IOT-based Secure Video Content Detection System for Stray Animals

Abstract :

The increasing presence of stray animals in urban and rural environments has raised significant concerns for human populations worldwide. Stray animals, including dogs, cats, and other domesticated animals, often lack proper care, leading to potential risks such as disease transmission, attacks, and accidents. With the help of technology, it is possible to solve the problem of stray animals. Nowadays the CCTV cameras are placed everywhere. The videos are used to control crime and to help humans. These videos can be used for identification of stray animals to provide necessary information to NGO's, government authorities. The traditional method to control stray animals are catch-and-kill, trap-neuter-return (TNR) programs. Computer vision-based secure system may help to protect stray animals from accident. The aim of system is to support Government officials, provide accurate data to NGO and volunteer to save stray animals and provide safe environment without harming them. The present invention is directed towards a video content detection-based system to save stray animals from accidents and to take care of the animals by using object detection and geo-tagging technologies.

Keywords: Video content detection, IoT, Stray animals, NGO

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I. Introduction

People's attention has been drawn to the issue of stray animals, which has become a concern for humans. There are countless varieties of pets now that they have been domesticated and reproduced. People may easily buy dogs for fashion or a whim because there are so many pet businesses and puppy shops. People may give up their dogs due to boredom, growing older, disease, handicap, or other factors because it can be challenging to care for or train them. Hence, the stray animals like dogs, cats and cows roam in the roads and other areas without any guidance and unfortunately 20% of the stray animals meet with accidents primarily on roads or sometimes due to improper nutrition and care, these animals die on the roads which further causes several issues in society. The stray dog's numbers are not known to Municipal Corporation which is a big hurdle in their control. Also stray animal cause accidents on road which harmful for animals as well as people. Proposed system will generate real time data of stray animals using CCTV cameras. The system implemented using CNN based classification model for animal detection and generating geo tag images.

II. Related Work

Stray animal overpopulation poses serious global issues, impacting communities, environment, and health due to uncontrolled reproduction. Consequences include accidents, diseases, and predation. Control methods like contraception, trap-neuter-return, and more have pros and cons. Solutions involve animal rights laws, medical care, shelter, and reproductive control, while public health agencies regulate disease prevention and hygiene. Laws should encompass care, shelter, and rights of strays. Education and community involvement are crucial for effective management, while public health agencies must regulate hygiene and disease control to address stray animal-related issues [1-3].

A business model is proposed which aims to prevent malnutrition and starvation in stray animals through IoT technology and supervised learning for distributing region-specific food. The limitations of the system is connecting peers and monitoring is difficult [4]. Recognizing the need for comprehensive solutions, this study reviews existing strategies and practices employed globally to mitigate the issue of stray animals. These solutions range from traditional methods like catch-and-kill programs to more humane approaches such as trap-neuter-return (TNR) programs and responsible pet ownership campaigns. The evaluation is done with the effectiveness, advantages, and limitations of these approaches and emphasizes the importance of a holistic and context-specific approach in tackling the problem [5-7].

Furthermore, the critical role of governmental agencies, non-governmental organizations, and local communities in developing and implementing sustainable solutions is given in this paper. Collaboration among stakeholders is crucial for addressing the root causes of stray animal populations, including irresponsible pet ownership, lack of awareness, and inadequate animal welfare infrastructure [8].

The Monitoring applications based in IoT is proposed to help animals and keep records of environments. However, work was based on environment by monitoring air or water quality, atmospheric or soil conditions and not specifically for animals. [9].

III. IOT-based Secure Video Content Detection System

Here, an innovative solution for addressing the challenges of managing and assisting stray animals using Internet of Things (IoT) technology. By developing a comprehensive system that combines IoT devices with the expertise of Non-Governmental Organizations (NGOs), Municipal Corporation and volunteers. This approach aims to improve the well-being of stray animals through early detection, effective monitoring, and timely intervention [10].

The system work on videos from CCTV cameras and identify the stray animals. After indentification the classification will be done to provide specified animal data with geo tagged images . The overall system will be monitored through mobile app which provide interface and connectivity to NGO, Civic body like municiple corporation and cowsheds. The details of every module is given shown in figure 1.

