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Pinaka: AI Surveillance Drone

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Abstract: *Railway derailment accidents caused by unidentified objects on the track are a significant safety concern, leading to loss of lives, infrastructure damage, service disruption, and high economic and social impact. To address this issue, we propose a drone-based surveillance system designed to identify and report hazardous objects on railway tracks in real-time. This project integrates drone technology with advanced object detection systems to enhance safety and prevent accidents. The drone is equipped with a high-resolution camera and an object detection algorithm capable of identifying hazards such as gas tanks, stones, steel poles, and other foreign objects. Using computer vision and deep learning, the system is trained to recognize threats commonly linked to derailments. Upon detecting an object, the drone sends immediate alerts to the loco pilot, admin, or control center, providing real-time information about the object's nature and location. This enables quick responses, such as dispatching emergency services or security personnel for checks. At its current stage, the drone is manually operated, allowing human control over flight paths and surveillance. Future versions aim to incorporate autonomous flight, with the drone flying predefined routes and continuously scanning for hazards. This would overcome the limitations of ground-based systems by providing a broader view and access to remote areas. The key components of the system include drone hardware, a robust object detection model using machine learning, a communication module for real-time alerts, and an interface for monitoring and response. This proactive solution enhances safety, reduces accident-related delays, and supports efficient railway track maintenance, ensuring safer and more reliable railway travel*

Keywords: Railway Safety, Pinaka, AI Surveillance, Object Detection, YOLOv5, Deep Learning, Real-time Monitoring, Drones, Track Hazards, GPS Alerts, MySQL, 4G/5G, Autonomous Flight, Infrastructure Security, Predictive Maintenance, Aerial Inspection, Control Center Integration

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