IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 4, April 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

9940 572 462 | 6381 907 438 | ijircce@gmail.com | www.ijircce.com

International Journal of Innovative Research in Computer and Communication Engineering

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

IoT Based Animal Tracking System

Prof.Vishwanath V K[1]Prof.Shryavani K[2], Sinchana B Gowdar[3], Sindhu R Pawar[4], Siri B A[5], Siri M Bankapur[6]

Assistant Professor, Department of Computer Science and Engineering, Bapuji Institute of Engineering and Technology, Davangere, Karnataka, India[1]

Assistant Professor, Department of Computer Science and Engineering, Bapuji Institute of Engineering and Technology, Davangere, Karnataka, India[2]

B.E Student, Department of Computer Science and Engineering, Bapuji Institute of Engineering and Technology, Davangere, Karnataka, India[3]

B.E Student, Department of Computer Science and Engineering, Bapuji Institute of Engineering and Technology, Davangere, Karnataka, India[4]

B.E Student, Department of Computer Science and Engineering, Bapuji Institute of Engineering and Technology, Davangere, Karnataka, India[5]

B.E Student, Department of Computer Science and Engineering, Bapuji Institute of Engineering and Technology, Davangere, Karnataka, India[6]

ABSTRACT: Wild animals are becoming endangered and eventually extinct due to human activities. Hence it is important to protect the life of wild animals. Here we are making an attempt to propose a project which tracks Wild animals using IoT and Cloud Technologies. This project aims at designing an Animal tracking system. The tracker will be a device bundled with few sensors and an Arduino or Raspberry pi board which collects the sensor signals and sends to the cloud system which is attached to the body of an animal. This tracker will be continuously sending the information of the animal with respect to the GPS defined boundaries. Based on the data received by the tracker system, an application residing at the cloud will process and alerts the respective authorities, in case of any emergency for the animal via the web app/android app. The application also consists of a dashboard to display the various statistics of the wild animals. Our proposed project would find beneficial for monitoring wildlife related complexities like poaching, railway and roadway accidents, destruction of vegetation and threat to life on the straying of wild animals out of their habitation area.

KEYWORDS:GPS, Animal tracking, Real-time monitoring, Sensor technology, Wireless communication, Animal movement.

I. INTRODUCTION

The use of IoT technology has been rapidly growing in various industries, including agriculture and livestock management. One application of this technology is in animal tracking systems, which provide real-time monitoring and tracking of animals for improved management and welfare.

An IoT-based animal tracking system is a solution that uses various IoT devices, such as GPS collars, sensors, and cameras, to collect and transmit data on the animal's location, behavior, and health to a central server or cloud platform. The system offers a comprehensive solution for animal management, providing valuable insights on the animal's movement patterns, feeding habits, and overall health, enabling the owners or managers to make informed decisions.

The benefits of an IoT-based animal tracking system are numerous, including improved animal welfare, increased productivity, and enhanced operational efficiency. For instance, tracking animals' movements enables owners or managers to identify any changes in behavior that could indicate illness or injury, enabling them to take appropriate action promptly.

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

Moreover, the system can also help identify the best grazing areas, monitor feeding and watering habits, and detect any environmental changes that may affect the animal's well-being. This technology can also improve the traceability of animal products, ensuring that food safety regulations are met.

In conclusion, IoT-based animal tracking systems offer a practical and efficient solution for animal management, enabling real-time tracking and monitoring of animals, improving their safety and health, and providing valuable insights for informed decision-making.

II. LITERATUE SURVEY

In order to get required knowledge about various concepts related to the present application, existing literature was studied. Some of the important conclusions were made through those are listed below.

