Wildlife and Environmental Monitoring using Information Technology: An assessment Approach

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Abstract— In the course of earth evolution, there has been significant development related to human race. However, right from the Stone Age to the mobile age, the development is with respect to human beings only, his progress for making a comfortable life. Technology can help the animals and plants for their identification, monitoring and studying their behaviour pattern. Use of technology for Wildlife monitoring is a boon provided by the advances in the research; however extensive use of it may prove as a hindrance to the animal behaviour. The data gathered by Wildlife monitoring can be used for number of purposes viz visualisation, analysis, interpretation, prediction etc using various algorithms and tools. The paper is designed to study the role of Information technology and study various tools and strategies for their efficient Habitat monitoring.

Keywords—WSN, Eigenface algorithm, Nose printing, Infrared Technology, RFID, Information Technology (IT)

I. INTRODUCTION

After human evolution, it's the MAN –the only animal who has survived through various disasters. On this earth over the period of time, number of species came into existence and vanished- for instance dinosaurs. According to the Darwin's theory which states-Survival of the fittest-the best-survived species are human beings. Human beings have not only survived on this earth for thousands of years but have changed their life for better, a better today and a better tomorrow. There are other species also, they might be less powerful in terms of brain but are equally important for the balance of eco-system. Number of amendments is done in the Acts which are related to human beings per year as compared to, the amendments with respect to animals which is 1 amendment in 3-4 years. According to the research made by the scientists of WWF and Zoological park of London, the animal's population across the globe is just 50% of the original population which exists 40 years back. *"Living Planet Index"* indicates the sudden fall of animal population over the time period. Initially the wildlife conservation was not an serious issue. Deforestation, rapid climatic changes and hunger of human beings for acquisition of more land has created a need for wildlife conservation, with the technological advancements and increasing human concern about animals, it has been now possible to identify, monitor and understand the animals and thus various conclusions can be drawn from the analytical data. The following Objectives are kept in mind while designing the paper.

Objectives:
1. To understand the significance of wildlife and need to conserve it.
2. To study the role of IT in tracking and monitoring of animals.
3. To analyze the effectiveness of various IT strategies for animal identification.

II. BACKGROUND OF STUDY

Use of Information Technology in animal identification

Information technology and its various tools would play an important role in monitoring, cluster identification and study the distribution of wild animals. The capability of IT to sense the behaviour of the wild animals, and effects of surrounding environment on them would help to do the study in a better way the health and behaviour when studied in depth will lead to depth understanding of entire wild animals and eventually lead to improvement in their lifetime. As mentioned earlier, tools and strategies pertaining to IT, can help to understand the behaviour of the animals and thus will help in their conservation also. The paper aims to give answer to the following queries:

1. How IT can help in tracking and monitoring of animals?
2. What are the pros and cons of using various IT tools?
3. How IT can support for wildlife conservation?
4. What factors are considered while selection of IT tools and strategies for animal monitoring.
5. What role IT can perform in identifying the behavior of animals.
6. Is it necessary to monitor wildlife by implementing various devices?
7. Do we need an effective Automated Habitat monitoring system which applies and enforces the Government law?

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There are number of technologies that can be applicable to animal of any type, such as terrestrial, aquatic and aerials birds. These technologies involve attachment or implantation of various devices. Using WSN, the environmental or physical conditions such as temperature, pressure, vibration, motion of wild animals can be studied. The sensor nodes are equipped with components like low capacity processor, sensing device, short range radio and limited battery. RFID was initially used as animal identification system [12], in the year 2010 as Farm management process for cattle's, later on it was implemented for wildlife for its conservation. For the selection of IT tool, number of factors are considered which includes Habitat range, type of animals(for example passive acoustic system or Ultrasound devices is meant for tracking of aquatic animals), animal population, distribution region, movement patterns, size of animals, trade in animals etc.[13]

