PROJECT ABSTRACT

IoT Pet Collar with Geofence and Activity Tracking

A wearable ESP32 pet collar with GPS geofence alerts and IMU-based activity tracking, publishing location and activity to a mobile dashboard. Delivered built-to-order with working prototype, firmware, enclosure guide, report, PPT and viva kit.

01. Title

IoT Pet Collar with Geofence and Activity Tracking

02. Introduction / Background

A pet that slips out unnoticed can be hours gone before anyone realizes, and the commercial GPS trackers that solve this charge subscriptions for hardware the owner never understands. There is also a second, quieter problem: gradual lethargy — the early sign of illness — is invisible without a baseline of normal activity. This project builds an open, subscription-free pet collar on an ESP32: GPS geofencing for escapes and IMU-based activity summaries for health awareness, in a wearable the student designs around real constraints.

03. Problem Statement

Wearable electronics is a constraints-first discipline — weight, battery and comfort decide the design before features do — yet student projects rarely document those trade-offs. The project addresses this by treating the collar as a wearable from the start: a weight budget, a fix-rate-vs-battery analysis, a pet-safe enclosure, and honest statements about GPS limits, all in the report.

04. Objectives

- Track the pet's GPS position and publish it to an owner dashboard.
- Implement a configurable home geofence with immediate breach alerts.
- Classify rest versus activity with the IMU and summarize daily active time.
- Monitor battery voltage and raise low-battery alerts.
- Design a lightweight pet-safe enclosure with a documented weight budget.
- Deliver the complete student kit: prototype, firmware, enclosure files, report, PPT and viva Q&A.;

05. Proposed Methodology

The collar is built in three parts. (1) Electronics: ESP32, NEO-6M GPS and MPU6050 on a compact layout with a Li-ion cell and charger. (2) Wearable: a rounded 3D-printed enclosure on a standard collar strap, designed against an ~80 g weight budget. (3) Software: firmware for GPS handling, geofence checks, activity classification and Wi-Fi publishing to a Blynk/ThingSpeak-class dashboard. The student configures the geofence, runs outdoor tracking trials, and records the fix-rate-vs-battery trade-off.

06. System Architecture / Working

After acquiring a GPS fix outdoors, the collar publishes position fixes and activity state over Wi-Fi. Each fix is checked against the configured home geofence; a breach raises an immediate dashboard alert. The IMU classifies rest versus movement continuously, accumulating active minutes into a daily summary. Battery voltage is monitored with a low-battery alert, and the on-collar LED signals fix and alert states.

07. Hardware / Software Requirements

- ESP32 development board (Wi-Fi)
- NEO-6M GPS module
- MPU6050 IMU
- Li-ion battery + TP4056-class charger
- 3D-printed enclosure + collar strap
- Status LED
- Cloud dashboard (Blynk/ThingSpeak class)
- Arduino IDE (C/C++ firmware)

08. Expected Outcomes

- A wearable collar reporting live position with geofence breach alerts.
- A dashboard with track history and daily activity summaries.
- A documented weight budget and fix-rate-vs-battery analysis.
- A complete report, PPT and viva Q&A; on wearable design and GPS/IMU integration.

09. Applications

- Pet safety demonstrations for owners and shelters.
- Teaching wearable power budgeting and GPS integration.
- Animal-activity study projects in applied coursework.

10. Future Scope

- 4G cellular variant for unlimited tracking range.
- Finer activity classification (walk/run/sleep) with on-device ML.
- Multi-pet dashboard for shelters and breeders.
- Solar trickle-charging collar variant.