iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 5 **Issue:** V **Month of publication:** May 2017

**DOI:**

www.ijraset.com

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Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

# An Automatic Repelling System to Reduce Human Elephants Conflicts Using Sensors

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***Abstract:*** ***In major areas, Human-Animal Conflict occurs due to the shortage of food and shelter. Due to the human population explosion and deforestation, forest areas were completely destroyed and this results in Human-Animal Conflict. As far as now, Elephant identification has been done by using Camera Surveillance, LVDT, Geophone and Acoustic sensors. As these methods are very expensive and less accurate, an automated system for identification of elephant using piezoelectric vibrating sensor is introduced in this project wherein the Human-Elephant Conflict can be reduced to a large extent. The piezoelectric vibrating sensors are deployed in three layers to identify the presence of elephants. The first outer layer gives the warning signal to alert the people around that area. Middle layer activates the first repelling system to make the elephants run back to the forest. If the elephant is still moving forward towards the conserved area, the third layer activates the second repelling system. As the sensors are deployed in a cyclic manner, it can easily divert the elephant's attention and thereby the Human-Elephant Conflict can be avoided.***

***Keywords: Piezoelectric vibrating sensor, Segmentation, Repelling systems, Field coverage, Arduino microcontroller***

## I. INTRODUCTION

In the earlier days, the forest areas are very huge. Due to deforestation, all the trees are now built as large buildings. As the human population is still increasing, forest areas are going to be completely destroyed. Human-animal conflict in the society is mainly due to the shortage of food for animals. In this paper, we discuss about the elephant intrusion. The existing method for detection and the repelling of elephants in the farm areas and conserved areas is very expensive. Hence a new method is introduced for the identification of elephants and the repelling system to divert the elephants' attention at low cost.

This automated system consists of number of vibrating sensors to detect the presence of elephants, one warning system to alert the people around that area and two repelling systems to make the elephant to run back to the forest area. This system can also be used to protect the conserved area from all other animals like bear, tiger and leopard by varying the sensor range and modifying the repelling systems.

## II. LITERATURE SURVEY

Based on the study of previous research works and the field research, we can summarize the factors like lack of protection in farm lands, damage of fences , shortage of food resources, climatic variations, occupying traditional migration paths of elephants, improperly constructed trenches, forest fire contributes the intrusion of elephants along forest borders and farm lands. Some of the repelling methods for elephants are air guns, non-electric fences, electric fences, chilli rope fences, loud alarm, chilli smoke, watch towers, solar power torches, trenches, fire, fire crackers and throwing arrows\stones.

There are several automated systems introduced and implemented for elephant detection. Some of them are discussed below:

In [1] 2013, Xin Jin proposed a method to detect the target and classifying the target based on its kind by using Seismic and PIR sensors and it has the advantage of higher accuracy in classifying the target wherein it costs high for the real time implementation.

In [2] 2013, the author proposed a model to detect the presence of elephant by using digital Image Processing to avoid human-elephant conflict. It also proposes an optimization method better than Euclidean and Manhattan algorithms. But this method cannot extend its application of tracking other animals.

In [3] 2014, Ramkumar. R and Sanjoy deb proposed an automated system of ASRET with sensor nodes, gate way node and a CPU with a warning unit. The disadvantage of this method is ASRET is temperature dependent. Hence it is very difficult to implement during climatic changes.

In [4] 2015, Vinod A.Dhande and Dr. Kantilal. P. Rane proposed a method for animal identification using IRIS recognition which was based on Digital Image Processing. This method is highly accurate but costs high to implement.

In [5] 2015, the authors introduced a human detection robot by using PIR sensors and obstacle sensor which detects the human

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

beings in a particular area. This robot can only detect human beings and no other obstacle can be detected.

In [6] 2016, Prabhu. M proposed a surveillance system to detect elephant intrusion into forest borders using Seismic Sensors and cameras which is very expensive and difficult for maintenance.

In [7] 2016, Qu Hongquan, Zheng Tong, Bi Fukun and Pang Liping introduced a method to detect the vibration for optical fibre pre warning system which only sense the vibration produced by the obstacles.

In [8] 2016, R. Maheswari explained the elephant monitoring system by developing an embedded based system using Internet Of Things which can only monitor the elephants presence.