III. LITERATURE REVIEW

To track the moving objects like wild animals, researchers have formulated an estimation of signals which calculates the time dependent measurements to represent the location and the characteristics of the target [1]. Also, it is been noted that the sea-bird colonies are very sensitive to human presence which leads to decline in their breeding, the entire race of sea birds may get abandon if the disturbance is continual.[1] With the use of WSN, human beings need not to be physically present for animal monitoring, thus minimizing the impact of human presence on animal society. [6] As research has also been done just to study the impact of the transportation infrastructures have significantly negative impact on the animal wildlife.[2] . To monitor animals initially collar belts were attached to the neck of the animal, which leads to have an negative impact on the animals behaviour. To overcome impact of human presence on the animals and plants, WSN has played an important role [3] To monitor the behaviour of Deer's, a WSN based system called as DeerNet is being implemented. However, such system monitors the behaviour but animal diseases cannot be detected and diagnosed further. [7]

IV. RESEARCH METHODOLOGY

As per is [25], the Research methodology is a way to systematically solve the research problem. Also, it comprises of various dimensions such as research methods/techniques, develop certain tests, assumptions underlying various techniques, evaluate his basis of research decision etc. A vast research is done in the area of Wildlife and Habitat monitoring using IT tools and strategies. The research methodology followed differs from research to research, however, Experimental, diagnosis and descriptive, kinds of research are used in majority. Along with it some research is purely a formal; some may use simulation or kind of research. An experimental approach, involves the researcher to alter systematically the variables of interest and observe the changes as per [26] is adapted in research paper [1], [4],[5],[8] and many other. Conceptual research involves development of new theories and ideas which is specified in [10]. The field of research with animal involvement may use combination of several research methods also a single research type can also used. The type of research to be implemented depends on the research scope, objectives region, animals, budget, region, research feasibility availability of required resources and number of factors which directly or indirectly affects the research. We have adapted Formal research technique for writing this research paper which gives insights about use of Information Technology for the management of wildlife for its conservation.

Animals' identification and monitoring is critical as it involves use of different technologies which have pros and cons of using it. Some technologies which involve attachment of physical devices to animals weigh 5% of animals body. But, piercing animals just for the sake of monitoring seems to be unacceptable. The behaviour of the animals due to such piercing may affect their routine. Also, there are many other technologies such as WSN and GPS requires frequent battery charging. To overcome all such disadvantages we can use other technologies such as Animal tattooing, nose printing, ear tags, freeze branding, Electronic identification, paint branding[5] An per the experiment conducted on 350 cows [8], Nose printing is a simple technique which can easily identify the animals using simple stamping pad later on these nose print can be analysed using Eigenface algorithm which was previously used identify human finger prints.[9] Also, as per [10], a complete automated system for the Cattle identification using their muzzle images is well described.

The body temperature of animals varies from each other. Also, they can maintain the normal temperature by involving in number of activities such as running, wallowing in mud, taking shade etc. The high temperature in an animal is indicator of his ill health. The body temperature shows a significant change when the animal is unwell, such temperature variation can be noted using "Infrared "technology. Moreover, it helps us to monitor of body temperature, injuries, inflammation, diseases, general behaviour etc. [4] It involves use *Infrared Cameras* also called as *Thermal Imaging cameras* which can effectively monitor the animal as well as their physiological behaviour. It is possible to carry the sample animals in the Investigative laboratory and study the change in behaviour when in normal and ill health. The thermal cameras will help us to know the animal health status. Also, it can be collaborated with the animal identification system , so that we will come to know the Life history of the animals. The animal identification system will be highly dependent upon the stripes the animal possesses on his body and/or his nose prints. We thus need an animal identification system which not only identifies the animals but help in their monitoring and studying the behaviour pattern. The system should be adjoined with Animal Protection Law, so that whenever there is violation in the law, devices can intimate the concerned regulatory body.

V. CONCLUSIONS

Animal identification and monitoring system is the need of the hour, so much research is done on it, but many of its dimensions are yet to be unveiled.

The use of technology can reduces the risk of physically monitoring the animals, but in turn the animals are pierced for the sake of tagging them, which not affects the natural movement of the animals but also may be proved as brutal act by human beings. The study on the animals through the eyes of IT tools and strategies will help us the detect the problems in animal societies and help and support for their conservation. According to the literature review, its petty much clear that the Wildlife conservation using IT tools is the area which is yet to explored thoroughly. Scientists and Researcher needs to study this area in depth and give gift this World with a balanced Eco-system.

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