IOT Based Livestock Health Monitoring System

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***Abstract*—IOT-based livestock health monitoring is a ground-breaking initiative aimed at transforming cattle care and management. In a nation where cattle play a pivotal role in rural economies, the absence of accessible veterinary care, delayed vaccinations, and disease outbreaks pose significant threats to cattle health and the livelihoods of dependent communities. This project offers a comprehensive solution by harnessing cutting-edge technology. It includes a robust cattle information management system, utilizing speech recognition for data input to accommodate diverse user literacy levels. The core feature is an intelligent vaccination scheduler, creating personalized vaccination plans based on individual cattle profiles, and sending timely reminders to owners. It employs advanced image processing to detect early signs of disease. The project ensures accessibility through voice-enabled interaction and simplifies the registration of new cattle and along with that it includes the cattle tracker and shed cleaning.**

***Index Terms*—IoT, Cattle management, vaccinations, cattle health, disease Detection, tracker.**

I. INTRODUCTION

Agriculture is a time consuming and labour demanding sector. The introduction of automation to the field of agriculture is the best solution to these problems and it makes farming in a systematic manner which yields to a higher rate of production. Through this automated method, greater productivity can be achieved in less time. India record of progress in agriculture over the past four decades has been quite impressive. The agriculture sector has been successful in keeping pace with rising demand for food. Contribution of agricultural growth to overall progress has been widespread. Increased productivity has helped to feed the poor, enhanced farm income and provided opportunities for both direct and indirect

II. LITERATURE REVIEW

Cattle external diseases like Foot and Mouth Disease (FMD), Lumpy Skin Disease (LSD), and Infectious Bovine Keratoconjunctivitis (IBK) are the most highly contagious diseases around the world. Early diagnosis is crucial for controlling these diseases. Traditional Convolutional Neural Networks is the most used architecture in the state-of-the-art of image processing and computer vision field. According to our knowledge, no other system for cattle disease detection in the husbandry farm has been introduced by using deep learning techniques. This proposed model referred to early detect the most common external diseases using several CNN architectures like conventional deep CNN, Inception-V3, and VGG-16 in the field of deep learning.

III. METHODOLOGY

The system uses sensors attached to livestock to monitor temperature, heart rate, movement, and location. An ESP32 microcontroller collects this data and sends it to a Flask-based web server via Wi-Fi. The data is stored in an SQLite database and analyzed to detect health issues based on preset thresholds. If abnormalities are found, alerts are sent to the farmer through Telegram. A web dashboard displays real-time data and animal location for easy monitoring.

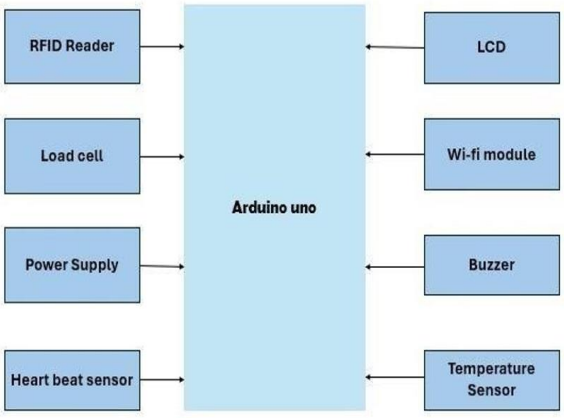

Fig.1 Block Diagram

IV. SYSTEM ARCHITECTURE

The system is built around an Arduino Uno microcontroller, which integrates multiple sensors and modules to monitor livestock health. Key components include an RFID reader for animal

identification, a load cell for weight measurement, a heartbeat sensor, and a temperature sensor. Data from these sensors is processed by the Arduino and displayed on an LCD. A Wi-Fi module transmits the data to a remote server, while a buzzer provides immediate alerts in case of abnormal readings. The system is powered by a regulated power supply, ensuring continuous operation in the field.

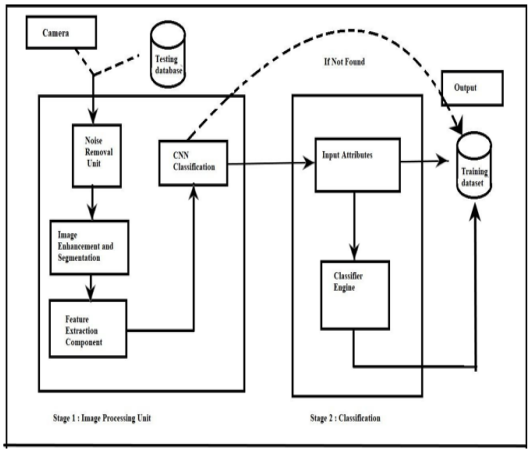

Fig 2. System Architecture Design

V. SYSTEM DESIGN

The purpose of the design is to plan the solution of problem specified by the requirement specification. This phase is the first step in moving from problem to the solution domain. In other words, starting with what is needed, design takes care of how to work to satisfy the needs. The design of the system is perhaps the most critical factor affecting the quality of the software and has a major impact on the latter phases, particularly testing and maintenance. System design aims to identify the modules that should be in the system, the specification of the modules to interact with each other to produce the desired results.

