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Role of GPS Tracking in Monitoring the survival and hunting of Wildlife

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ABSTRACT
To manage the wildlife and their security, information about wildlife is required to manage the wildlife properly. To make sure that no species go extinct and maintain biodiversity, it's necessary to maintain control and monitor the wildlife animals properly. Monitoring includes observation and assessment to forecast the human environment. Modern-day and traditional technologies are being used to manage and organize the wildlife environment. These technologies have exceptional navigation and other equipment. One of the critical challenges is to monitor the large animals because they have very low density and more significant habitats than the other small animals. Such animals are elks and moose, for example. The population size of the animals can be found without spending a lot of finances and without causing any danger to the animal habitat. The models used in this case have different results that vary from the other models because of the various parameters being considered and the different assumption that is made. Factors affecting the results of any model are the location, climate, and economic conditions of that country in all the territories. The most common devices used for this purpose are cameras, Global Positioning Systems (GPS), air vehicles.
Keywords: *Wildlife, Monitoring, Global Positioning Systems (GPS), Animal Population, air vehicles.*

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INTRODUCTION

In the present day world, climatic change is the rising factor. The wildlife which is at the threat of it can't be ignored. The steps that should take to ensure the safety of wildlife are monitoring the wildlife habitat, evaluating the wildlife habitat, and continuously analyzing the states of the earth's environment.
It's the challenge today to make sure that the wildlife is safe in all regions with all small and large animals. Protecting these animals is necessary because there is a specific balance of animals of all kinds in the wildlife. Unfortunately, many species have become extinct either due to hunting or climate change. This scenario is becoming a world's concern for the move towards greenhouse to make sure all the habitats are safe and good attention is being given to these lives by many international organizations. This paper will present the methods and the devices that can be used to ensure that these species are safe. The different methods that can be used to make sure the safety of these natural habitats is represented in the Table 1.

LITERATURE REVIEW

In the paper [1], the author has thoroughly discussed wildlife monitoring or tracking that do focus on different sectors within the forest areas; for example, through this article, a proposed open-source Arduino model is prepared at low cost, and that is fixed with an accelerometer and other components that are mandatory for the wildlife monitoring system. The monitoring process can be processed in different areas and under various forms; anyhow, some of the critical things are most focused to increase the population under wildlife system, and that can be done with the help of GPS tracking system is being proved from this article [2]. Most probably, this article tells us about the identity frame created through the insiders, which is mainly focused on American countries based on educating the hunters and the different manuals preserved from non-governmental agencies [3]. With the article [4] & [9], we could be

able to assume that trophy hunting is more complicated at the sight of wildlife conservation while getting enough technological aspects related to wildlife conservation would automatically boost up the conservation process. If it is possible to detect the density of birds and their living area, it would be the easiest way to increase the probability of detection methods. In such a case, through this paper [5], the author has added a few removal models and enough survey protocols based on time management. Maintaining a proper and stable population of wildlife management is overabundant; in such case, hunting is one of the standard techniques that are used for earning in different ways of animal organs; through this article [6], the Bayesian state-space model is affected with landscape component and make understand the activity of a particular animal by increasing the trapping plateaued model. Some of the technological features are still used for identifying the birds location and other accessing, it is necessary to update the list of breeding birds of the country, and the entire process has been conducted within Italy, finally, at the end of the project, there were six species classified and endangered [7]. In the paper [8], a radio-tag mechanism is being proposed that automates the information related to the bird's GPS tracking and identifies the survival of reintroducing the grey partridges. Paper [10] is entirely concentrated with the integrated population models. In contrast, the applications of R and JAGS are being considered one of the integrated population models. That is combined with multiple data sets with separate demographic parameters in range.

Methods	Animals
Survey & questionnaire	Large & medium sized animals
Counting by traces of vital activity (counting indirect signs the number of burrows, claw marks, the number of feces, etc)	Large & medium sized mammals
Sampling & marking	All animal species
Winter route tracking	Large, medium, & small animals & birds
The utilize of pens, nets & traps	Large & medium sized mammals
Remote tracking utilizing specialized equipment (sensor nets, camera traps, GPS sensors & acoustic sensors)	All animal, bird & insect species
Aerial survey (counting, video & shooting from aerial devices & systems)	Large animals

Table 1: List of methods followed for confirming animal safety

MATERIAL AND METHODS

Remote Monitoring

The remote monitoring of this wildlife is getting a lot of attention. Traditional methods require the data to be gathered from the people who spent time for research in the natural habitat. The analysis is performed through aerial vehicle monitoring and by wildlife photographers. Remote monitoring uses modern-day devices such as cameras, GPS, and sensors to monitor and analyze wildlife. The most advanced technology in this field is automatic monitoring. It will aid in tracking the animals, providing detailed reports about their health, how it's being affected by the environment, and the changes in the animal's behavior, which will give valuable insights that these animals are on the verge of danger.This method has some advantages in remote areas; there is the issue of power supply, batteries, and maintenance of such equipment. But the use of this equipment is very cost-effective and gives valuable results compared to the other traditional methods.

