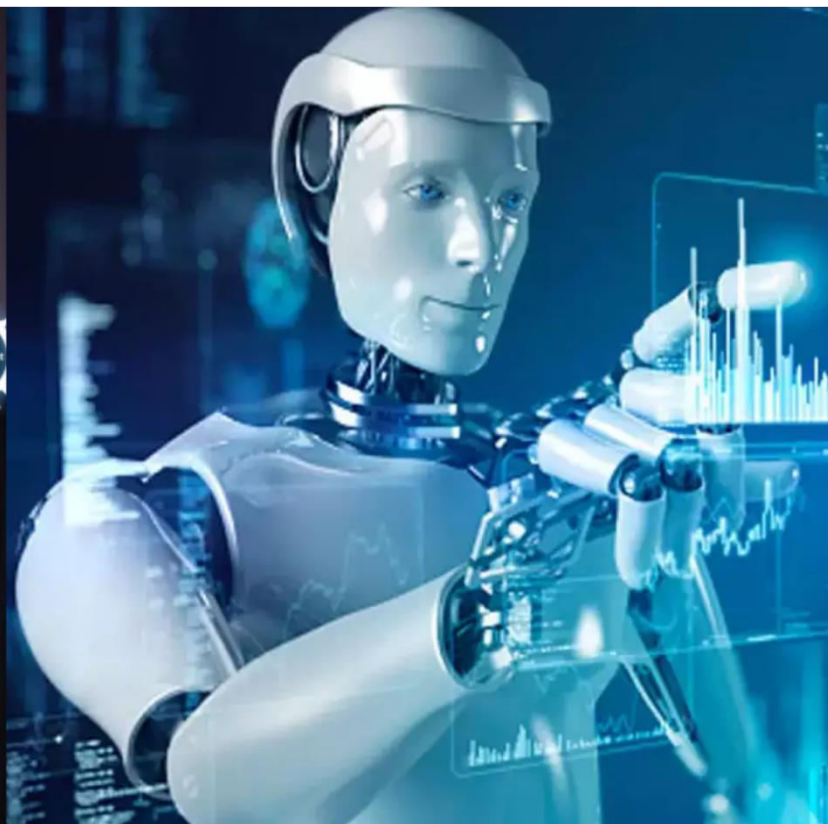




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Survey Paper on Cattle Herd Management using IoT

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ABSTRACT: Livestock plays an important role in the Indian economy, but traditional herd management methods require manual record tracking and management. Internet of Things (IoT) is becoming popular and mainstream recently, in automation. It helps to save time, reduce human workloads, and can be integrated into herd management. This survey paper will discuss existing IoT technologies used for cattle herd management, such as RFID and NFC. It will try to compare those technologies, the pros and cons of those technologies, and the limitations of those technologies. This goal is to understand the different technologies used for herd management and how they actually make herd management easier.

KEYWORDS: IoT, Cattle Herd Management, Livestock, NFC, RFID, smart agriculture

I. INTRODUCTION

Livestock plays an important role in the contribution of food and non-food items to the people. It provides milk and eggs which are consumed largely around the world. The economy of countries like India, China, U.S are dependent on livestock. Therefore, it becomes equally important to manage livestock efficiently. Manual herd management is labor, cost, and time intensive. Tasks like monitoring health, production, cattle, the paperwork related to them are extremely time consuming. This is where IoT enters and solves almost all the problems. It leads to automation in herd management which saves time, labor, and cost. This survey aims to compare existing technologies for cattle herd management and provide a brief overview of how these technologies are helping in better herd management.

II. LITERATURE SURVEY

Traditional methods are outdated:

Manual and traditional methods rely on the experience of the livestock manager. These methods are not only labor-intensive but also prone to human error. For example, tracking cows, recording their health status, measuring temperature, and maintaining biodata in physical registers is time-consuming and often inconsistent. Manual herd management also makes it difficult to retrieve historical data quickly for decision-making or disease tracking. The Internet of Things (IoT) solves many of these problems by automating data collection and storage, reducing reliance on human labor, and providing more accurate and timely information. (Moutaouakil et al., 2023)

Health monitoring can be achieved using IoT:

IoT devices such as pulse sensors, accelerometers (e.g., MPU-6050), infrared thermometers (e.g., MLX90614), and other wearable sensors can continuously monitor vital parameters of cattle like heart rate, body temperature, activity levels, and stress indicators. These devices allow early detection of health issues such as infections, heat stress, or abnormal behavior, which manual observation might miss. Farm workers often cannot monitor all animals closely throughout the day; automated IoT systems help in providing real-time data and alerts to ensure timely intervention. (Darvesh et al., 2023)

Near Field Communication Technology can be used for cattle herd management:

NFC technology enables interaction between smart objects, such as NFC tags and readers. Each cattle is tagged with a unique NFC chip, allowing instant identification when scanned by a reader or smartphone. NFC systems are particularly useful for small to medium farms due to their low cost, ease of use, and ability to integrate with mobile

devices for record retrieval. Farmers can easily update vaccination records, track movements, and access health histories in real-time, reducing paperwork and human errors. (Ahiara W.C et al., 2022)

Existing Gaps:

Most existing solutions focus on either cattle tracking or health monitoring individually. Very few systems integrate both into a unified platform, creating a limitation in holistic herd management. Additionally, high setup costs, connectivity issues in rural areas, and lack of user-friendly dashboards for farmers remain significant barriers. This survey highlights these gaps and emphasizes the need for integrated, cost-effective solutions that combine monitoring, identification, and data analysis.

III. PROPOSED METHODOLOGY

This survey focuses on studying and comparing existing IoT-based cattle herd management systems, mainly using RFID and NFC technologies. The methodology is designed to ensure a structured, comprehensive analysis of current research.

Paper collection and selection:

Research papers were collected from reputable sources, including IEEE Xplore, ResearchGate, ScienceDirect, and other peer-reviewed journals. Keywords such as “IoT,” “Cattle Monitoring,” “RFID,” “NFC,” “Livestock Management,” and “Smart Farming” were used to ensure coverage of all relevant technologies. Only papers published between **2018 and 2025** were considered to include the most recent technological advancements.

Screening and filtering:

Collected papers were screened based on relevance to cattle herd management and IoT applications. Studies focused solely on crop monitoring or general IoT applications without livestock-specific implementations were excluded. Preference was given to papers with real-world experiments, pilot projects, or implemented case studies.

Analysis and comparison:

The shortlisted papers were analyzed on multiple dimensions:

- **Technology type:** RFID, NFC, IoT sensors, or combinations
- **Application area:** Identification, health monitoring, movement tracking, or feeding management
- **Advantages:** Automation, accuracy, timesaving, low-cost solutions
- **Limitations:** High setup cost, connectivity issues, scalability, and integration challenges

A **comparison table** was created to summarize the findings, highlighting the strengths and weaknesses of each technology and its suitability for different farm sizes.

Discussion of insights:

From the analysis, it was observed that while RFID and IoT sensors are highly effective for automated tracking and health monitoring, NFC provides greater accessibility for small farms through smartphone integration. Despite technological advancements, integration into a unified system remains a challenge, and rural connectivity or cost constraints limit widespread adoption.

Future perspectives:

The study also considers how combining these technologies with cloud computing, AI-based health prediction, and GPS tracking could improve overall herd management efficiency and accessibility, guiding future research and implementation strategies.

IV. RESULTS

After comparing different research papers, it was found that IoT-based systems have significantly improved cattle herd management. Technologies like RFID are highly effective for identification and tracking, while NFC provides an easy and low-cost solution for small-scale farms. IoT sensors, when integrated, help in real-time health and activity monitoring of the cattle.

Most studies reported better data accuracy, time savings, and reduced human effort through automation. However, challenges like high setup cost, limited connectivity in rural areas, and lack of unified systems were common among the reviewed papers.

Overall, the survey shows that combining IoT with RFID or NFC can create smarter, more efficient, and data-driven herd management systems

V. CONCLUSIONS

IoT-based cattle herd management systems offer a modern and automated approach to livestock monitoring. The use of technologies like RFID and NFC simplifies identification, tracking, and health record maintenance. Compared to traditional methods, these solutions save time, reduce labor, and improve data accuracy. However, adoption is still limited due to high setup costs and technical constraints in rural regions.

This survey highlights the potential of integrating multiple IoT technologies into a single platform for complete herd management. With future advancements such as AI-based disease prediction and GPS tracking, smart livestock management can become more accessible and effective for farmers.

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