Automatic Number Plate Recognition (ANPR) System

Documentation

1. Overview

The ANPR System is a Python-based application designed to recognize vehicle number plates using a webcam or uploaded images. It allows users to detect number plates, fetch vehicle details, and manage records via an admin panel.

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2. Features

- **Camera Integration**: Capture images using a webcam.
- **Image Upload**: Upload an image for plate recognition.
- **Automatic Plate Detection**: Extracts the number plate from an image.
- **Vehicle Information Retrieval**: Fetch stored vehicle details.
- **Admin Panel**: Allows authorized users to add vehicle records.
- **Integration with M-Parivahan API**: Fetch vehicle details directly from the official VAHAN database.

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3. Technologies Used

- **Programming Language**: Python 3.x
- **GUI Library**: Tkinter
- **Image Processing**: OpenCV, PIL (Pillow)
- **Data Handling**: SQLite (Future Implementation)
- **API Integration**: M-Parivahan API / VAHAN API (Upcoming feature)

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4. Installation

4.1 Prerequisites

Ensure you have the following installed:

- Python 3.8+
- pip package manager

4.2 Install Required Dependencies

Run the following command:

pip install opencv-python numpy pillow tkinter requests

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5. File Structure

```
ANPR/
├── main.py           # Main application file
├── detect_number.py     # Number plate recognition logic
├── vehicle_db.py        # Vehicle database operations
├── vahan_api.py         # API integration for fetching vehicle details
├── icons/           # Icons for GUI buttons
├── uploads/          # Captured/uploaded images
├── background.jpg      # Background image
```

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6. Functionality

6.1 Camera Capture

- Opens a camera window.
- Press Spacebar to capture an image.
- Press Q to close the camera.

6.2 Upload Image

- Select an image from your computer.

6.3 Detect Plate

- Runs recognition on the uploaded or captured image.
- Displays the detected plate number.

6.4 Fetch Details

- Enter a number plate manually.
- Retrieves stored vehicle data.

6.5 Admin Panel

- Secure login with a password.
- Add new vehicle details in a structured form.

6.6 Integration with M-Parivahan / VAHAN API

The **M-Parivahan API (VAHAN API)** allows us to fetch real-time vehicle details using the number plate. This API is managed by the **Ministry of Road Transport & Highways (MoRTH), Government of India**.

How to Integrate VAHAN API

1. **Register for API Access**: Visit the official **Parivahan Sewa website** to request API access.
2. **Obtain API Key**: After approval, you'll receive an **API Key** for authentication.
3. **Make API Requests**: Use the **requests** library in Python to fetch vehicle details.
4. **Parse JSON Data**: Extract relevant details like owner name, registration date, vehicle type, etc.

Example API Request:

```
import requests

API_KEY = "your_api_key_here"
NUMBER_PLATE = "MH12AB1234"
url = f"https://vahan.nic.in/api/vehicle-info?plate={NUMBER_PLATE}&apikey={API_KEY}"

response = requests.get(url)
data = response.json()
print(data)  # Parsed vehicle details
```

Permissions Required for Integration

- **Government Authorization**: The VAHAN API requires official permission from MoRTH.
- **API Key**: Unique authentication token for making API calls.
- **Data Usage Agreement**: Ensure compliance with data privacy policies before integrating.

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7. Future Enhancements

- **Database Integration**: Store vehicle details persistently.
- **Cloud Storage**: Sync images and data to a server.
- **Mobile App**: Develop an Android/iOS companion app.

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8. Contributors

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9. License