These methods use cameras, sensors for audio. The techniques with these combinations of both audio and video are very much cost-effective. Their advantage is that these methods are long-term and require less human input. As the technology has improved a lot, these technologies are being used very commonly, which can reduce the cost by many folds, and thus we can maintain the wildlife in a much better manner as compared to the old traditional methods.

Visual observation methods:

These methods use the global positioning system and digital visuals. The use of this method has proven to be the most cost-effective and efficient method compared to the other methods. These methods provide an overall analysis of the data collected from different areas. The cameras with the ability to capture images in 2D and 3D are used to detect the animals. These techniques provide an excellent platform to detect animals and monitor their habitat without causing any danger to the animals and without any contact with them.

Big data is also being applied here to make sense of the data collected from these GPS and camera devices. These devices detect the animals and their tracks, which even contribute more to the safety of such animals and their habitat.

It's not like these habitats are just monitored but as the data is collected. This data is being processed in data science algorithms and also processed by big data technology to analyze it so that can take necessary actions promptly, and if there is some future event that can cause danger to the wildlife, that can also take promptly. The data plots of the GPS obtained after monitoring wildlife is represented in the Figure 1.

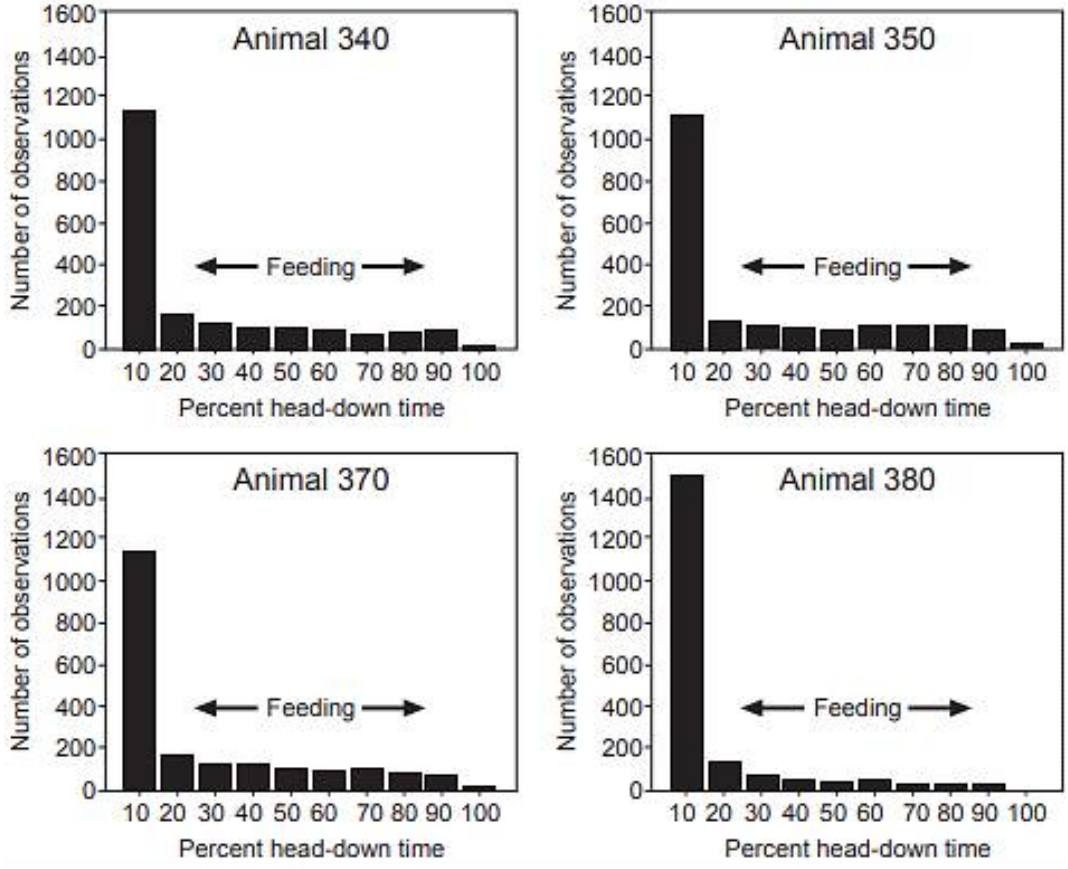

Figure 1: GPS Monitor plot for Wildlife

Figure 1 is representing the number of animals, whereas Table2 focused on the elk animal in specific under various habitats.