1. **"IoT Based Smart Animal Tracking System using RFID Technology"** by N. N. Nikam et al. This paper presents an IoT-based animal tracking system using RFID technology. The paper "IoT-Based Animal Tracking System: A Review" provides a comprehensive review of existing literature on IoT-based animal tracking systems. The authors discuss the various technologies and techniques used in these systems, including GPS, RFID, and sensors that monitor movement, temperature, and other aspects of animal behavior. The paper also discusses the applications of IoT-based animal tracking systems, including wildlife conservation, livestock management, and pet tracking. The authors highlight the potential benefits of these systems, such as improved animal welfare, disease prevention, and increased productivity in the agricultural sector. The review also discusses the challenges associated with implementing IoT-based animal tracking systems, such as issues related to data privacy and security, battery life of tracking devices, and the need for reliable communication networks in remote areas. The authors suggest that future research should focus on the integration of machine learning and artificial intelligence techniques for data analysis, the development of more energy-efficient tracking devices, and the improvement of communication networks in remote areas.

2. **"Real-time animal behavior monitoring using IoT and machine learning"** by B. R. Suresh and S. S. Guruprasad. This paper presents an IoT-based animal behavior monitoring system that uses machine learning techniques for real-time data analysis. The sensor device is equipped with an accelerometer and a gyroscope to detect the animal's movements, and it uses Bluetooth Low Energy (BLE) technology to communicate with the central server. The authors also propose the use of machine learning algorithms to analyze the sensor data and detect abnormal behavior that may indicate a health issue or an escape attempt. The proposed system allows animal owners or caretakers to monitor the animal's behavior remotely in real-time using a mobile application that connects to the central server. The authors suggest that this system could be useful for various applications, such as tracking the health of livestock and monitoring the behavior of wild animals. The paper also discusses the challenges associated with implementing IoT-based animal behavior monitoring systems, including issues related to data privacy and security. The authors propose several solutions to these challenges, such as the use of encryption and authentication protocols to secure data transmission. In conclusion, the paper presents a comprehensive overview of an IoT-based system for real-time animal behavior monitoring. The authors highlight the potential benefits of such systems for animal welfare and management and suggest several future research directions, such as the development of more accurate and energy-efficient sensor devices and the integration of multiple sensor modalities for more comprehensive monitoring

3. **"A review on IoT-based animal health monitoring system"** by N. Singh and R. Singh. This paper focuses on the use of IoT-based animal tracking systems for animal health monitoring. The paper "A review on IoT-based animal health monitoring system" provides a comprehensive review of existing literature on IoT-based animal health monitoring systems. The authors discuss the various technologies and techniques used in these systems, including sensors that monitor various aspects of animal health such as body temperature, heart rate, and rumination behavior. The paper also discusses the applications of IoT-based animal health monitoring systems, including disease detection and prevention in livestock and pet animals. The authors highlight the potential benefits of these systems, such as early detection of health issues, reduced veterinary costs, and improved animal welfare. The review also discusses the challenges associated with implementing IoT-based animal health monitoring systems, such as issues related to data privacy and security, the need for reliable communication networks, and the cost and complexity of sensor devices. The authors suggest that future research should focus on the integration of machine learning and artificial intelligence techniques for data analysis, the development of more accurate and reliable sensor devices, and the improvement of communication networks in remote areas.In conclusion, the paper provides a valuable overview of IoT-based animal health monitoring systems and highlights the potential benefits and challenges associated with these systems. The

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

review can serve as a useful resource for researchers and practitioners interested in developing and implementing IoT-based animal health monitoring systems.

4. **"IoT-based animal tracking system for livestock management"** by A. Kaur et al. This paper presents an IoT-based animal tracking system for livestock management that uses a combination of RFID and GPS technologies. The system is designed to monitor the location and health status of animals, and to provide real-time alerts to farmers in case of any abnormal activity. This paper presents an IoT-based animal tracking system for livestock management that uses a combination of RFID and GPS technologies. The system is designed to monitor the location and health status of animals, and to provide real-time alerts to farmers in case of any abnormal activity. The authors tested the system on cows and found that it could accurately track their location and health status. The system is composed of three main components: the animal tracking device, the gateway, and the cloud-based server. The animal tracking device is a small electronic device that is attached to the animal and is capable of collecting data on the animal's location, temperature, and activity level. The gateway is responsible for collecting data from the tracking devices and transmitting it to the cloud-based server. The cloud-based server stores and processes the data and provides farmers with a user-friendly dashboard to view the information. The authors conducted several experiments to evaluate the performance of the system, including measuring the accuracy of the location tracking and the battery life of the tracking devices. The results showed that the system was able to accurately track the location of animals in real-time, and the tracking devices had a long battery life.

