

Automatic Number Plate Recognition System



The Camera based Automatic Number Plate Recognition (ANPR) system is for highway applications. It enables high-performance automatic detection and recognition of number plates and Vehicle Classification in real-time. This AI-driven system with sophisticated Computer Vision and Machine Learning technology to recognize vehicle number plate and collects high-quality images of number plates along with timestamps.

Key feature:

- Used for vehicle number plate detection & recognition which can be further utilized for various applications e.g., section speed detection, RADAR triggered for Spot Speed Detection, MSWIM integrated ANPR, etc
- Capture number plate along with the vehicle image, Real time detection and recognition (OCR) of number plates, Recognition of two-line & non- Standard Number Plates
- Recognize vehicle class (Car/Bus/Truck/Bike), Recognize Yellow/White number plate color with light, Hot-list vehicle alarms, etc
- Easy to use Auditing & Reporting Modules
- Control room application integration for e-challan, ICCC, Vahaan, etc
- Robust 24x7 operations, low maintenance



ANPR System - Vehicle Detection & Plate Recognition

Live Camera Feed

Controls

- Start Detection
- Pause & Capture
- Stop Detection
- Export Results
- Clear Results

Statistics

Total Detections: 11
Camera: Connected

Detection Results

Time	Type	Plate Number	Conf%
14:27:22	Truck	BGG6U5J	99.0%
14:27:19	Car	HAS4K6	85.0%
14:27:08	Car	CEG1NYL	79.1%
14:26:55	Car	MGG6ZFX	99.0%
14:26:45	Truck	DRAINAGEDIVISION	75.0%

Detection Stopped FPS: 48

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Core Functional Modules

- Vehicle and plate detection: Detect moving vehicles in the video stream, localize the number plate region, and capture clear plate images.
- OCR and validation: Use ANPR/ALPR software to segment characters and convert the plate image into text, then validate format (e.g., Indian HSRP patterns) against rules or databases.
- Vehicle classification: Use deep-learning models (YOLO, CNN-based) to classify vehicle type (car, bus, truck, 2-wheeler, etc.) from the same video frames in real time.

Hardware Architecture

- Cameras: 2–5 MP IP cameras with sufficient resolution so plates are at least ~100 pixels tall in the image, placed at <25 m with <45° viewing angle for reliable ANPR.
- Illumination and optics: IR illumination, proper shutter speed, and lenses tuned to avoid motion blur and glare in day/night conditions.
- Edge device / NVR / server: Local processing unit (industrial PC, NVR with AI, or embedded controller) to run ANPR + classification models and buffer video

Software and Data Flow

- ANPR engine: Pipeline of preprocessing, plate detection, character segmentation, OCR, and results normalization, optimized for local plate styles (e.g., Indian fonts and colors).
- Vehicle AI model: Object-detection and classification network (e.g., YOLO family, CNN) trained on local traffic data to distinguish multiple vehicle classes and count them.
- Backend services: Database to store plate numbers, images, and classification results plus APIs to integrate with parking, toll, security, or enforcement systems.

Typical Use Cases

- Access control and parking: Open boom barriers automatically based on white/blacklists, log vehicle class and stay duration for billing and audits.
- Tolling and traffic analytics: Class-based toll calculation, per-lane counts, speed estimation, and vehicle mix statistics for ITS and planning.
- Security and enforcement: Real-time alerting for wanted or blacklisted plates, overloading checks by matching declared vs detected vehicle class.

High-Level Solution Stack (Proposed)

- Field layer: 2–4 IP ANPR-capable cameras per lane, IR illuminators, optional loop or radar sensors for trigger.
- Edge/processing layer: One industrial PC or AI NVR per site running ANPR engine and vehicle-classification model, with local cache and health monitoring.
- Application layer: Central server or cloud app exposing web UI and REST APIs for search, reports, alerts, and integrations with your existing RFID/parking/ERP stack.

If you share your exact use case (toll, parking, gate control, city traffic) and expected lane count and throughput, a block diagram plus BoM and software architecture can be outlined for you.

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Suggest Hardware configuration for Vehicle Image Capture & Detection System: -

For reliable vehicle number detection and capture, use dedicated ANPR-

- Capable IP cameras plus a modest edge/server PC; generic CCTV alone is usually not sufficient. Recommended Camera Specs
- Resolution: 2–5 MP (1080p to 4 MP/5 MP); ensures plate height ≥ 80 –100 pixels at target distance for accurate OCR.
- Sensor and lens: 1/2.8" or larger CMOS, motorized varifocal lens (e.g., 8–32 mm) so you can fine-tune field of view for 8–30 m capture range.
- Shutter and IR: Supports fast shutter (up to around 1/10,000 s) and built-in IR or external IR illuminator for night capture without motion blur.

Example ANPR Camera Features

- Integrated ANPR: Camera models with on-board LPR/ANPR analytics and plate capture distance around 8–30 m, with IR range up to ~30 m.
- Outdoor rating: IP66/IP67 housing, operating temperature roughly -20 °C to +60 °C to handle Indian outdoor conditions.
- Interfaces: PoE/PoE+, ONVIF support, alarm output to directly trigger boom barrier or traffic lights if needed.

Illumination and Accessories

- IR illuminator: For challenging sites, add a 20–30 W 850 nm IR illuminator aligned with the lane to improve night plate contrast.
- Mounting: Rigid pole or gantry mount at 3–6 m height, viewing angle under ~30–45° horizontally and vertically, fixed to avoid vibration.
- Lane-level/edge PC: Industrial PC or small-form-factor system with Intel Core i5/i7 (or similar) CPU, 8–16 GB RAM, 256 GB SSD, & minimum 4 GB graphic card suitable for ANPR and basic analytics.
- Central ANPR server: For larger sites, a Xeon-class CPU with 16–32 GB RAM and enterprise HDD/SSD is typical in vendor sizing guides for multi-lane ANPR parking/toll systems. Quick 3–5 Lane Starter BoM (Indicative)
- 3–5 × 2–4 MP ANPR IP cameras with integrated IR and varifocal lenses (brand: Hikvision/Sparsh/ATSS or equivalent).
- 1 × industrial PC/mini server (i5/i7, 16 GB RAM, 512 GB SSD) running ANPR + your vehicle classification software.
- 1 × PoE switch (8–16 ports), appropriate IR illuminators if required, and weatherproof junction boxes.

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