

Advanced Prediction System to avoid Harmfulness from Poisonous Creatures

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Abstract- There are numerous creatures in the world and some of them are exceptionally unsafe to people and it likewise prompts demise. While we are moving to crop area/ forest, the poisonous creatures may assault the individual and made them sick (some time cause to death).

Our aim of these project is to develop an embedded device which we can recognize the nearby harmful creatures/animals. By identifying the nearby harmful creatures and alerting the respective individual will reduce the rate of attacks or passing which is caused by creatures. It is extremely useful to the general population (such as formers).

Keywords- Machine Learning, kNN, svm

I. INTRODUCTION

The main undertaking within the discipline is to avoid harmfulness from nearby Poisonous Creatures. There are two possible ways of identifying the creatures are One way of identification is by their unique hissing sound produced by them and another way is by their respective temperatures. I have used both the approaches in the proposed system.

In the first approach, the machine learning is involved which is used to train the system with respective sounds of poisonous creatures and the following steps are done

- Segmentation
- Feature Extraction
- Classification

In the second approach, it is archived by the temperature/thermal sensor like thermopile IR(infrared) sensor where the temperature range of each creature are stored in the system database and then the sensor will start sensing the temperature of an each creatures and it also used to identify which side of a person is that poisonous creatures are present.

II. OVERALL SYSTEM ARCHITECTURE

The overall system architecture of an device is given in the Fig(1) which consists of both the approaches. where the

both the approaches works simultaneously and if suppose first approach fails to identify or confuse due to an high probability of noise in audio signal which was recorded by the micro-phone .

Then the next approach will identify the poisonous creatures by their respective thermal radiation or by their body temperature and finally , the device will notify the person who is connected to an device with identified poisonous creatures.

Here both the sensor and micro-phone are configured with the raspberry pi device with their programming approaches (modules) like sensor raw data analysis and audio extraction and analysis respectively .when the device is turned to NO state it start recording the hissing sound of an creatures and the system will have the supervised knowledge about all poisonous creatures sound and it remove some possible noise the audio signals and it will classify the signals with the predefined class and knowledge of an creatures and second approach will sense the temperature or thermal radiation of an object or creatures which is in front of the sensor and it will compare the defined temperature range in system database and it matches it send the notifications to nearby person who is connected to the devices otherwise it will skip the temperatures and continues the same process until the device turn off. Explain of two different approaches are given below.

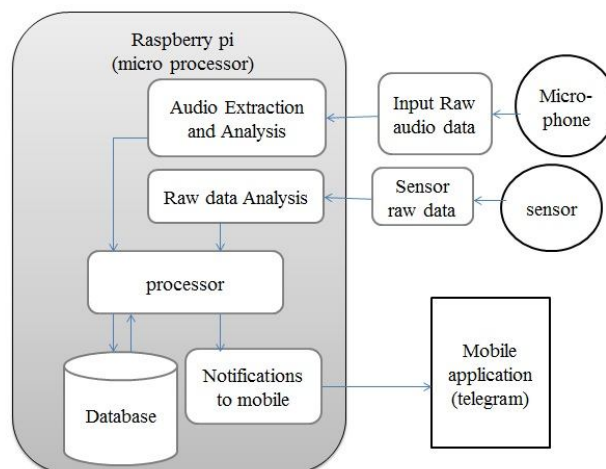


Fig.1.Overall Architecture of an System

III. FIRST APPROACH

A. Segmentation

The system will start recording the real-time audio signals and the goal of these step is to split the recorded audio signals into homogeneous segments and they are stored in the particular directories for the feature extraction process and the segmentation process involves the both the supervised and unsupervised.

In sometimes the supervised is utilized to characterize and segment the audio signals by using an HMM approach to achieve joint segmentation- characterization.

if the supervised knowledge is not available for new inputted audio signals it may utilize the unsupervised method and they are clustered into new class or existing.

