iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: VII Month of publication: July 2022

DOI: https://doi.org/10.22214/ijraset.2022.45853

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

Observation and Classification of Fauna for Forest Survey

Vimal Naveen[1], Skanda V Jois[2], S L Nishanth Kumar[3], Sagar B S[4], Geetha M N[5]
[1, 2, 3, 4, 5]*Department of Electronics and Communication Engineering, Vidyavardhaka College of Engineering, Mysuru, India*

Abstract: Human-animal conflict has become a serious issue in agriculture and forestry, threatening human lives and squandering resources. As human risks to the natural environment increase, so does the necessity to track the evolution of diverse invertebrates. Conservation initiatives should be well-directed, yet the labour required to obtain information is frequently time-constrained. Estimates of the number of mammals give vital insights into conservation measures, but only a few systematic human studies and yearly census efforts have contributed in any way to this endeavour. Even despite these efforts, established techniques of measuring numbers vary greatly and are frequently overlooked in efforts to authenticate the data produced. To address this issue, wildlife monitoring can provide researchers with as much information as wildlife species, quantity, habits, quality of life, and habitat conditions, assisting researchers in understanding the nature and potential of wildlife resources, and providing the foundation for effective protection, sustainable use, and scientific management of wildlife resources. We demonstrate how this tool works in a number of contexts, including animal behaviour, population monitoring, and animal interaction.
***Keywords:** Forest survey; animal-based tracking; Face recognition; line transect method*

I. INTRODUCTION

The survival and expansion of animals supports the environment's entire balance and sustainability. Making educated management decisions requires reliable wildlife knowledge. Effective management and monitoring of both big and small terrestrial animals is critical for biodiversity monitoring and protection. Wildlife is threatened during their habitat with people due to their variety, extinction, and the influence of natural science on their natural environments. Understanding the need of limiting the number of species, particularly commercial species, contributes to meeting the issue of protecting the planet's biodiversity. Regular observation and monitoring of animal species offers a foundation for researchers to examine animal behaviour and quality of life, as well as to monitor animal natural circumstances.

Global practice illustrates the feasibility of merging old and new technology, as well as specialized equipment, environmental management planning, and management procedures, into practice. Wide terrestrial animals require all monitoring strategies due to their low population density and large habitat. Examples include leopards, elephants, and deer.

The protection and management of wildlife species is dependent on our understanding of their worth. In India, the sole source of human estimates for species is census work done at specific times of the year, year, or year. The country has a lengthy history of wildlife management in many regions of the world, but with the exception of a few studies, wildlife professionals have undertaken no long-term study on any species. The information gathered during census activities is retained at the department's offices. Attempts to employ them in administrative procedures are uncertain, and only a small number of them have been examined to ensure their trustworthiness. Scientific research, if it exists, concentrates on the interests of people or groups and, in many circumstances, does not appear to match the demands of the forestry department, and it is frequently inaccessible to check census numbers.

Many animal species in India have a lengthy history of counting; nevertheless, vigorous and systematic census efforts for species such as elephants began only in 2002. When it comes to human values, institutions may perform good science. A census can be carried out for scientific objectives. For a long period, the impacts of all environments and species may be unreachable. Courses are only offered for a limited time, and interests are distributed owing to a lack of funding or other factors.

Comparisons produced using various approaches may have additional restrictions; for example, census work can only be done once a year and is not designed to cover the whole research region. Long-term studies can be undertaken at various periods of the year, but only cover a portion of the research region. The two ways may complement each other since the calculating method covers the whole region while long-term research cover smaller regions over time. The territory covered, as well as the number of persons listed in such categories, may have an impact on the findings.

Elephants occur only in a few areas across the block due to their low density and dispersal strategy, and trained forest workers can see and count them all. Their numbers are underestimated due to their high density, high-density dispersal, and difficulties in spotting the animals.