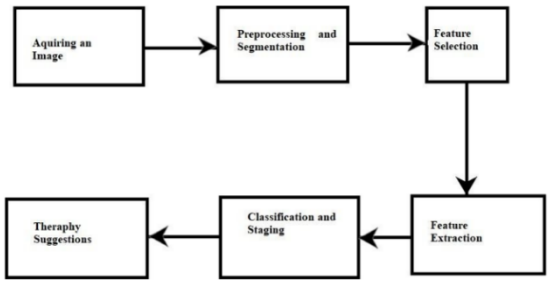

Fig 3. Architecture of the proposed system

VI. HARDWARE AND DESCRIPTION

The IoT-based Livestock Health Monitoring System uses several key hardware components to ensure accurate health tracking of animals. The Arduino Uno R3 acts as the main controller, handling data from various sensors. A load cell is used to monitor the weight of livestock, which helps in detecting health changes over time. The RFID reader is employed for identifying individual animals, ensuring data is linked correctly. Health parameters like body temperature and heart rate are measured using temperature sensors and heartbeat sensors, respectively. The collected data is displayed in real time on a 16x2 LCD screen, making it easy for farmers to view the status instantly. A reliable power supply unit ensures stable operation, and the system is built using basic electronic components like wires and a breadboard for easy integration and prototyping.

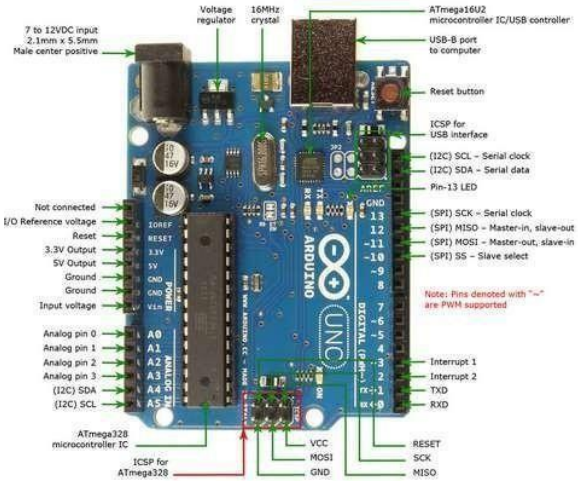

Fig 4. Ardunio Uno

Ardunio-The Arduino board then reads and processes this data. Using wireless communication modules like Wi-Fi or GSM, the Arduino sends the collected information to a remote server or cloud. If any health issues or abnormalities are detected, the system sends real-time alerts to the farmer, helping them monitor the livestock's health remotely.

Fig 5. RFID Reader

RFID Reader:-The RFID reader is also known as an interrogator, it provides the connection between the tag data and the software that needs Information.

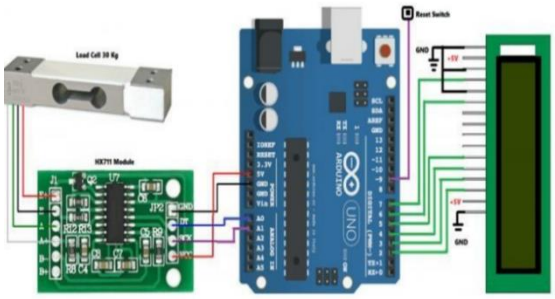

Fig 6. Circuit Diagram

VII. IMPLEMENTATION

The implementation of the IoT-based livestock health monitoring system begins with assembling the hardware components, including the Arduino Uno, sensors (temperature, heartbeat, load cell), RFID reader, Wi-Fi module, LCD, and buzzer. Each sensor is interfaced with the Arduino using appropriate digital or analog pins. The Arduino is programmed to read sensor data at regular intervals, process it, and display the results on the LCD screen. The Wi-Fi module is configured to send the collected data to a remote server or cloud platform for real-time monitoring. The RFID reader identifies individual animals, ensuring that health data is correctly mapped. When abnormal values are detected, the buzzer is activated and a notification is sent to the farmer via the connected server or messaging service. This setup allows continuous monitoring of livestock health, enabling early detection of potential issues and timely intervention.