5.

6. **"IoT-Based Animal Tracking System: A Review"** by D. V. Dugad, V. B. Bhise, and N. N. Mhala. This paper provides a comprehensive review of the IoT-based animal tracking system. The authors discussed various aspects of animal tracking such as animal behavior monitoring, animal location tracking, and animal health monitoring. It is a review paper that discusses various aspects of IoT-based animal tracking systems, including animal behavior monitoring, animal location tracking, and animal health monitoring. The paper presents an overview of the different sensors and devices used in these systems, the communication protocols used to transmit data, and the different data analysis techniques used to extract useful insights. The authors also discuss some of the challenges and opportunities associated with IoT-based animal tracking systems.

7. The paper **"Animal monitoring based on IoT technologies"** by Deepa, Vitur, Navaneeth, and Vijayrathinam S. discusses the development of an IoT-based animal monitoring system. The authors propose a system that integrates various sensors and devices to monitor different aspects of animal behavior, including movement, temperature, and heart rate. The paper discusses the use of wireless communication technologies such as Bluetooth and Wi-Fi to transmit data from the sensors to a central server for storage and analysis. The proposed system also includes a mobile application that allows animal owners or caretakers to monitor the animal's behavior remotely in real-time. The authors suggest that this system could be used for various applications, such as monitoring the health of livestock or tracking the movement of wild animals in their natural habitats. The paper also discusses some of the challenges associated with implementing IoT-based animal monitoring systems, including issues related to data security, power management, and network connectivity. The authors propose several solutions to these challenges, including the use of secure communication protocols and the optimization of power consumption in the sensors and devices.

8. The paper **"Movement Monitoring of Pet Animal Using Internet of Things"** proposes an IoT-based system to monitor the movement of pet animals. The authors describe the system architecture, which consists of a wearable sensor device attached to the pet's collar, a gateway device that collects data from the sensor, and a cloud-based server that stores and analyzes the data. The sensor device is equipped with an accelerometer and a gyroscope to detect the pet's movements, and it uses Bluetooth Low Energy (BLE) technology to communicate with the gateway device. The authors also propose the use of machine learning algorithms to analyze the sensor data and detect abnormal movements that may indicate a health issue or an escape attempt. The proposed system allows pet owners to monitor their pets' movement in real-time using a mobile application that connects to the cloud-based server. The authors suggest that this system could be useful for various applications, such as tracking the exercise levels of pets and detecting abnormal behavior that may indicate a health issue. The paper also discusses some of the challenges associated with implementing IoT-based animal monitoring systems, including issues related to data security and privacy. The authors propose several solutions to these challenges, such as the use of encryption and authentication protocols to secure data transmission.

9. The paper **"Animal monitoring based on IoT technologies"** proposes an IoT-based system for monitoring the behavior of animals. The authors describe the system architecture, which includes various sensors and devices that

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

monitor different aspects of animal behavior such as temperature, heart rate, and movement. The data from these sensors are transmitted wirelessly to a central server for storage and analysis. The authors suggest that this system could be useful for various applications, such as monitoring the health of livestock and tracking the movement of wild animals. The proposed system also includes a mobile application that allows animal owners or caretakers to monitor the animal's behavior remotely in real-time. The paper discusses the use of various communication technologies such as Bluetooth and Wi-Fi to transmit data from the sensors to the central server. The authors also propose solutions to some of the challenges associated with implementing IoT-based animal monitoring systems, including issues related to data security and power management.

