each segment is represented by a sequence of the frequency and normalized magnitude values of the sinusoid. The temporal evolution of these features is modelled using hidden Markov models (HMMs).

**SUMMARY OF LITERATURE SURVEY:**

Table 1. Analysis Table for Detection of bird species

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl. No | Title | Existing System | Methodology/Algorithm | Drawback |
|  1 | UnsupervisedModeling of Individual Vocalization Elements | audio field recordings | (HMMs). | individual birdrequires more time to train the system |
| 2 | Conv-Codes: Audio hashing for bird species classification | Propose a supervised, convex representational based audio hashing framework for bird species classiﬁcation. The proposed framework utilizes archetypal analysis, a matrixfactorization technique. | Archetypal analysis, a matrix factorization technique | System need more time forclassification |
| 3 | Spectrogram Segmentation for Bird Species Classification based on Temporal Continuity | Presents an enhanced approach for bird species classification from their recorded audio signals. | Gray Level Co-occurrence Matrix (GLCM) | The present technique still involves thresholds, which is alwaysUndesirable in signal processingtechniques. |
| 4 | Bird Species Recognition based on SVM Classifier and Decision Tree | A new feature which is the ratio between the distance of the eye to the root of beak and the distance of the width of the beak is used to distinguish the different birdSpecies | Multi-Scale Decision Tree and SVM Framework | There is a problem of erroraccumulation in decision tree. |
| 5 | Simultaneous Segmentation and Classification of Bird Song Using CNN | Methods proposed for bird syllable segmentation in are mainly unsupervised. The boundary of each bird syllable is determined by analyzing signal information such as frequency,energy and amplitude | CNN | It will not take into account the temporal relation between bird syllables |
| 6 | Fine-Grained Bird Species Recognition Via Hierarchical Subset Learning | Proposes an expert local classiﬁer with strong discriminative power to distinguish visually similar classes to learn for each subset | hierarchical subset classiﬁcation | Has gap between the performance of the automatic system and the performance of the ground truthsystem. |
| 8 | HierarchicalClassiﬁcation of Bird | Address the task of hierarchicalbird species identiﬁcation from | Global ModelNaive Bayes | GMNBperformance |
| 9 | Wavelet TransformDigital Sound Processing to Identify Wild Bird Species | One such better approach as applied to wild bird species is presented. Feature extraction is done by first performing wavelettransform on sampled bird sounds | WAVELET TRANSFORMtechnique | recognition rate is not good |
| 10 | Compressed Convex Spectral Embedding for Bird species Classification | This system focuses on the problem of bird species identiﬁcation using audio recordings. System propose a multi-layer alternating sparse- dense framework for bird speciesidentiﬁcation | convex-sparse representations and compressed convex spectral embedding’s(CCSE) | Classiﬁcation on a large- scale data set results in low efficiency. |

## III.SYSTEM REQUIREMENTS SPECIFICATION

Human era can perceive all the sounds and differentiating them from their source. But many times, it is difficult to recognize the types of a source. The chirping of birds is one such audio sound existing in our natural surroundings which is not easy to differentiate and hence a software-based product will help

to overcome this limitation of human era.

Research on different kind’s Eco environmental sounds will be beneficial in the study of the wildlife and their evolution with time. Based on such research, development of an automatic system for bird species identification from their sounds made in field conditions could be very useful.

Wild birds are the spirit of nature, knowing wild birds and protecting them is a very important task of the education for environment and biodiversity. Identified bird by its voice is important for scientific and technological

activities.

**3.1 DEFINITIONS, ABBREVIATIONS AND ACRONYM**

* SVM: Support Vector Machine
* IDE: Integrated development Environment
* Xml: Extensible Mark-up Language
* JS: JavaScript
* ML: Machine Learning
* DBMS: Database Management

 System

**3.2 PRODUCT FUNCTIONS**

The main function of this project is

* Users will be able to provide the feedback regarding the system after determining the bird species. Users are provided with the facility of knowing more information about the identified bird species.
* To provide information regarding the birds by using the voice signals.

**3.3 DESIGN & IMPLEMENTATION CONSTRAINTS**

System has following design and implementation Constraints System should allow the user to get information about various bird’s species. User need to register them self to use our system. Administrator of the system will add, delete and update bird dataset. Administrator of the system is responsible for managing the system.

Software development life cycle Here agile method is used which combines the advantages of waterfall approach and iterative model

**V.DESIGN**

Architectural design is a concept that focuses on components or elements of a structure and unifies them into a coherent and functional whole,

according to a particular approach in achieving

the objective(s) under the given constraints

or limitations.

**V.1 PRE-PROCESSING**

**FEATURE EXTRACTION AND**

**CLASSIFICATION**

 Create Feature Matrix

Feature extraction using CNN

 Figure 1 Steps in Feature Extraction.

Test Samples using SVM

Training feature matrix into class models

 Figure 2. Steps in classification.

**VI.RESULTS AND DISCUSSION**

Figure 3. Login page for the user.



 Figure 4. Bird species determination page.

**VII. CONCLUSION:**

We have presented a method of automatically classifying the bird species by using the real time recordings of bird sound. We have used machine learning techniques and the numerous recordings of bird sound for improving the performance of the identification tasks, which help the user to identify the bird features through the web application.

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