Even if it was done a long time ago, verification of census performance findings and long-term study has a specific message for the 'Elephant Project,' the Government of India, and its coordinated effort for elephant employment. read. The blockchain calculating approach has received much criticism since it does not allow for any checking of outcomes using current options. Based on these experiences and findings (comparisons of census performance and long-term study), it is said that, rather than criticizing blockchain statistics and advocating that they be removed from the elephant census operating system, it is vital to assure census, the outcomes are accessible throughout time. It can be observed by studying the outcomes or observations of elephant sightings in locations like Bandipur, Nagarhole (Karnataka), and Mudumalai (Tamil Nadu) that volunteers only see elephants when they are known to be sighted in these regions. Because of the increased interest in animal counting and the requirement for data validation, it was anticipated that this study would be of some help to certain users. It can also be useful in identifying limits and encouraging others to do both part-time censuses and long-term research using comparable approaches to compare findings and assess the dependability of estimates.

II. BACKGROUND STUDY

Species Monitoring Methods [1] by Alexander Prosekov, Alexander Kuznetsov, Artem Rada, and Svetlana Ivanova explored how successful control and monitoring of both big and small wildlife are connected to monitoring and protection. The world's biodiversity. Monitoring is a natural strategy that is integrated into animal observation, exploration, and human prediction. Global practice indicates the viability of merging existing old and new technologies, as well as specialized equipment, environmental management planning, and management procedures. Large terrestrial animals require all monitoring strategies due to their tiny population and extensive range. A range of instruments and equipment (e.g., cameras, GPS sensors, and unmanned aerial vehicles) can be utilized, depending on the geographical, climatic, and economic characteristics of each place, with flexibility that allows researchers to establish a gold standard among the abilities they want.

Monitoring the diversity of large herbivorous species on different scales: comparisons of direct and indirect methods by Joris PGM Cromsigt, et al. [2] demonstrates that large numbers of herbivores are key indicators of diversity, which can affect the balance. of the richness of mammalian species. When examining the monitoring system, the monitoring approach assisted in determining how the number of herbivores influenced the ratings of different types of animals and how this differed based on a given decision.

Bozeman, Bright Owusu, A Basic Overview of Line Transect Sampling and Its Applications[3], the publication introduces the transect sampling method, a distance sampling approach commonly used in ecology. The perpendicular distance between the recognized items is utilized to calculate the density and quantity of the objects. The study entails randomly putting one or more transect lines in the study region, as well as adding the discovery function to locate noteworthy objects gathered through the acquisition function.

Animal-Based Animal Tracking Using a Free Walking Camera was given by Lars Haalck et al [4], image-based surveillance of individual animals might give rich data to enable advances in biological and medical research, but few, if any, known processes lead to unrestrained wildlife behaviour in the wild.

Machine learning to identify animal species in camera trap images: Ecological applications by Michael A et al [5], the study demonstrates how cameras function in motion ("camera traps"), which are among the most potent instruments for wildlife research and are extensively employed in nature and management studies to view animals from a distance. The reference alludes to how photos may be used to automatically identify wildlife species based on camera photographs obtained during forest exploration.

Attendance System using Face Recognition by Azmath Moosa [6]. This is a commuting programme based on an educational institution study using facial recognition. The camera is used in this application to take employee photographs for face recognition and identification. If the result is found on a face-to-face website, the photograph is taken one by one to examine the employee's face on a face-to-face website, and attendees are recorded.

Khwaja, H.; Buchan, et al. Pangolins in global camera trap data: Implications for ecological monitoring. Glob. Ecol. Conserv. [7]. Due to its non-discriminatory character, camera configuration gives a unique chance to monitor wide-scale interoperability by producing significant volumes of data through a number of forms. This has the ability to give information on the nature of uncommon, hidden, and underserved species, as well as the repercussions of conservation actions.

Jesso Jose, Ernakulam, Kerala, implements the Forest Monitoring System. The initiative's purpose is to monitor the forest [8].

This network allows for remote monitoring of many sites, as well as links between each sensor and control channel. PIC microcontroller, LCD, fire sensor, smoke sensor, RF / ZIGBEE, ultrasonic detector, and camera are all part of the project. We may use this capability to study animals and the forest floor in order to monitor deforestation, wildfires, and other issues.

