Elephant detection and localization using infrasound

Outline of the thesis

by

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Chapter 01: Introduction.

Goal and objectives. The world elephant population has been on the decline [13] due to many reasons, among which the human elephant conflict is a major cause. Human settlements and cultivations adjoining the forest areas have resulted in the blocking of elephant migration routes and further the presence of crops attracts wild elephants, causing damages to livelihood of humans while threatening the lives of both elephants and humans. The wildlife conservation authorities worldwide do not possess an established method to manage this situation which is non-destructive to both elephants and humans, with most authorities having to resort to brute force, often consequently aggravating the situation in the long term [13]. At present, the primary solution introduced is the use of electric fences around elephant habitats to prevent elephants venturing beyond their habitat to encroach into human settlements; an expensive and potentially life threatening solution.

The objective of this research is to implement a cost effective input to a larger system that will help to solve the human elephant conflict building on and expanding upon the previous findings of related research. Research to date has found that elephants pass various messages using infra sound frequencies and this low frequency sound waves travel a greater distance than higher frequency waves due to high frequency waves being more easily absorbed by air molecules compared to the lower frequency waves [5]. In this research, an electronic system consisting of low cost sensors that have the capability of detecting infrasound calls emitted by the elephants as well as digital signal processing techniques are combined to identify elephant infrasonic vocalizations to localize the sound emitting sources. Further, attempts are made to use these information in various scenarios such as prior warning system before elephants enter a cultivation and elephant herd detection among other things.

- Research question.
- Background and significance of the project.
- Scope of the thesis.
- Hypothesis.

Chapter 02 : Literature Review.

Related works on :

- Biological researches on elephant communication.

- Behavior of infra sound waves.
- Sound localization.
- Signal classification.
- Acoustic detection of elephants.
- Infra sound recording devices

Chapter 03 : Design and Methodology.

- Introducing Elocate sensors.
- Overview of sound localization.
- Comparison of localization techniques.
- Application of cross correlation using Elocate sensors.
- Feature extraction.
- Signal enhancement.
- Classification using SVM.

Chapter 04 : Implementation.

- Electronic circuit of the sensors.
- Noise reduction techniques.
- Implementation of localization.
- Data collection.
- Implementation of pre processing.
- Training SVM.
- Testing the model.

Chapter 05 : Results and Evaluation.

- Results of each experiment conducted.
- A comprehensive analysis on results.

Chapter 06 : Conclusion and Future Works.

- New possibilities discovered.
- Problems encountered.
- Increasing the accuracy of detection and localization.
- Summary

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