B. Feature Extraction

This process involves where the large set of data is reduced and the reduced data represent the large data set which is done by the python libraries and it constructs the combinations of the variables to get around these problems while still describing the data with sufficient accuracy.

C. Classifications

In order to train the machine and to use the supervised knowledge that is used to classify the unknown audio signals to the predefined class in the system (such as snake etc.) and the system implements the following types of classifiers:

- k Nearest Neighbor kNN
- Support vector machines (SVM)

where the support vector machines(SVM) and k Nearest Neighbor (k-NN) are machine learning methodology that processes the audio file (data set) used for classifications and regression analysis.

For example: there is a set of training audio files, each of belongs to one or more categories, so the SVM training algorithm constructs a model that categories new data to the predefined class or category

Confusion matrix is formed in the classification process which also helps to classify the audio segments into a

predefined class or creatures an new class for these categories and each row of the matrix represents the instances in a predicted class while each column represents the instances in an actual class.

For example: let us consider some of the data set like snake, poisonous red frog ,cheetah. etc. and we have to obtain the confusion matrix for these given class

Actual class

	snake	Poisonous red frog	Cheetah
snake	0.90	0	0.10
Poisonous red frog	0	0.80	0.20
Cheetah	0.10	0.05	0.85

These two classifiers are fully dependent on the following python open source libraries

1. *MLpy*
2. *sklearn*
3. *numpy*
4. *Scipy*

MLpy and sklearn is a Python packages for Machine Learning and MLpy utilized for its k Means and SVM usage (SVM is really a python wrapper of the LibSVM execution) and sklearn is utilized for HMM (Hidden Markov Model) implementations.

Numpy is a basic library for numeric calculations utilizing Python. It has been predominantly utilized for it's clusters and networks portrayal and taking care of, alongside an arrangement of separate essential exhibit functionalities.

D. Working Flow:

Here the working flow of this system is given in the Fig(2), where the device starts recording the audio signals when the device is turned on then the following steps are followed by the device

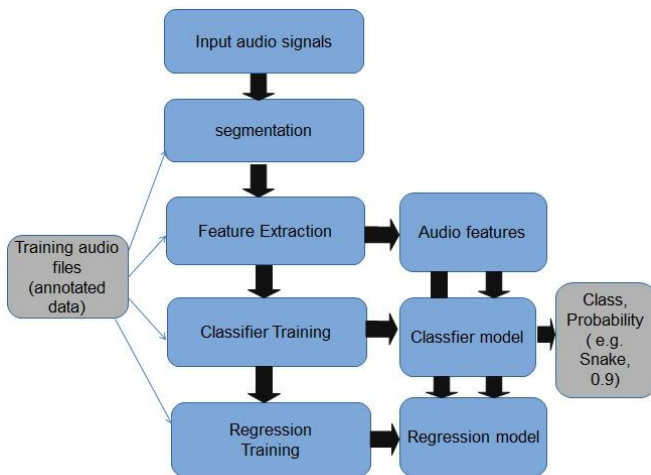


Fig.2. Working flow of an first approach

1. *Segmentation*: when the micro-phone records the real audio signals continuously and there the segmentation is involved which is to split the audio signals into several homogeneous segments(even length) and next step is to take each single audio segments and perform feature extraction process.
2. *Feature Extraction*: Where the segments are reduced to equivalent signal like discarding silence, possible removal of noise the particular segments etc. , and it reduce the large data set to reduced form which is represents the large data set
3. *Classifier training* : This step involves supervised knowledge where it will classify the new audio signals into predefined class and simultaneously it will train the system with the given input audio signals also .

e.g.: if the system trained with different signals of an snake then we test the system with new snake audio signal it will recognize or identify the class which the current input audio signal is belongs to and it will also train the system with the new audio signals automatically.

4. *Regression Training*: Is the process of deciding the factual connection between at least two factors where an adjustment in a reliant variable is related with , and relies upon, an adjustment in at least one free factors.