Mohammad Abu-Lebdeh, Fatna Belqasmi, and Roch Glitho were awarded a patent on June 10, 2016 for An Architecture for QoS-Enabled Mobile Video Surveillance Applications in a 4G EPC and M2M Environment [9]. According to research, mobile video surveillance programs are extensively used in homes, workplaces, warehouses, airports, and other areas to provide real-time video surveillance as well as live pre-recorded video search.

III. METHODOLOGY

A camera module is connected to the Raspberry Pi module. Python programming language is used to develop a code for the process. A code is developed to identify and store the animals which appear in front of the camera module. The pictures of the animals are stored before in order to process and match the data during the survey.

The control flow is shown in Figure 1. Python IDLE is used to run the script, to get the pre-loaded tensor flow modules. The camera module waits for an animal to appear in its field of vision. When an animal is sighted, the image is taken along with the date and timestamp. The image acquired by the camera is digitally processed and compared to one in the database.

The Raspberry Pi uses the camera module to capture the video, which splits it into frames using OpenCV packages. The image detection of the species in the image is then processed using OpenCV and pre-trained TensorFlow modules, with the goal of mapping it to a category and pre-trained detection model. The result of the detected species is then displayed with a tag specifying the name of the animal. If the species recognized in the image is not found in the database or the category list, the output is displayed as “none”, and the image, along with the date and timestamp is saved in the database folder to be investigated later. If the detected species are found in the category list, it generates an output with name and uniquely assigned ID number of the species, then saves the data in the text format with date and time in a text file and saves the image with the detected named label in the database folder for future reference.

As a result, the smart camera maintains a track of and builds a database with images of all of the forest’s animal species. It can also assist in understanding animal behaviour as well as development and flow of vegetation and animals in the forest.

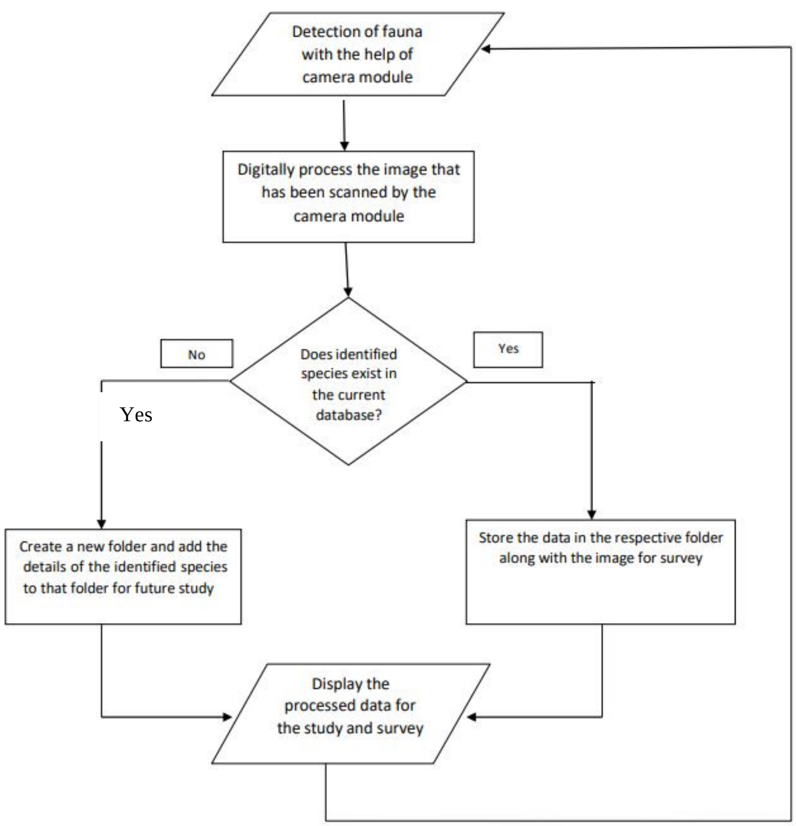


Figure 1: Flowchart for proposed diagram

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

IV. IMPLEMENTATION

To setup the prototype the camera module is plugged into the dedicated camera port on the motherboard of the Raspberry Pi 4. The HDMI cable should be connected to the display monitor before powering the microcontroller. The power adapter is then connected. A red LED turns ON indicating the Raspberry Pi has sufficient power. When the camera module is configured in the terminal and the required commands are entered, a green LED adjacent to the red one blinks, indicating that the microcontroller is processing the information entered.