10. The paper **"Real-time animal tracking using IoT and machine learning"** by S. Sahoo et al. (2019) describes a system for tracking animals in real-time using Internet of Things (IoT) and machine learning (ML) technologies. The system consists of a network of sensors that collect data on the animal's movements and behavior, which is transmitted to a central hub for processing. The data is then analyzed using ML algorithms to generate insights into the animal's behavior and habitat preferences. The authors note that traditional animal tracking methods are often invasive and can disrupt the animal's natural behavior, whereas the IoT and ML-based approach is non-invasive and can provide more accurate and detailed information on the animal's movements. The paper also discusses the challenges associated with implementing such a system, including the need for reliable connectivity in remote locations, as well as issues related to data privacy and security. Overall, the authors conclude that IoT and ML-based animal tracking systems have the potential to significantly improve our understanding of animal behavior and help inform conservation efforts.

11. The paper **"An IoT-based solution for animal tracking and monitoring"** describes an IoT-based system for tracking and monitoring livestock animals. The authors present a solution that utilizes GPS and RFID technologies to track the location of animals and collect data on their behavior and health. The system consists of a collar worn by the animal, which contains GPS and RFID sensors, and a gateway device that communicates with the collar and collects data from multiple animals. The data collected includes the animal's location, body temperature, and activity level. The authors discuss the potential applications of the system, including disease detection and prevention, livestock management, and improved animal welfare. They highlight the benefits of using an IoT-based system, such as real-time monitoring, reduced labor costs, and improved accuracy in data collection. The paper also discusses the challenges associated with implementing an IoT-based animal tracking and monitoring system, such as issues related to data privacy and security, and the need for reliable communication networks in remote areas.In conclusion, the paper provides a detailed overview of an IoT-based solution for animal tracking and monitoring, and highlights the potential benefits and challenges associated with such systems. The paper can serve as a useful resource for researchers and practitioners interested in developing and implementing IoT-based animal tracking and monitoring systems.

12. **"IoT-based animal monitoring and tracking system using a smart collar"** is a research paper published in 2018 by H. Han et al. The paper proposes the development of an Internet of Things (IoT) based system for monitoring and tracking animals using a smart collar. The smart collar is equipped with various sensors such as GPS, temperature, humidity, and accelerometer sensors. These sensors collect data on the animal's location, health status, and behavior, which can be transmitted to a cloud-based server through a wireless communication module. The system consists of three main components: the smart collar, the gateway, and the cloud-based server. The smart collar is worn by the animal and is responsible for collecting and transmitting the data. The gateway is responsible for collecting the data from multiple smart collars and forwarding it to the cloud-based server. The cloud-based server is responsible for storing, processing, and analyzing the data, which can be accessed by authorized users through a web-based interface. The proposed system has several potential applications, such as monitoring the health and behavior of livestock animals, tracking the movements of endangered species, and managing the behavior of pets. The system can also help in preventing the spread of diseases among animals, detecting abnormal behavior or health conditions, and identifying the causes of livestock mortality.

1. The paper **"Wireless Sensor Network Based Animal Tracking System for Wildlife Conservation"** by P. Jayakumar et al. describes the design and implementation of a wireless sensor network (WSN) based animal tracking system for wildlife conservation. The authors discuss the various challenges associated with tracking wildlife, such as the need for continuous monitoring, the difficulty of tracking animals in remote areas, and the risk of disturbing the animals' natural behavior. They propose a WSN-based system as a solution, which consists of several sensor nodes that are deployed in the area of interest to collect data on the animals' movements. The authors describe the hardware and software components of the system, which include the sensor nodes, a base station, and a database management system.

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

They also explain the communication protocol used by the system and the algorithms used for data processing and analysis. The paper presents the results of a field trial conducted to evaluate the performance of the system. The trial involved tracking the movements of a group of elephants in a forested area. The authors demonstrate that the system is capable of accurately tracking the elephants' movements and generating real-time alerts when the animals leave their designated area. Overall, the paper concludes that the WSN-based animal tracking system has the potential to be a valuable tool for wildlife conservation efforts. It provides a non-invasive method of monitoring animals in their natural habitats, which can help researchers and conservationists to better understand animal behavior and develop effective conservation strategies.