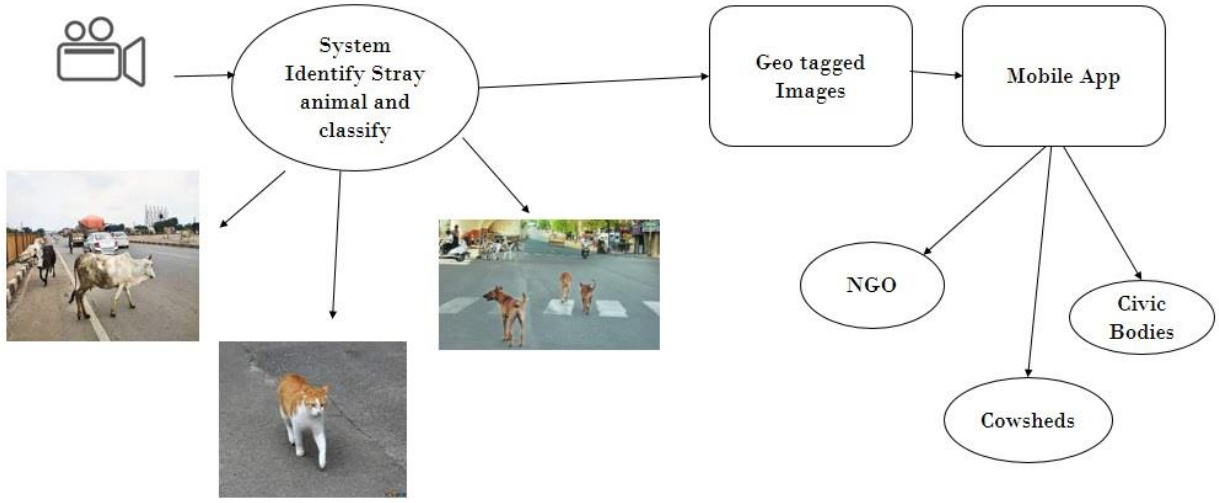

Figure 1: Overall Monitoring System

The increasing population of stray animals in urban and rural areas has raised concerns about their welfare and the potential impact on public health and safety. IoT technology offers a novel way to tackle this issue by creating a network of connected devices that can detect, track, and assist stray animals. Components of the IoT based Stray animal's detection and assistance system.

IV. The proposed system comprises the following interconnected components:

- **Sensors Nodes**: Strategically positioned across areas with high stray animal presence, sensor nodes consist of cameras, infrared sensors, and microphones. These nodes gather data related to animal movement, behavior, and vocalizations.
- **Data Processing Units**: Installed within each sensor node, these units process the collected data using deep learning based algorithms for animals detection and behaviors analysis. With the help of CNN algorithm the classification and detection of animals will be done with accuracy.

- **Communication module**: Sensor nodes are equipped with communication capabilities to transmit relevant data, including images, audio snippets, and detection alerts, to a centralized database with cloud server.
- **Android App**: The cloud server data will give input to android app, the app will provide interface for all responsible connected members. The app will ensure easy access with real time data analysis.
- **NGO, Municipal Corporation Interface:** The access of intuitive interface that provides real time insights into stray animals movements, behaviors trends and potential risks will be given to NGO, Municipal Corporation and other involved volunteers.
- **Collaborative efforts**: Collaboration with people is paramount to the success of this system. Animal welfare expertise, local knowledge, and community networks to complement the technological aspects is major aim of this system. They can utilize the collected data to implement targeted rescue operations, vaccination drives, and adoption initiatives.

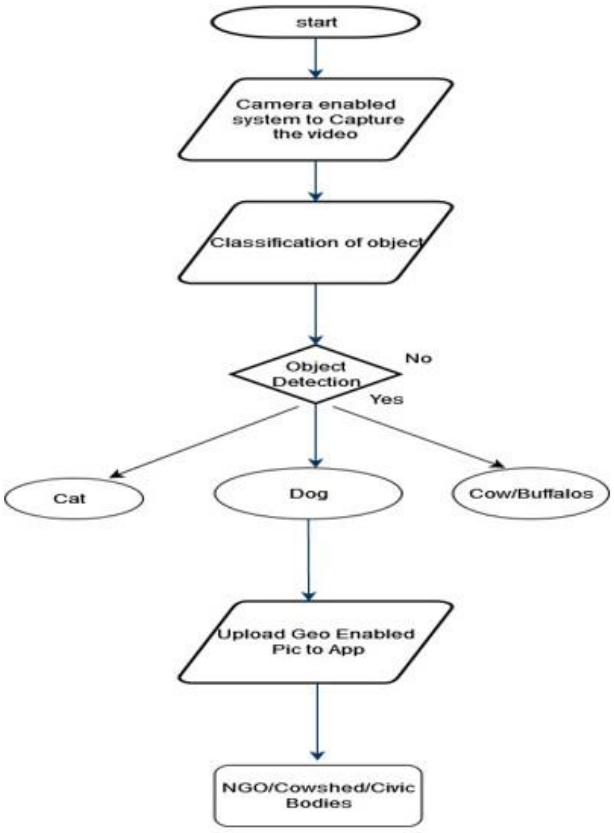

Figure 2: Flowchart of system

V. Benefits :

- **Early detection and intervention**: Timely alerts enable NGOs, municipal corporation people and volunteers to respond swiftly to animals in distress, reducing suffering and risks.
- **Resource optimization**: With real time data about stray animals type and health condition helps in optimizing resource allocation for maximum impact.
- **Public Participation** : The success of any system is based on accessibility of data to maximum people, in this system public can get involved in reporting and assisting stray animals, fostering a sense of community responsibility.