The display can be remotely controlled by an open-source software known as VNC Viewer. VNC stands for Virtual Network Computing. It is a cross-platform screen sharing system that was created to remotely control another computer. This means that a computer's screen, keyboard, and a mouse can be used form a distance by a remote user from a secondary device.

V. RESULT

The equipment was setup in a wildlife environment, to conduct field trials to study the protype behaviour and results.

A. Image Capturing

The following are the field trials captured using the equipment of different wild animals:

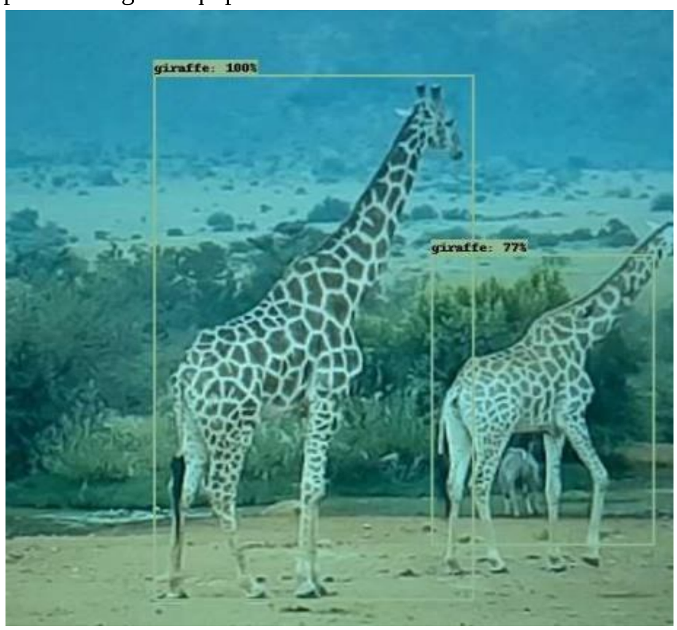


Figure 2: Detection of giraffes with the name tag

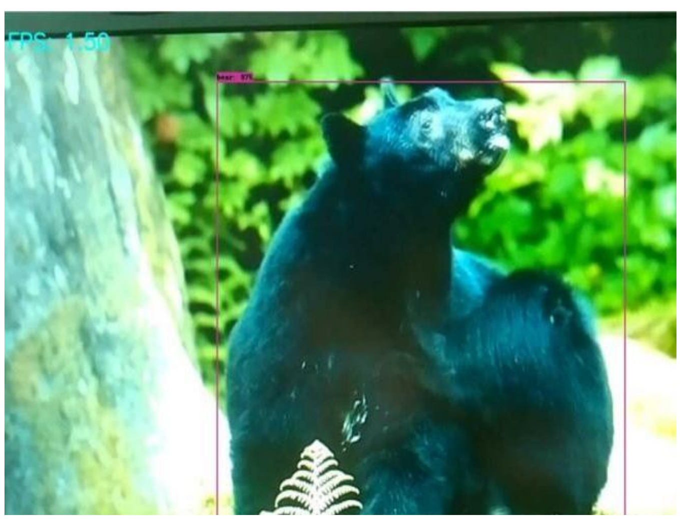


Figure 3: Detection of a solitary bear

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

The equipment has successfully recognized a pair of giraffes. The percentage match is also shown at the top of the frame enclosing the animal as shown in Figure 2 and Figure 3.