In [9] S.J.Sugumar and R. Jayaparvathy proposed an automated unsupervised Elephant Image Detection System as a solution to avoid Human-Elephant Conflict. Elephant image was captured in the forest border areas and was sent to a base station via RF network. This processing unit looked for a pattern match of the incoming signal with the reference signal. The received image was decomposed using Haar Wavelet to obtain multilevel wavelet coefficients, with which it perform image feature extraction and similarly match between the elephant query image and the data base image using image vision algorithms. The optimized distance metric retrieves more images with lesser retrieval time than the other distance metric. As this method used camera which is very expensive and difficult for maintenance, this was considered as an ineffective method.

In [10] Vinod A.Dhande and Dr. Kantilal. P. Rane proposed the animal detection model with the help of iris information of the animal group which was based on Digital Image Processing. First feature of animal eye image was obtained using threshold segmentation method and these features are stored with the animal name in the database. After creating the database KNN algorithm is used to find out the animal type form the input iris image using database of the features. As this can move, it covers lot of distance that reduces the use of many sensors or many robots. Iris modeling was done to characterize iris properties and provide clues to feature extraction using MATLAB software. From the detected iris region the animal type was recognized. As this method for animal identification using IRIS recognition is based on Digital Image Processing and a high resolution camera is needed, this is highly accurate but costs high to implement.

In [11] Xin Jin proposed a method to detect the target and classifying the target based on its kind by using Seismic and PIR sensors. This method used Geophones to detect the seismic activities of the obstacle and PIR sensor to classify the kind of obstacle. Geophones were buried in the ground where the target could intrude in and PIR sensors were kept at the pathway of the intruder. As two sensors were used for the detection, there will be no failure of detecting the obstacle. Hence it has the advantage of higher accuracy in classifying the target wherein it costs high for the real time implementation.

## III. PROPOSED METHOD

This system consists of three consecutive layers. The first outer layer consists of a piezoelectric vibrating sensor placed at a far distance from the conserved area. When an obstacle enters the working range of the piezoelectric vibrating sensor, the sensor senses through the vibration created by the obstacle and identifies whether the obstacle is an elephant or not.

When the sensor confirms the presence of elephant by matching the voltage created in the sensor and the given threshold value in the Arduino microcontroller which is used as the interface for the sensors, warning/repelling systems and all other components. When the elephants' presence is confirmed, the approximate distance of the elephant from the preserved area will be displayed in the LCD and the relay for the warning system will be switched ON. The warning system is used to make the people around that area to be alert and warn them to be safe from the elephants.

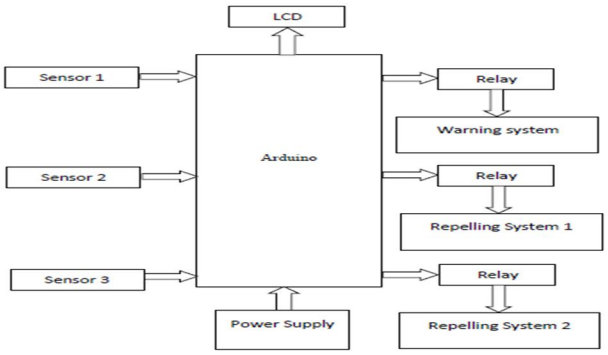


Fig. 1 Block Diagram of the System

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ISSN: 2321-9653
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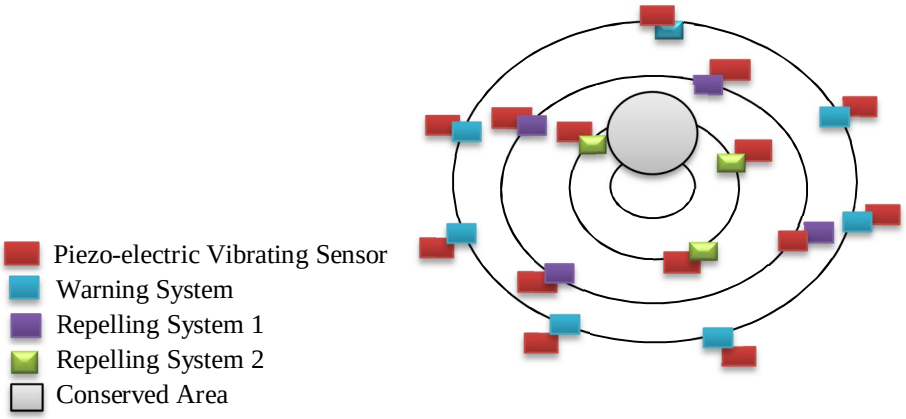