Habitat	Standardized residual for feeding during day	Standardized residual for feeding during night
Dense canopy white spruce	-1.3	0.4
Moderate canopy white spruce	2.4	0.2
Open canopy white spruce	1.2	1.6
Dense canopy ponderosa pine	-2.1	-2.0
Moderate canopy ponderosa spruce	-6.1	-3.7
open canopy ponderosa pine	-1.0	-1.3
Shrublands	-1.2	-3.4
Dense canopy aspen	-0.7	0.3
Moderate canopy aspen	-0.8	-0.8
Open canopy aspen	2.5	-0.8
Private (mostly grassland)	8.4	5.0
Grasslands	4.8	2.4

Table 2: Elk monitoring during the day and night timings

The following Figure2 shows the performance plot of the GPS for wildlife monitoring

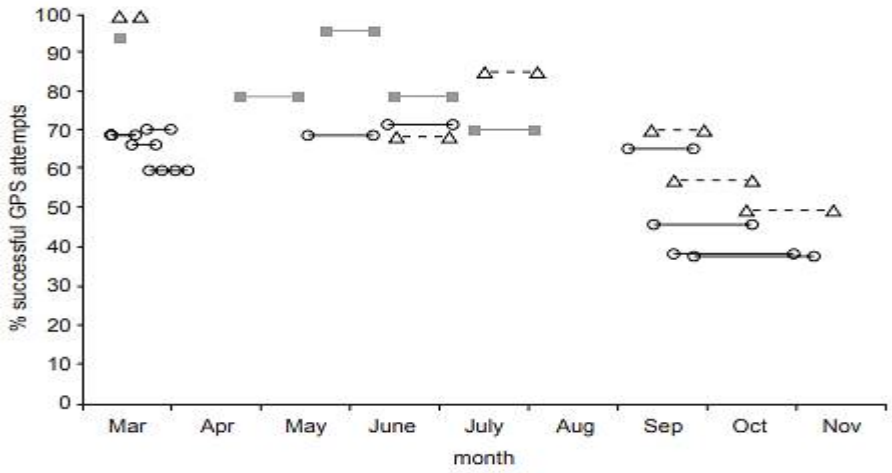

Figure 2: Performance Plot for annual monitoring

The GPS results for detection of MOOSE in different weathers is projected in the Figure 3.

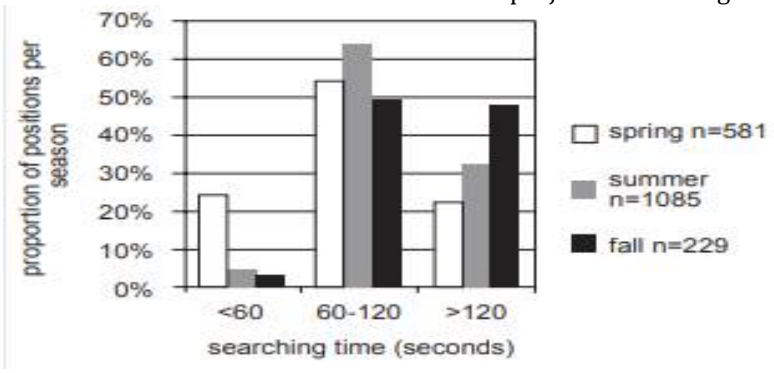

Figure 3: Monitoring of Moose

The data obtained after monitoring the deer from wildlife is given in Figure 4.

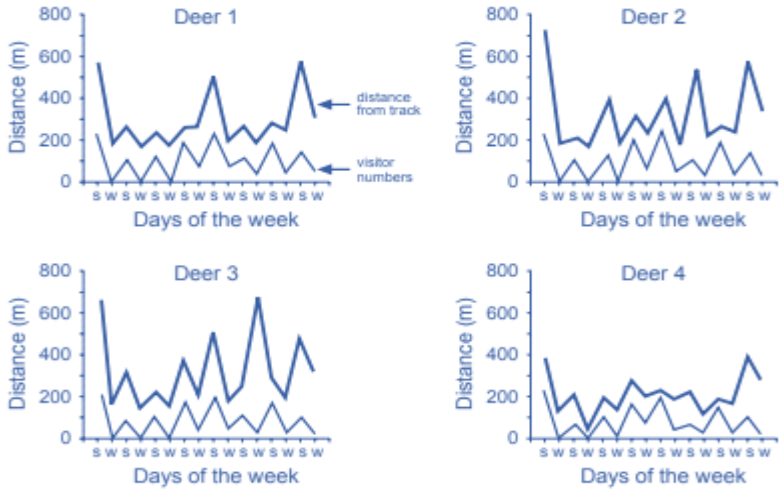

Figure 4: Deer monitoring using GPS

Principal of the global positioning system:

A total of twenty-four satellites are rotating around the earth which are broadcasting signals to the two frequency bands L1 and L2. More three high-frequency signals are also being added to improve the accuracy and visualization for military services as well as civilian purposes is given in Figure 5.

L1 signal is the CA code that is modulated to carry the information that is being used by the global positioning system receiver. The information is used by GPS to find out the position data, ephemeris data, and also almanac data. Each satellite exchanges the ephemeris data that is used to find out the exact position of each satellite that is orbiting the earth. This data can be used to find our position for almost 4-5 hours then the new data gets generated and this data becomes nearly invalid.

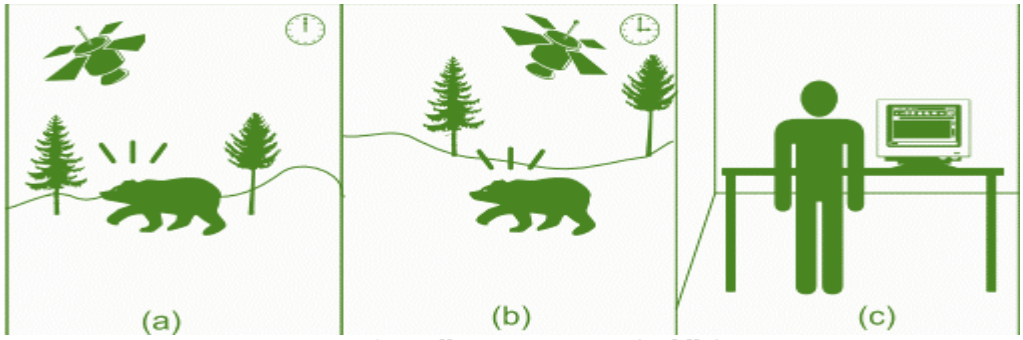

Figure 5: Satellite monitoring of wildlife

The main equation of the hyperplane used by the support vector machine algorithm is given in Equation (1).

F(Y)=zT*PHI(Y)+B (1)

The integrals are obtained by the following Equation (2).

A=integration(I(x,y)deltaA (2)

Delta A in the above equation is the area of the single-pixel and its scale is changeable. The following Equation (3) represents the mean of the image obtained by the sum of all the pixel values.

M=1/m*n(f(x,y) (3)

Satellite tracking:

The satellite tracking even though is more efficient but still, there is a need for improvements in this field. It has some advantages as well as some disadvantages. It provides real-time updates of the position with high accuracy. There is no need for labor to track the animals because once the satellite is deployed into the desired location it tracks the location on its own and the data can be stored and analyzed later with the built-in software and mathematical models.

One of the disadvantages of the satellite tracking system is that a lot of funds are depleted to get the data from the satellite. The average price to obtain data is nearly three thousand dollars. Then after obtaining the data, sources and funds are required for the processing of the data, and that alone costs up to five thousand dollars.

There are many methods in remote sensing such as:

- ARGOS tracking
- VHF
- Global Positioning Tracking (GPS).

The number of fixes that can be taken per day is very small by the ARGOS method is very small as compared to the GPS tracking system. The reason for that is the time window for ARGOS is very small.The other major drawback of these satellite tracking methods for wildlife is that large-sized batteries are required to keep the satellite working. This drawback can be removed by using solar plates on these satellites that can be very lightweight up to fifteen grams only.

CONCLUSION

In this research paper for the safety of the wildlife animals and wildlife habitat, some traditional methods and modern-day technologies are being discussed. Wildlife is on the verge of danger due to humans' hunting activities and climate change, affecting their lives, and many such species are going extinct. Many species have gone extinct over the past few years just because we didn't pay much attention to how the climate affects their lives.For these animals to not go extinct and maintain biodiversity, monitoring and controlling this wildlife habitat is required. One of the promising remote technologies that can monitor each animal, their habitat, and even their tracks can be detected, observed with the help of the global positioning system. The data is stored in this satellite which are monitoring such habits is then taken and processed to analyze the condition of the habit, number of a particular species in habitat and to take necessary actions to ensure their safety.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest for this study

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