VIII. RESULTA AND DISCUSSIONS

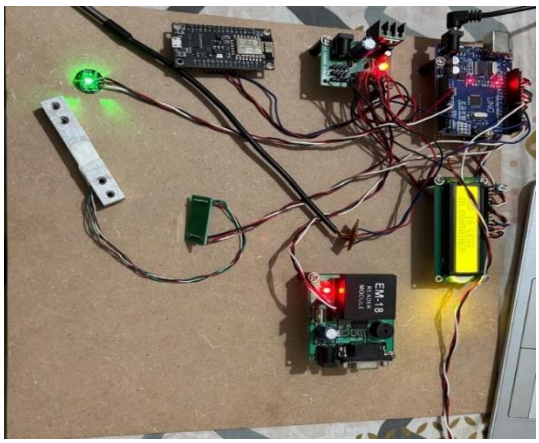

Fig 7. Prototype Setup of IoT-Based Livestock Health.

The implemented IoT-based livestock health monitoring system successfully measured and transmitted real-time data including body temperature, heart rate, and weight of animals. Each animal was accurately identified using the RFID module, and health data was correctly logged and displayed both on the LCD and the web interface. Alerts were generated when abnormal parameters were detected, and notifications were successfully sent via the integrated alert system. The system demonstrated reliable performance in continuously monitoring animal health and provided timely insights, enabling early detection of health issues and reducing the risk of disease outbreaks.

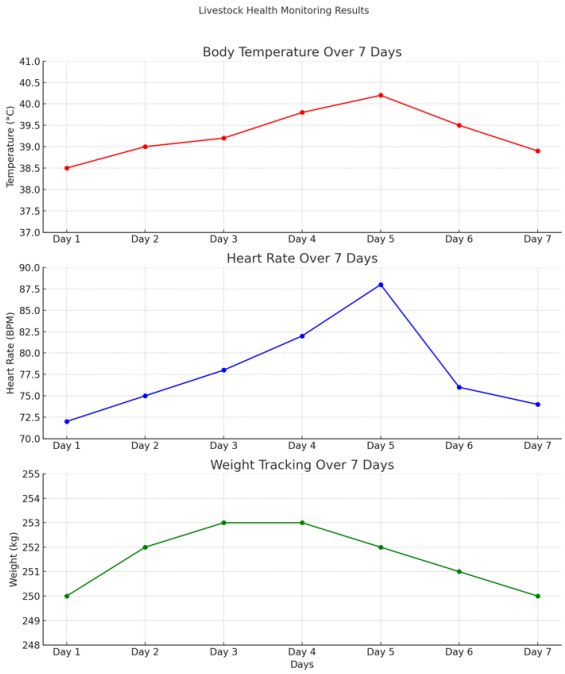

Fig 8. Graph

The graph illustrates the daily trends of body temperature, heart rate, and weight of a livestock animal over seven days. A noticeable spike in both temperature and heart rate on Day 5 indicates a potential health issue, such as fever or stress, which the system can detect in real time. The weight data remains relatively stable but shows a slight dip during the same period, possibly due to reduced feed intake. These trends demonstrate the system's ability to monitor vital health parameters and provide early alerts for timely intervention.

This image shows a Telegram bot interface named "Cattle management", which is part of the IoT-based Livestock Health Monitoring System. The bot is used to deliver real-time alerts and updates to farmers regarding the status and health of their cattle.

Fig 9. Alert Message

IX CONCLUSION

IOT-based livestock health monitoring is a system that leverages cutting-edge technologies such as machine learning, computer vision, and natural language processing to revolutionize cattle farming. Its primary focus is on enhancing cattle welfare, increasing farm productivity, and fortifying the livelihoods of rural communities. By effectively managing cattle skin diseases and maintaining a clean and disease-free environment, this comprehensive approach leads to healthier, more productive cattle. Moreover, it aids in reducing economic losses through informed market pricing, ultimately empowering rural communities reliant on cattle farming. In summary, IOT-based livestock health monitoring marks the onset of a new era in sustainable and prosperous cattle farming.

While promising, this system faces challenges related to implementation costs, infrastructure requirements, data security, and the need for farmer training and adaptation to new technology. In the future, the system's horizons extend beyond cattle as it plans to broaden its scope to include other livestock, such as sheep. This expansion aims to make the benefits of technology- driven farming accessible to a wider range of animal types. Additionally, further developments may encompass integrating emerging technologies like the Internet of Things (IoT) for real-time data on animal health and behaviour, enhancing automation for tasks like feeding and monitoring, and refining machine learning models for more precise disease detection. The goal is to make the system more cost-effective, user-friendly, and comprehensive, addressing the evolving needs of livestock farming.

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