Fig. 2 Sensor Deployment

When the elephants move towards the preserved area crossing the first sensor layer, the second layer will begin operating. The piezoelectric vibrating sensor 2 will sense the presence of elephants as like sensor 1 and the LCD will display the status of the elephant. When the particular voltage created by sensor matches the threshold value, the relay for the repelling system 1 will be turned ON. The sound of the elephants threatening animal is given as the repelling system 1 by which the elephants changed its motion direction towards forest. If the elephants still coming in the same preserved area which is sensed by the third piezoelectric vibrating sensor, repelling system 2 will be turned ON. The smoke valve is placed in the second repelling system through which heavy smoke spreads around that area. The smell created by the smoke will divert the elephants' attention. Hence there will be no chance of elephant intrusion in the preserved area.

## IV. RESULT AND DISCUSSION

The figure 3 shows all the three piezoelectric plates s1, s2, s3 which are kept at a distance of 0.5meter from each other and are connected to the sensor module which is placed in the conserved area. The analog outputs coming from any of the three sensor modules are given to the PINS of microcontroller from which the data can be read.

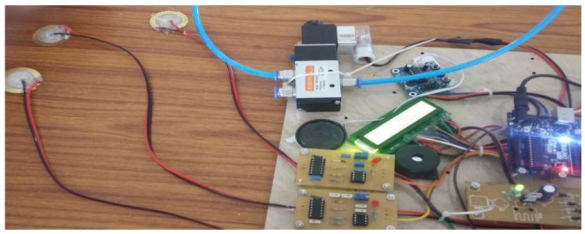

Fig. 3 Interfacing Piezoelectric Vibrating Sensors with Microcontroller

The figure 4 shows a buzzer which is taken as a warning system connected with the microcontroller. Note that any pins from A4 can be used for sensor interfacing since all these pins are dedicated for Analog to Digital conversion. After interfacing the buzzer with the sensor and the microcontroller, a vibration is given to the sensor s1. As the sensor detected the vibration range lesser than 400, the buzzer will produce the alert and LCD will display the status as BUZZER ON and the voltage produced by the vibration.

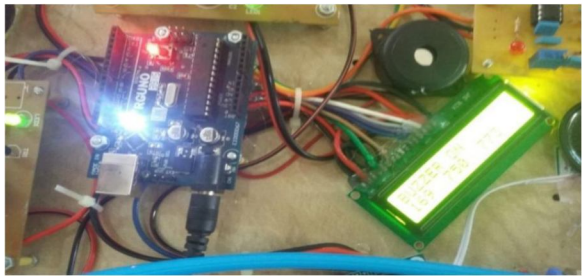

Fig. 4 Interfacing Warning Systems with Microcontroller

Volume 5 Issue V, May 2017
ISSN: 2321-9653
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The figure 5 shows the interfacing of first repelling system with the microcontroller. As the elephant have the nature of oscillating and frightening on hearing the sound of tiger, leopard and other certain animals, here the sound of tiger is given through the APR module as the first repelling system. Since the sensor is given along with a module, connection can be established directly from the module to the microcontroller. When the vibration range lesser than 400 is given to the sensor s2, the APR Module produced the tiger sound and the LCD shows the status as VOICE ON and the voltage produced by the sensor.

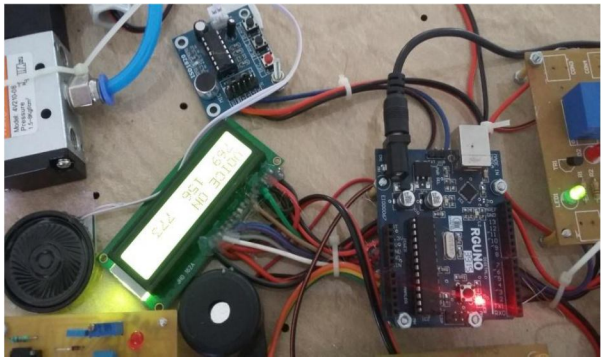


Fig. 5 Interfacing First Repelling System with Microcontroller

The figure 6 shows the interfacing of second repelling system with the microcontroller. To introduce smoke, a solenoidal valve unit is connected with the microcontroller as the second repelling system. When the vibration range lesser than 400 is given to the sensor s3, the smoke valve will be ON and the status was updated in the LCD as VALVE ON and the voltage created by the vibration is displayed.