VI. Challenges:

- **Data**: Sensitive animal data and public spaces information privacy and security.
- **Power Supply**: Continuous power supply to the devices for capturing videos and sensor operations.
- **Community Engagement**: Integrating educational campaign and community involvement to foster compassion and awareness.
- **Efficiency**: The real time video processing and identification of animals through CNN based algorithm requires high computation power.

VII. Results with Discussion

The results will be real time data with accurate detection of animals. The data and location will help in protecting stray animals, giving them shelter homes and providing necessary medical support through government agencies. The Wire frame of proposed android app is shown in figure 3.

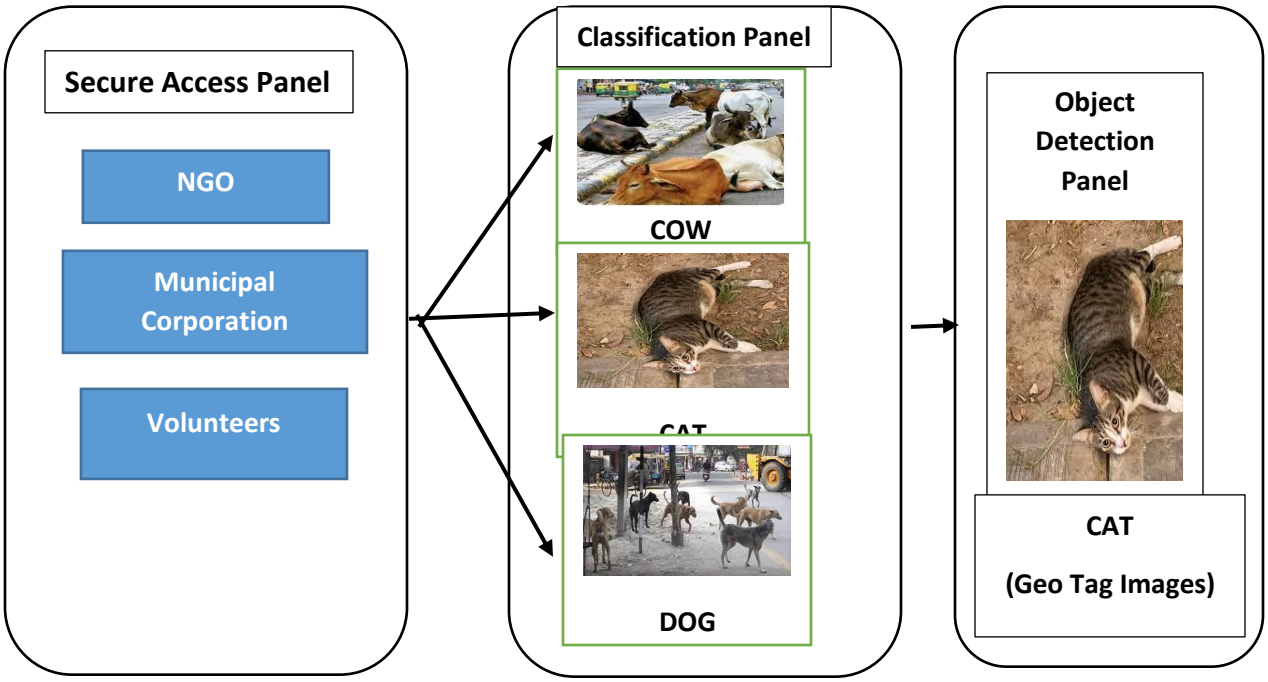

Figure 3: Android App Interface

VIII. Conclusion

The concern of stray animals poses complex challenges for human societies, necessitating a proactive and adaptable approach. By analyzing the multifaceted nature of the issue, this paper advocates for the implementation of humane and long-term strategies that prioritize animal welfare, public health, and social harmony. It is hoped that this work will contribute to the ongoing discourse surrounding the plight of stray animals. By leveraging technology and the expertise of NGOs, this system has the potential to improve the lives of stray animals, promote community engagement, and contribute to more humane urban and rural environments.

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