ISSN: 2321-2152

IJMECE

International Journal of modern electronics and communication engineering

E-Mail
editor.ijmece@gmail.com
editor@ijmece.com

www.ijmece.com

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

Raspberry Pi-Powered Face Detection Lights

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ABSTRACT:

Cattle health and welfare are of paramount significance in livestock production, which is an essential part of the agricultural sector. In this article, we take a look at Cattle's Livestock Guardian, a state-of-the-art health tracking system that uses wireless technology and the Internet of Things to keep tabs on the well-being of cattle in real-time. An Internet of Things (IoT) data transmission system, a DHT11 temperature and humidity monitor, a heart rate monitor, a pH sensor to track rumen acidity, a respiratory sensor to analyze breathing, a GPS module to track location, and more sensors are all part of the system. In the event of a health anomaly, a buzzer is built in to provide rapid notifications. This method aids farmers in better managing cattle and preventing diseases by constantly monitoring critical parameters and transmitting data to a central monitoring system.

INTRODUCTION

Despite the importance of cattle ranching, it might be difficult to keep track of the well-being of a big herd. Information regarding the health and activity of objects may be gathered by means of the system's wireless sensor points. Machine learning algorithms examine the data transmitted to a central server in order to identify health issues. Veterinarians and farmers can detect health issues in animals in the early stages with the use of real-time monitoring. Improved efficiency and less need for human intervention are two additional benefits of the system. The overarching goals of the system are to enhance the well-being of animals, optimize agricultural methods, and guarantee the integrity and excellence of dairy products. The goal is to: • Find health issues in animals quickly by monitoring them in real-time; • Make big farms more efficient by reducing labor-intensive manual control. Reducing the likelihood of disease transmission and keeping animals healthy are two ways to guarantee that meat and dairy products are safe to consume.

LITERATURE REVIEW

The creation of a feedlot-specific wireless sensor network for the purpose of monitoring animal vitals [1]. Using directional antennas and wireless sensor network technologies, this research presents a novel and practical method for monitoring the health of cattle. To set up the system, you'll need to put ear tags that are based on IEEE 802.15.4 technology on the animals, then record how they eat and send the data to the aquarium router. Based on the simulation results, a wake-up time of 2500 ms is required to achieve a tag interpretation success rate higher than 90%. The system also has a routing technique that thinks about the energy usage vs. network lifespan trade-off. Instead of studying routing according to duty cycle, future studies should investigate the trade-offs between wake-up radio, solar energy, drone help, LPWA technology, and the number of routers. Cattle Health Monitoring Through the Use of Intelligent Wearable Devices and Biosensors: A Taxonomy [2] Livestock management is going through a technological revolution, with smart wearables and biosensors quickly replacing traditional methods of monitoring animal vitals. You may get real-time monitoring and quick responses with these little, non-invasive gadgets. But at the moment, these technologies are not formally classified. Developing a taxonomy of the most cutting-edge smart wearables and biosensors used for cattle health monitoring is the primary objective of this work. Type of sensor, power source, health parameter monitored, and body part connected are all factors in this categorization. Collecting biometric data from cow farms remotely via the use of wireless sensor networks [3].

ISSN 2321-2152
www.ijmece.com
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Methodology

Working

DHT11 Sensor: Thermometers the air, which have an effect on the comfort of cattle

Pulse Rate Sensor: Tracks the pulse rate of cattle to identify potential health problems at an early stage.

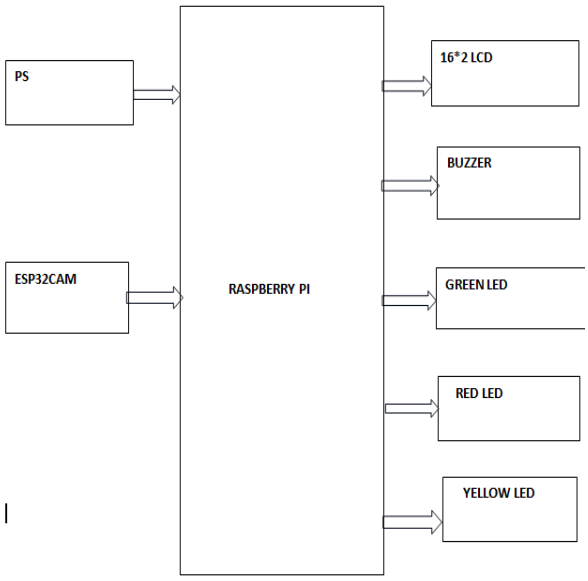
pH Sensor: Finds gastrointestinal issues by measuring rumen acidity.

Respiratory Sensor: Monitoring breathing patterns may help diagnose respiratory diseases.

GPS Module: Allows for the monitoring of livestock's whereabouts in real time.

IoT-based Communication: Data transfer via wireless means to an oversight system located in the cloud.

Buzzer Alert System: Notification sent without delay in the event of abnormal health metrics. Producers have access to up-to-the-minute information and notifications about possible health hazards once all sensor data has been analyzed and sent over the internet of things to a central monitoring system. Designed for large-scale animal husbandry, the system is easy to scale, has efficient communication, and uses little electricity.



Block diagram

pH SENSOR

For the purpose of monitoring water quality, a pH sensor is among the most essential instruments for taking pH readings. The alkalinity and acidity of water and other solutions may be measured using this sort of sensor. When utilized correctly, pH sensors can guarantee the integrity and security of wastewater and industrial operations.

RESPIRATORY SENSOR

One way to keep tabs on your breathing is using a respiratory sensor. These little devices can detect your breathing rate, airflow, lung capacity, and even your breathing patterns. With their real-time data for evaluating respiratory health, these sensors are vital for research, fitness monitoring, and medical diagnostics. Respiratory sensors aid in the diagnosis of sleep apnea, asthma, COPD, and other underlying medical disorders by monitoring changes in airflow, temperature, electrical signals, and pressure.

PULSE SENSOR

An electronic gadget called a pulse sensor may detect changes in blood volume and use that information to calculate the heart rate. To monitor the heart's rhythm in real time, these sensors use electrical signals or photoplethysmography (PPG) to follow the pulse. Pulse sensors aid in the monitoring of cardiovascular health and general well-being and find extensive use in research, fitness tracking, and medical diagnostics. The majority of pulse sensors rely on optical technology; in this setup, a light-emitting diode (LED) illuminates the skin, and a photodetector determines the quantity of light that the blood vessels absorb or reflect. Variations in light absorption, which the sensor converts into a pulse rate, are caused by changes in the amount of blood in the capillaries as the heart pumps blood. Electrocardiograms (ECGs) sometimes include an electrical pulse sensor, another kind that may detect electrical impulses produced by the heart's activity. Both kind are great for learning about HRV, stress, and blood flow efficiency.

DTH11 SENSOR

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

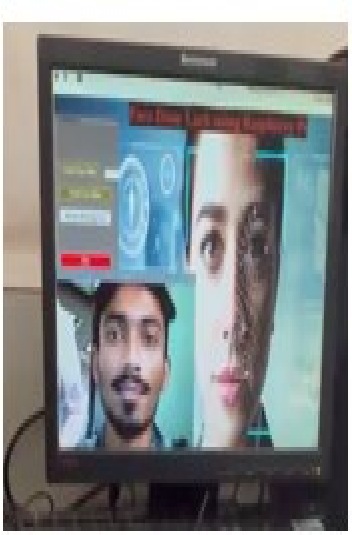
One inexpensive digital sensor that can measure humidity and temperature is the DHT11 sensor. Because of its dependability and ease of use, it finds widespread use in automation systems, Internet of Things (IoT) applications, and weather monitoring. The sensor is designed to be easily interfaced with microcontrollers like Raspberry Pi and Arduino since it measures ambient conditions using a thermistor and a capacitive humidity sensor. The output is digital.

GPS

Receiving signals from satellites, a gadget known as a GPS module may ascertain exact position, speed, and time data. Applications like the Internet of Things (IoT), vehicle tracking, and navigation systems make heavy use of it. Using UART, SPI, or I2C serial connection, the module may talk to microcontrollers like Raspberry Pi, Arduino, or ESP8266. There are typically four or six pins on a GPS module, however this might vary by model and manufacturer. A common 4-pin arrangement. The GPS module receives power from the VCC (Power) supply. Depending on the model, it usually runs on either 3.3V or 5V. Connects to the power supply and microcontroller's ground, often known as GND. TX (Transmit) - Uses UART connectivity to send GPS data to the microcontroller.
The fourth component, RX (Receive), is often optional but is used to receive data from the microcontroller.
Extra Pins (Applicable to Certain Models): Pulse Per Second (PPS)—Provides accurate timekeeping by emitting a pulse signal at a rate of one per second. The "Enable" or "V_BCKP" command is used to turn on or off the module. When it's turned on, the module continues to operate continuously.

RESULTS

Output1



Final output

CONCLUSION

An unique solution for real-time health monitoring of cattle is offered by The Cattle's cattle Guardian, which utilizes the Internet of Things (IoT) and wireless technologies. The suggested system increases farm output, decreases cow mortality, and integrates several health sensors with a buzzer alarm system to better illness diagnosis. Better livestock management and more economic advantages are the

results of Internet of Things (IoT)-based remote monitoring, which allows farmers to respond instantly to the detection of any health abnormalities.

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