2.1Literature Review Summary

The literature review on IoT-based animal tracking systems highlights the various technologies and techniques used in these systems, including GPS, RFID, and sensors that monitor movement, temperature, and other aspects of animal behavior.The reviews discuss the applications of IoT-based animal tracking systems, including wildlife conservation, livestock management, and pet tracking. They highlight the potential benefits of these systems, such as improved animal welfare, disease prevention, and increased productivity in the agricultural sector. The reviews also discuss the challenges associated with implementing IoT-based animal tracking systems, such as issues related to data privacy and security, battery life of tracking devices, and the need for reliable communication networks in remote areas. Overall, the literature reviews suggest that future research should focus on the integration of machine learning and artificial intelligence techniques for data analysis, the development of more energy-efficient tracking devices, and the improvement of communication networks in remote areas. The reviews provide a valuable resource for researchers and practitioners interested in developing and implementing IoT-based animal tracking systems

III. COMPONENTS USED

1. ESP32 Beam V1.1 ESP32 868Mhz Development board: ESP32 Beam V1.1 is a development board that is based on the ESP32 microcontroller. The ESP32 is a low-cost, low-power microcontroller that is designed for use in a variety of IoT (Internet of Things) applications. The ESP32 Beam V1.1 development board is specifically designed for use with the 868 MHz frequency band, which is commonly used for low-range wireless communication.
Some of the features of the ESP32 Beam V1.1 development board include:

- Support for both WiFi and Bluetooth connectivity
- A built-in OLED display for displaying data and information
- A variety of input and output (I/O) pins for connecting sensors and other peripherals
- Support for Arduino programming, allowing users to easily write and upload code to the board

2. GSM 7000G: GSM 7000G is a type of GSM (Global System for Mobile Communications) module. GSM is a standard for wireless communication that is used by mobile phones and other devices to transmit and receive data over a network. The GSM 7000G module is a device that is specifically designed to transmit and receive data using the GSM standard.
Some of the features of the GSM 7000G module include: • Support for 2G (GSM/GPRS) and 3G (WCDMA) communication

- A built-in SIM card slot for connecting to a mobile network
- A variety of input and output (I/O) pins for connecting sensors and otherperipherals
- Support for SMS (short message service) and data transmission.

3. GPS-NEO 6M-GPS-NEO 6M is a type of GPS (Global Positioning System) module that isdesigned for use in a variety of applications, including drones, robots, and other automated systems. The module is based on the NEO-6M GPS chip, which is a high-performance GPS receiver that is capable of tracking up to 22 satellite channels.Some of the features of the GPS-NEO 6M module include:

- High accuracy: The NEO-6M GPS chip is capable of providing position and time information with an accuracy of up to 2.5 meters.
- Low power consumption: The module is designed to be energy-efficient, allowing it to operate for long periods of time on small batteries or other low-power sources.
- Easy to use: The module is easy to integrate with a variety of systems andincludes a range of output options, including serial, 12C, and pulse-per-second (PPS).

International Journal of Innovative Research in Computer and Communication Engineering

