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Cattle Health Monitorng System with Smart Shelter

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Abstract

The primary methods of managing cows prior to the development of modern cow health monitoring systems with smart shelters were manual intervention by farmers and traditional processes. These techniques were often less precise and more labour-intensive than modern technical alternatives. Livestock shelters used to often be simple structures, such as sheds or barns, that provided basic weather protection. These shelters lacked modern conveniences like climate control and mechanized feeding systems. The Cattle Health Monitoring System with Smart Shelter, a significant advancement in livestock management, employs technology to improve animal comfort, productivity, and agricultural sustainability. An innovative technology solution to improve the health and care of cattle in farming environments is the Cattle Health Monitoring System with Smart Shelter. This system provides real-time monitoring and analysis of multiple factors relevant to the comfort and health of cattle housed in smart shelters by integrating automation, data analytics, and modern sensors. A network of sensors is integrated within the system to detect and monitor vital indicators like body temperature, humidity, gps tracker, and ruminant sensor. The cloud and IoT system are connected. It offers farmers an economical and effective way to keep an eye on the health of their cattle, which may ultimately result in increased productivity and efficiency in the animal business.

Keywords: Animals; cattles; Iot, livestock; health monitoring; smart shelter

INTRODUCTION

Before the creation of contemporary cow Health Monitoring Systems with Smart Shelters, farmers' manual intervention and conventional procedures were the main ways used for cow management. When compared to the technical solutions of today, these methods were frequently more labor-intensive and less exact. In the past, livestock shelters were frequently straightforward buildings like barns or sheds that offered rudimentary weather protection. Advanced amenities like automatic feeding systems and climate control were absent from these shelters. A major development in livestock management, the Cattle Health Monitoring System with Smart Shelter uses technology to enhance animal welfare, production, and agricultural sustainability. This solution helps farmers monitor and control cattle health and comfort more effectively, which benefits both farmers and animals by integrating cutting-edge sensors and automation within smart shelters [1-4]. The Cattle Health Monitoring System with Smart Shelter is a unique offering that has the potential to completely change how cattle are handled and maintained in contemporary farming operations. The manual monitoring and intervention of farmers in cattle management may not always be adequate for the prompt detection of health problems or the best possible environmental conditions. The Cattle Health Monitoring System with Smart Shelter improves the way cattle are

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managed and cared for in farming environments. With the use of sophisticated technology like automation and sensors, this system can manage and monitor cow health and comfort in specifically constructed smart shelters in real time.In recent years, there has been a growing interest in using cattle health monitoring to increase agricultural production. Numerous scientists have created a variety of techniques to track cattle's health and identify illness symptoms. A few of these systems make use of wearable technology, including sensors and monitoring systems that improve the management and care of cattle in agricultural settings [5]. One such system is the Health Monitoring System with Smart Shelter. With the use of sophisticated technology like automation and sensors, this system can manage and monitor cow health and comfort in specifically constructed smart shelters in real time [7-9].

LITERATURE SURVEY

The purpose of this study is to create a method for managing the health of dairy cows. We use IOT and intelligent system technology to combine monitoring and detecting systems into a single application,

In 2019 by Syarif et al [10]. Name: Health monitoring and early diseases detection on dairy cow based on internet of things and intelligent system.

[2] "In 2019, Electronic Science and Technology, China, developed a neck-worn monitor that captures cows' physical status and uploads data to our server via NB-IOT communication modules. The name is NB-IOT-Based Dairy Cow Health Monitoring Systems.

This study describes an application system for fog computing that analyzes animal activity and monitors health in a dairy farming setting. A fog-based platform receives the sensed data from the sensors and uses it for data classification and analysis. by Mohit Taneja, Alan Davy, Cristian Olariu, and John Byabazaire in 2018. Name: To Provide Supported Animal Behavior Analysis and Health Monitoring Application Support in Dairy Farming [11].

[2] "In this work, data from five distinct types of acceleration sensors at two different locations on a dairy cow are compared. A video-surveilled measurement series was used to gather data. by Halachmi et al [12] in 2018. Name: Smart animal agriculture: application of real-time sensors to improve animal well-being and production.

Problem Statement

In order to efficiently monitor and control the health of cattle, this project intends to construct a complete Cattle Health Monitoring System coupled with a Smart Shelter. The system will make use of a variety of sensors and technologies to continuously monitor the cattle's vital signs and give farmers and doctors access to real-time data.

Objectives

The objectives of a Cattle Health Monitoring System with Smart Shelter are multifaceted, aiming to address various aspects of cattle welfare, productivity, and farm management.

COMPONENTS USED

ESP32

The ESP32 as shown in Figure 1. is a semiconductor that gives embedded devices, or Internet of Things devices, Wi-Fi and (on some models) Bluetooth connectivity. While ESP32 is essentially simply a chip, the manufacturer frequently refers to modules and development boards that use this chip as "ESP32." RAM size of the ESP32 chip is 520 KB. For most tasks, this is adequate, but for others, additional RAM might be needed. A memory chip can be added to the circuit by the manufacturer to boost the microcontroller's power [4].

MLX90614: Temperature Sensor

Melexis produces an infrared temperature sensor called the MLX90614 as shown in Figure 2. It is frequently employed in many different applications for non-contact temperature readings.

Range of Temperature Measurement The extended temperature range model may cover from -40°C to 125°C (-40°F to 257°F), whereas the regular variant may cover from -70°C to 380°C (-94°F to 716°F). With the MLX90614 non-contact infrared thermometer, you can take an object's temperature without ever touching it. It works on the basis of objects emitting infrared radiation, which it detects and transforms into temperature data. The MLX90614 is frequently utilized in many different applications, including consumer electronics, home appliances, automotive systems, medical equipment, and industrial temperature monitoring. It is especially helpful in scenarios where contact-based temperature sensors are unfavorable or impossible because to its non-contact measurement capacity

ADLX345: Accelerometer Sensor

Analog Devices makes a tiny, thin, low-power, three-axis accelerometer module called the ADXL345 (as shown in Figure 3). The X, Y, and Z axes are the three directions in which the ADXL345 can measure acceleration. This makes it a 3-axis accelerometer. Because of its low power consumption design, the ADXL345 is appropriate for battery-powered devices and applications where energy efficiency is crucial. Applications for shock and vibration monitoring in a variety of industries, including as automotive, aerospace, consumer electronics, and industrial equipment, frequently use accelerometers. Because of its tiny size and low weight, the ADXL345 module can be easily integrated into wearables, small electronic systems, and portable devices. The ADXL345 is commonly used in gaming controllers, pedometers, tilt sensing, vibration monitoring, motion detection, and gesture recognition systems [3].

NEO-6M: GPS MODULE

A well-liked GPS module that is frequently utilized in many different applications needing precise timing and location data is the NEO-6M (as shown in Figure 4). A GPS (Global Positioning System) receiver module is called NEO-6M. It uses signals from GPS satellites in Earth's orbit to pinpoint the exact location of the module. Various factors, including satellite visibility, signal strength, and climatic circumstances, may cause variations in accuracy. Because of its low power consumption, the NEO-6M module is appropriate for battery-powered devices and applications where energy efficiency is crucial.

Figure 1. ESP32.

Figure 2. MLX90614.

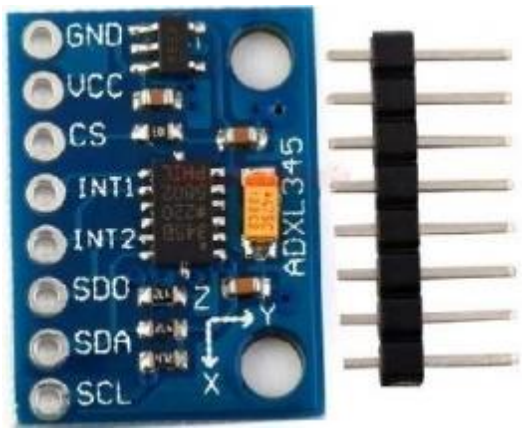

Figure 3. ADLX345.

Figure 4. NEO-6M.

The module finds extensive usage in applications that demand precise positioning and timing data, such as asset tracking, weather stations, drones, car tracking systems, and navigation devices. All things considered, the NEO-6M GPS module provides an affordable means of acquiring precise positioning and timing data, which is why a variety of applications in various sectors and industries like it [5].

MQ 137: Used for Detecting Ammonia (NH_3) Gas

A gas sensor module called the MQ-137 as shown in Figure 5. was created especially to find ammonia (NH3 gas) in the atmosphere. The MQ-137 sensor can identify ammonia (NH3 gas) in the ambient air since it is sensitive to it. The MQ-137 module can detect ammonia gas concentrations between 5 and 500 ppm (parts per million), albeit this can change based on the calibration and the surrounding environment. The sensor element's resistance varies in response to ammonia gas exposure, changing electrical conductivity in the process.

The amount of ammonia gas in the air is measured based on this change in conductivity. For a variety of applications where ammonia level monitoring and management are essential, the MQ-137 sensor module offers a practical and dependable method of detecting ammonia gas in the air.

LoRa-02

For low-power, long-range communication in Internet of Things (IoT) applications, LoRa-02 is a LoRa (Long Range) wireless communication module. Under optimal circumstances, LoRa-02 modules may reach several kilometers in communication range, which makes them appropriate for long-range connectivity applications like asset tracking, smart agriculture, and environmental monitoring. With its low power consumption, the LoRa-02 module as shown in Figure 6. offers a reliable and adaptable long-range wireless communication solution for Internet of Things applications.

Block Diagram

Block Diagram of flow of information through proposed methodology is shown in Figure 7.

Figure 5. MQ 137.

Figure 6. LoRa-02.

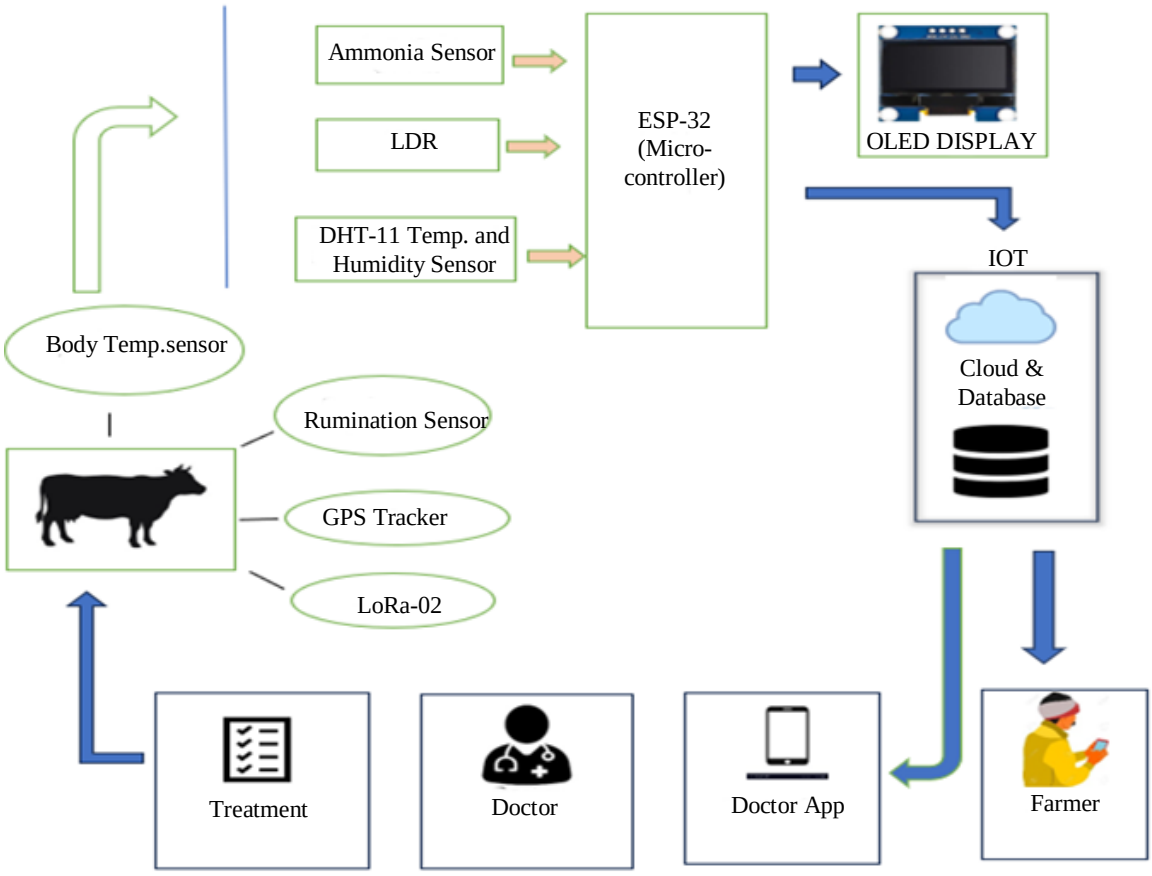

Figure 7. Flow of information through proposed methodology**.**

CONCLUSION

In conclusion, the creation and application of a Cattle Health Monitoring System coupled with a Smart Shelter provide the cattle farming sector a number of benefits. This system provides thorough management and monitoring of the health and welfare of the cattle. The combination of a smart shelter with a cattle health monitoring system is a game-changing strategy for raising sustainability, productivity, and animal welfare. This methodology establishes a new benchmark for contemporary and effective cattle farming methods by putting the health and welfare of the animals first while streamlining farm operations.

Results

The experiment's outcomes

The body temperature, rumination, and activity level of the cattle can all be effectively gathered by the device. In one instance, the cattle's body temperature rose and there was rumination, which the system picked up on. The cattle will be taken to the veterinarian for treatment after the farmer is notified. The following ways that the system can assist farmers in raising the well-being and output of their livestock operations:

- Early detection
- Decreased veterinary care
- Enhanced productivity

The technology is simple to operate and reasonably priced. The system's sensors are reasonably priced and simple to install.

Future Scope

Future development and improvement of the Cattle Health Monitoring System with Smart Shelter present a number of prospects. Further developments in sensor technology may result in the inclusion of more sensors to monitor other facets of the health and behavior of cattle. The accuracy of health projections might be increased, and more individualized health monitoring for individual cattle could be made possible by the advancement of data analytics techniques like machine learning and artificial intelligence.

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