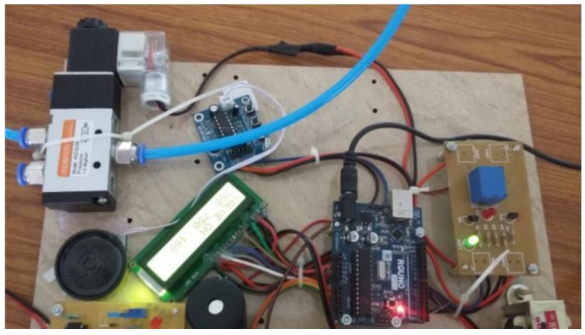


Fig. 6 Interfacing Second Repelling System with Microcontroller

The figure 7 shows the final prototype of the system which was taken for demonstration. The piezoelectric vibrating sensors are tested with different vibrating obstacle whereas the warning system, repelling systems are tested at all conditions. Thus the entire system is tested and found to be in working condition.

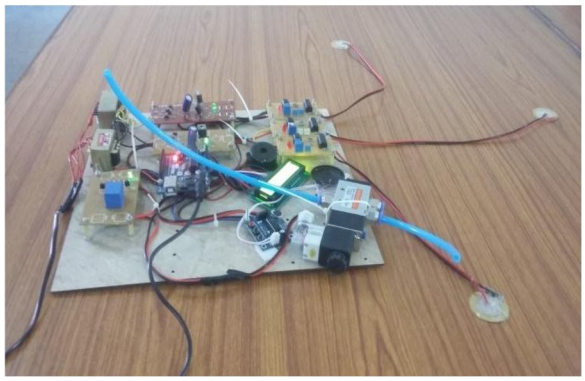


Fig. 7 Prototype of the Proposed System

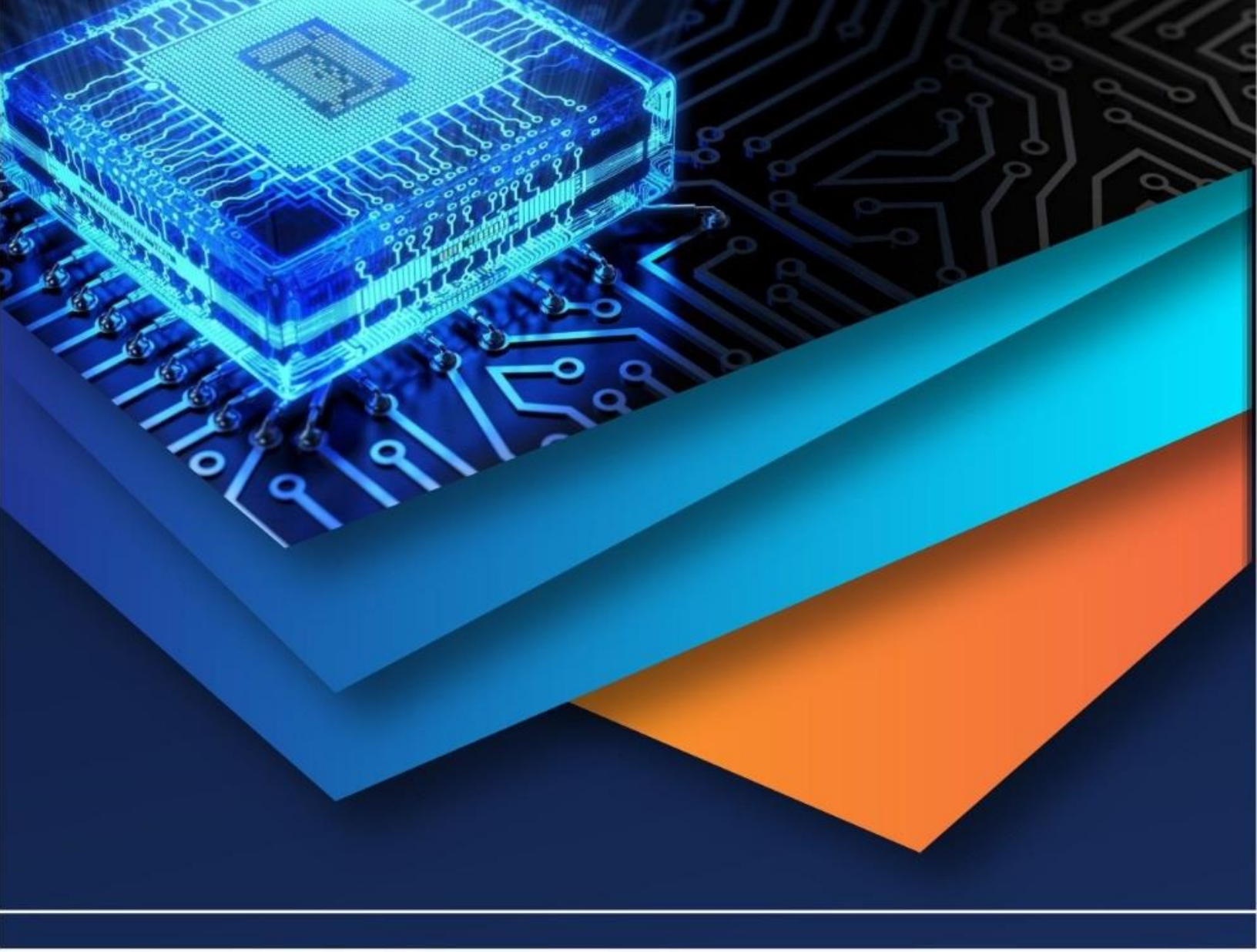
## V. CONCLUSION AND FUTURE WORKS

This automated elephant identification system and the repelling methods are used to provide more security for the people to protect their farms and their belongings from elephants. This can automatically detect the presence of elephants at low cost and it has the capability to make the animal to run back to forest. As the sensors are placed in consecutive layers and individual sensors are connected to a repelling / warning system, no error and delay will occur in detecting the elephants and for the execution of repelling the animal.

This system can be modified further by varying the threshold value in the arduino for the detection of other animal intrusion and the repelling system can be replaced according to the kind of animal to be identified. If the system is attached with SONAR (Sound Navigation and Ranging) it can determine the distance between the animal and the preserved area.

## REFERENCES

[1] R. Maheswari (2016),"Development of Embedded Based System to Monitor Elephant Intrusion in Forest Border Area using Internet of Things" presented at The International Journal of Engineering Research, Volume No.5, Issue no.7, PP.594-598.
[2] M. Prabu (2016), "An efficient surveillance system to detect Elephant intrusion into forest borders using seismic sensors" presented at International Journal of Advanced Technology/Vol.V11/Issue I.