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

IV. PROPOSED METHODOLOGY

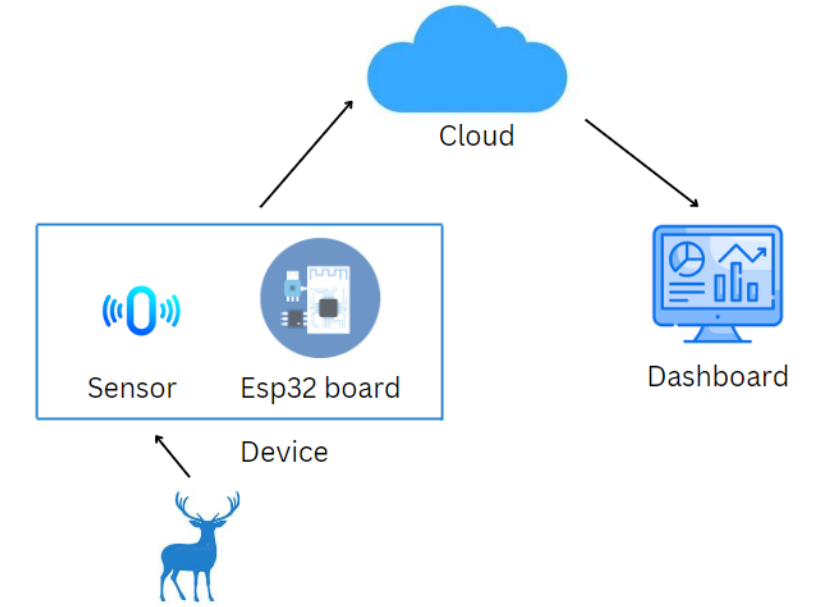

Fig4.1: Block diagram of the system

The system consists of esp32 board, sensors and dashboard as shown in the fig 4.1 . A collar device is put on the animal, this device contains the esp32 board and sensors. It contains a gps sensor that continuously tracks location in real time. The data collected from the sensor is sent to the cloud. The data is further analyzed and presented as the dashboard.

The workflow of the system as follows:

- Data collection:

IoT device with sensors such as GPS trackers is attached to animals to collect data on their location, movement and behavior. This data is transmitted to a cloud-based platform.

- Data processing:

The data collected from the device is processed and analyzed.

- Storage:

The processed data is then stored in cloud-based database for the long storage and retrieval

- Data visualization:

Once the data is processed and stored, it is visualized using dashboard.

- Data sharing:

The data can be shared with different stakeholders, such as researchers, wildlife managers, and government agencies, for provisioned by using the application.

The device collects location data for every instance. A SMS alert is also sent to the registered number when the animal crosses a predefined boundary. The alert indicates that the animal is outside the boundary and also sends its current location in order to track the animal. This helps respective officials to protect them and take decisions.

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104238 |

V. CONCLUSION

IoT based animal tracking devices offer a powerful tool for monitoring and managing wildlife populations. By leveraging advanced sensors and communication technologies, these devices can provide real-time data on animal movement, behavior, and environmental conditions, allowing researchers and conservationists to make informed decisions about conservation and management strategies.However, it is important to note that IoT based animal tracking devices also raise concerns about data privacy and security, as well as ethical considerations around animal welfare. Therefore, it is essential to carefully evaluate the potential risks and benefits of implementing such devices before deploying them in the field. Overall, IoT based animal tracking devices hold tremendous potential for enhancing our understanding of wildlife behavior and improving conservation efforts. However, it is critical to approach their implementation with caution and care to ensure that they are used in an ethical and responsible manner.

REFERENCES

1. "IoT Based Smart Animal Tracking System using RFID Technology" by N. N. Nikam,2021.
2. "Real-time animal behavior monitoring using IoT and machine learning" by B. R. Suresh and S. S. Guruprasad,2021.
3. "A review on IoT-based animal health monitoring system" by N. Singh and R. Singh,2020.
4. "IoT-based animal tracking system for livestock management" by A. Kaur et al. This paper presents an IoT-based animal tracking system for livestock management that uses a combination of RFID and GPS technologies,2020.
5. "IoT-Based Animal Tracking System: A Review" by D. V. Dugad, V. B. Bhise, and N. N. Mhala.
6. The paper "Animal monitoring based on IoT technologies" by Deepa, Vitur, Navaneeth, and Vijayrathinam S,2020.
7. The paper "Movement Monitoring of Pet Animal Using Internet of Things" proposes an IoT-based system to monitor the movement of pet animals,2019.
8. The paper "Animal monitoring based on IoT technologies" proposes an IoT-based system for monitoring the behavior of animals,2019.
9. The paper "Real-time animal tracking using IoT and machine learning" by S. Sahoo et al,2019.
10. The paper "An IoT-based solution for animal tracking and monitoring" describes an IoT-based system for tracking and monitoring livestock animals,2018.
11. "IoT-based animal monitoring and tracking system using a smart collar" is a research paper published in 2018.
12. The paper "Wireless Sensor Network Based Animal Tracking System for Wildlife Conservation" by P. Jayakumar,2018.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.379

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details