Figure 4: Detection of mother bear and her cub

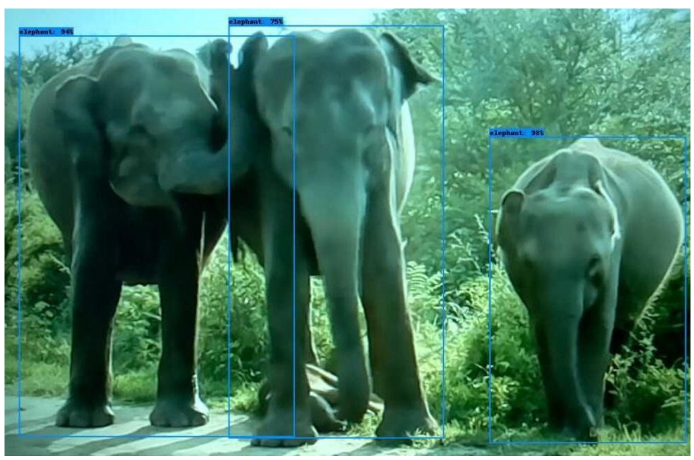


Figure 5: Detection of multiple elephants

The module is also capable in detecting multiple animals in the same frame within the field of vision as shown in Figure 4 and Figure 5.

B. Survey Database

The trained tensor models match and maps the image in a frame with the model's trained data to detect the image. As mentioned in the methodology, the attributes of pre-trained animal data models are assigned a unique ID number in a python script to differentiate species. The camera takes continuous samples, this helps the wildlife researches to study the animal behaviour in its nature state without causing any disturbance to the animal.

VI. CONCLUSION

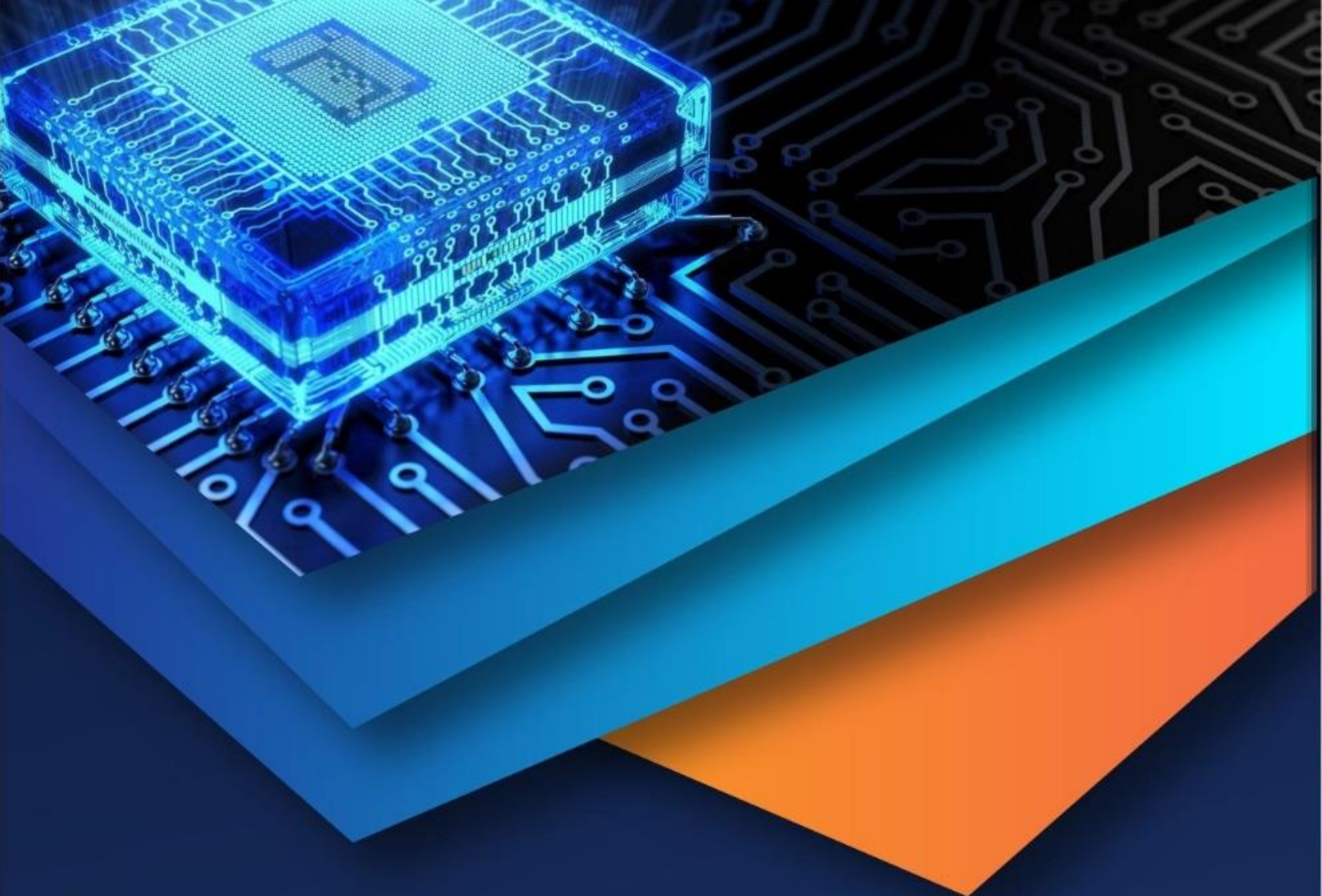
In order to make an influence and eventually contribute to conservation and management, research must be addressed. Unlike many other research methods, which necessitate some analysis to reveal natural processes and patterns before data can be processed, our proposed design has the advantage that raw materials, such as images, can generate powerful information and are an important tool for public awareness / representation. Pictures, in addition to sophisticated data or graphs, provide immediate access to scientific studies to the general audience. As a result, published results in the field in the form of media releases or popular presentations can help raise awareness of crucial management concerns and wildlife research.