[3] Qu hongquan, Zheng Tong, Bi Fukun, Pang Liping (2016), "Vibration Detection method for Optical Fibre Pre-warning System" presented at The Institution of Engineering and Technology Signal Process, Vol.10, Iss.6, PP.692-698.
[4] Lalith Seneviratne, G. Rossel, W.D.C.Gunasekara, H.L.P.A. Madanayake, Y.M.S.S. Yapa and G. Doluweera (2015), "Elephant Infrasound \ Calls as a Method for Electronic Elephant Detection", presented at IJ of Science, Engineering and Technology, Research Volume 4, Issue 3.
[5] Saravana Kumark, Princilla P. Germiya K Jose, Balagopal. G (2015), "Human Detection Robot using PIR Sensors", presented at IJ of Science, Engineering and Technology, Research Volume 4, Issue 3
[6] Vinod A.Dhande and Dr. Kantilal. P. Rane (2015), "Identification of Animal using IRIS Recognition" presented at International Journal of Advanced Technology in Engineering and Science" VolumeNo.03, Issue No. 01
[7] Ramkumar. R, Sanjoy Deb and Ranjanna.K.M (2014), "An automated system for remote elephant tracking to reduce human elephant conflict" presented at International Conference on Information and Communication Technologies
[8] S.J.Sugumar and R.Jayaparvathy (2013), "An early warning system for elephant intrusion along the forest border area" presented at Association of Computer, Vol. 104, No. 1\
[9] Xin Jin, Soumalya Sarkar Asok Ray, Shalabh Gupta (2013), "Target Detection and Classification using Seismic and PIR sensor" presented at I
[10] Dissanayake,s C.M. Kotagiri, R. Halgamuge, M.N. Moran, B. Farrell. P (2012), "Propagation constraints in elephant localization using an
[11] acousticsensor network," presented at Information and Automation for Sustainability(ICIAfS), IEEE 6th Inte11lational Conference on, vol., no.,pp.101 ,105, 27-29
[12] Bardeli. R (2009), "Similarity Search in Animal Sound Databases," presented at Multimedia, IEEE Transactions on, Vol, no. l, pp.68, 76, Jan. 2009.



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