After these process the system will produce a class name that the signal is matched with highest probabilities then the notification or alert message is given to a person who is

connected to the device through telegram open source mobile application.

E. Disadvantages:

Sometimes it will not be an efficient method to identify the creatures because if the probability of noise is high then the knowledge system will confuse and it not much efficient in such a situation or if the person mimicry or imitate like creatures and system will also fail in this scenario so the another approach is given below

IV. SECOND APPROACH:

To overcome these problems, we have proposed another alternate method is that each creature has their own temperature range by using their temperature range we can identify or sense the particular creatures .

The temperature range of each poisonous creatures are collected and stored in the database along with their respective names and thermal sensor will read the temperature of each object(creatures) in front of it and it send to the raspberry pi and the reading is compared with the temperature ranges stored in the database and if it matches the range then it will return the name of a poisonous creatures and alter the individual person with the alert messages and there is the other option that is the alert is given by the voice alert (there is a presence of snake both in Tamil and English) .

A. Working Flow :

Here the working flow of the second approach is given in the Fig(3) , where the device sensor starts sensing the temperature of each and every object which is present in front of the thermal sensor and the following steps are followed further.

The sensor raw data is sent to the raspberry pi device which will process the sensor’s raw data which means preprocessing like conversion process.

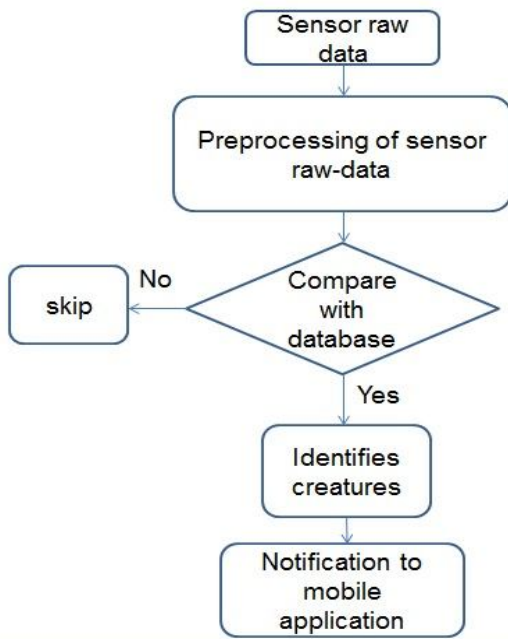


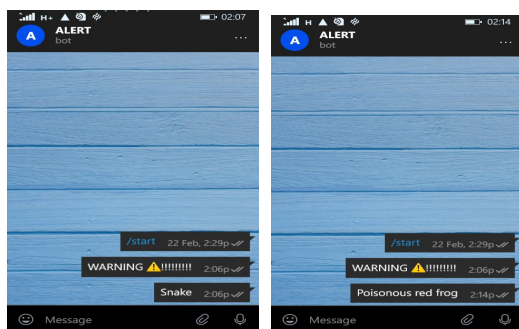
Fig.3. working flow of an second approach

Then the processed temperature data is compared with the database which has the temperature range of several poisonous creatures like snake if the temperature is matched with the database it will notify or send the notification message to an person who is connected to the device and it also alert the person like voice command .

V. NOTIFICATION

Where the notification or alert message is sent to user through an open source telegram mobile application by using telegram-cli (command line interface) . To receive the notifications from the embedded device we have created separate bot for this purpose which will handle the notifications only apart from the other messages. When the both or any of these approach returns the result to an system, it will interact (i.e. sends the notifications to user) with mobile using telegram command line interface.

The sample output of these device is given below



VI. CONCLUSION

Thus by using this device we can identify or recognize the nearby harmful poisonous creatures/animals and it will notify or alter the nearby persons which will reduce the probability attacks or passing which is caused by the creatures. It will useful to the peoples and military who are wandering in the crop or forestry areas. In Future, the efficiency of a system will be increased and the notifications are sent in offline mode which is not dependent on the internet access.

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