VII. ACKNOWLEDGMENT

This paper would not have been possible without the exceptional support of Head of the Department of Electronics and Communication Dr. C M Patil and Assistant Professor Geetha M N who have been supportive of our career goals and who worked actively to provide us with the protected academic time to pursue our goals.

REFERENCES

[1] Methods for Monitoring Large Terrestrial Animals in the Wild by Alexander Prosekov, Alexander Kuznetsov, Artem Rada and Svetlana Ivanova (July 2020).
[2] Cromsigt, J. P. G. M., van Rensburg, S. J., Etienne, R. S., & Olff, H. (2009). Monitoring large herbivore diversity at different scales: comparing direct and indirect methods. Biodiversity and Conservation, 18(5), 1219-1231.
[3] An Introduction to Line Transect Sampling and Its Applications by Bright Owusu Department of Mathematical Sciences Montana State University, Bozeman April 16, 2019.
[4] Towards image-based animal tracking in natural environments using a freely moving camera by Lars Haalck , Michael Mangan , Barbara Webb , Benjamin Risse Epub 16 Nov 2019.
[5] Machine learning to classify animal species in camera trap images: Applications in ecology by Michael A, Tabak Mohammad S, Norouzzadeh David W, Wolfson, Steven J, Sweeney, Kurt C. Vercauteren, Nathan P. Snow, Joseph M. Halseth, et al published on 7 September 2018.
[6] Attendance System using Face Recognition published on 7 December 2017 by Azmath Moosa.
[7] Khwaja, H.; Buchan, C.; Wearn, O.R.; Bahaa-el-din, L.; Bantlin, D.; Bernard, H.; Bitariho, R.; Bohm, T.; Borah, J.; Brodie, J.; et al. Pangolins in global camera trap data: Implications for ecological monitoring. Glob. Ecol. Conserv. 2019, 20, 1–14.
[8] Implementation of Forest Monitoring System project by Jesso Jose, Ernakulam, Kerala, 03 December 2015.
[9] An Architecture for QoS-Enabled Mobile Video Surveillance Applications in a 4G EPC and M2M Environment by Mohammad Abu-Lebdeh, Fatna Belqasmi and Roch Glitho received on June 10 2016.
[10] B. Risse, M. Mangan, L. Del Pero, B. Webb, Visual Tracking of Small Animals in Cluttered Natural Environments Using a Freely Moving Camera (2017).
[11] F. Romero-Ferrero, M. G. Bergomi, R. Hinz, F. J. H. Heras, G. G. de Polavieja, idtracker.ai: Tracking all individuals in large collectives of unmarked animals, arXiv.org (2018).
[12] A. W. M. Smeulders, D. M. Chu, R. Cucchiara, S. Calderara, A. Dehghan, M. Shah, Visual Tracking - An Experimental Survey., IEEE Trans. Pattern Anal. Mach. Intell. (2014).



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY