PROJECT ABSTRACT

IoT Cattle Health Monitor using Smart Collar with Farm Dashboard

A wearable ESP32 smart collar for cattle that tracks body temperature and activity over LoRa, with a per-animal farm health dashboard, fever alerts and the complete student kit. Delivered built-to-order with collar prototype, gateway, dashboard, report, PPT and viva kit.

01. Title

IoT Cattle Health Monitor using Smart Collar with Farm Dashboard

02. Introduction / Background

Dairy farmers usually notice a sick animal only after visible symptoms appear, when treatment costs more and milk yield has already dropped. Cattle mask early illness, but body temperature rises and normal movement falls first. Continuous, per-animal monitoring of these two signals is the practical early-warning channel. This project implements it as a collar-worn ESP32 node with a DS18B20 skin-contact temperature probe and an MPU6050 motion sensor, transmitting over LoRa to a farm gateway that serves a per-animal health dashboard with fever and inactivity alerts.

03. Problem Statement

Manual health checks cannot scale across a herd and miss the early, subtle phase of illness. Commercial livestock tags are expensive and closed. The project addresses this with a student-built smart collar that measures temperature and activity continuously, reports over long-range LoRa without farm-wide Wi-Fi, and presents every animal's status on a dashboard that flags fever above 39.5 °C and abnormal inactivity automatically.

04. Objectives

- Build a wearable collar node: ESP32 + DS18B20 temperature probe + MPU6050 IMU + LoRa radio in a 3D-printed enclosure.
- Convert motion data into a 0–100 activity index that reveals reduced grazing/rumination movement.
- Transmit collar ID, temperature, activity and battery over LoRa to a farm gateway every 30 s (design target).
- Serve a companion dashboard with per-animal cards, 24-hour temperature chart and event log.
- Raise fever alerts at 39.5 °C and watch-list flags on sustained low activity.
- Provide a buyer-run calibration procedure for the fever threshold and activity baseline.
- Deliver the complete student kit: collar prototype, gateway, dashboard, report, PPT and viva Q&A.;

05. Proposed Methodology

The system is developed in three layers. (1) Collar: the DS18B20 probe measures skin-contact temperature while the MPU6050 samples acceleration; firmware derives the

activity index and packs a LoRa frame with collar ID, temperature, activity and battery level. (2) Gateway: an ESP32 LoRa receiver checks each animal against the fever and inactivity thresholds and serves the dashboard over Wi-Fi. (3) Dashboard: per-animal cards, temperature trend chart with the fever band marked, and a timestamped event log of alerts.

06. System Architecture / Working

Each collar transmits its readings every 30 seconds; the gateway validates the collar ID, updates that animal's dashboard card, and evaluates the fever (39.5 °C) and low-activity rules. The dashboard renders temperature, activity bar, battery and last-packet age per animal, with a selectable 24-hour temperature chart. Threshold crossings change the card status and append to the event log, so the farmer's morning check is the watch list rather than the whole herd.

07. Hardware / Software Requirements

- ESP32 development boards (collar node + LoRa gateway)
- DS18B20 temperature probe (skin contact)
- MPU6050 IMU
- LoRa radio modules (SX1276/Ra-02 class)
- 18650 cell with charging module
- 3D-printed collar enclosure + fabric neck strap
- HTML/CSS/JavaScript companion dashboard
- Arduino IDE (C/C++ firmware)

08. Expected Outcomes

- A working collar prototype reporting temperature, activity and battery over LoRa.
- A gateway serving a live per-animal farm dashboard with fever and inactivity alerts.
- A documented calibration procedure for thresholds on the student's own demo.
- A complete report, PPT and viva Q&A; on the sensing-to-alert chain.

09. Applications

- Demonstrating wearable IoT for precision livestock farming.
- Teaching temperature sensing, IMU signal processing and LoRa communication.
- Academic study of threshold-based health alerting.

10. Future Scope

- Rumination-pattern analysis from the IMU as an added health channel.
- Multi-gateway roaming for large grazing areas.
- Solar-assisted collar charging.
- Herd-level analytics (yield correlation) on logged data.