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ACCIDENT EMERGENCY SERVICE & VEHICLE VERIFICATION SYSTEM

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ABSTRACT

The primary goal of the project is to create a digital identity (digital identity represents the digital form of a person's identity, i.e personal information and official documents) The user's identity and vehicle-related documents are examined and stored in a secure digital format in this project. This system will help the admin in collecting and verifying information of vehicle owners and then getting them registered. It then generates a QR code that could be paste on the vehicle of the owner. The QR code generated serves as a digital identity token, which gives authorized personnel the right to access and check the users' information and documents without holding the physical copies. This will help the user to store information in digital format and it ensures the protection of the data from unauthorized access. The system is user friendly, secure and efficient, making it a dependable way to verify vehicle identity. This project increases security, preventing access from outside someone who is aware where these things are stored.

Keywords: QR Code Vehicle Verification, Admin Document Validation, Authorized Personnel Access, Live Location Sharing, Secure Document Access Via OTP.

I. INTRODUCTION

The bikes being purchased by this program has been designed to help the customers have a safe and hassle-free buying experience. For buying a new bicycle, buyer has to provide his personal information such as PAN card, Aadhaar card and contact number. An Admin will check these and then provide with a QR code. This code must be on the bike. If the rider has an accident any unauthorized person with smartphone may quickly check this QR code and see who he is. They can only use the emergency number provided to call the rider's family so as to know whether they should take him or her to a public or a private hospital. When user purchases new bike, so before this user will have to give his personal details and driving license, Aadhar card, emergency contact number then this user's personal and document will be verified by admin. One QR code of this personal and document can be generated after verification process with pasting it on vehicles number plate if all information are correct otherwise it should not generate QR code as well as has to register or verify again. So when any accident happen or is missed out its way then Authorize person can easily check the real owner of vehicle they will scan this QR code and will call on emergency number and then to make sure either to take him to private hospital or civil hospital during accident even when traffic police stop us than he can ask for License than at that point the authorize person can view document as well user details, he can download the documents, if some authorized people want to access information from this system, then they need to login using userId and password also he/she will get OTP for accessing documents to his emergency contact number also live location is send to this number. The unauthorized people can also scan the QR code but they can send live location to emergency contact number and can access limited information.

II. METHODOLOGY

Agile methodology will be followed, allowing iterative development and regular updates based on feedback.

The SafePass Drive project employs a methodical and organized approach to guarantee correct data management, document authentication, and safe access to vehicle owner data in emergency or law enforcement situations.

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1. Requirement Analysis and Planning: The project starts with an exhaustive study of the non-functional and functional requirements.

This phase Includes: Listing down all user roles (User, Admin, Authorize Person, Unauthorize Person, etc). Specifying the basic features, like registration, document upload, admin validation, generation of QR code, access, and emergency alert system. Establishing security, privacy, and compliance requirements as required.

2. System Design and Architecture: The application is implemented based on a modular architecture, with the following main components:

Frontend UI: For user registration, QR Code display, Scanning, Information Display.

Backend Server: For data processing, verification logic, and database communication.

Database: For securely storing user data, document paths, QR code mappings, and login credentials.

3. Implementation Plan: The system is implemented in iterative steps:

Step 1: User Module – Implementing user sign-up, form validation, and document upload.

Step 2: Admin Module – Admin dashboard creation for verification or rejection of uploaded documents.

Step 3: QR Code Module – Auto-creation of a unique QR code for every verified user.

Step 4: Access Control – Implementing two-layered authentication for accessing documents by authorized users and restricted access for public users.

Step 5: Emergency Calling and Location Sharing – Enabling authorized users to send real-time location information to emergency contacts.

4. Data Verification & Security Measures: The application uses several verification and security.

Documents are authenticated by a specified admin prior to approval, QR codes are generated only after verification, User documents are secured through login + OTP verification, All sensitive information is encrypted while storing and transmitting.

III. MODELING AND ANALYSIS

1. TAXONOMY CHART

The following table shows the difference between our proposed system and the existing system.

Paper/Feature Name	Live Location Sharing	Notification system if document expired	Integration with Emergency Services	Authorize Access	Unauthorize Access	Digi-Locker
Accident Vehicle Investigation Using QR Code on Vehicle	☐	✔ ☐	☐	✔ ☐	☐	☐
Vehicle Documents Verification System using Digi-locker	☐	✔ ☐	☐	✔ ☐	✔ ☐	✔ ☐
QR Based Vehicle And Drivers Document Verification	☐	✔ ☐	✔ ☐	✔ ☐	✔ ☐	☐
Traffic Police Management & Detection of Stolen Vehicles Using QR Code	☐	☐	✔ ☐	✔ ☐	☐	✔ ☐
Proposed System	✔ ☐	✔ ☐	✔ ☐	✔ ☐	✔ ☐	✔ ☐

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2. System Architecture

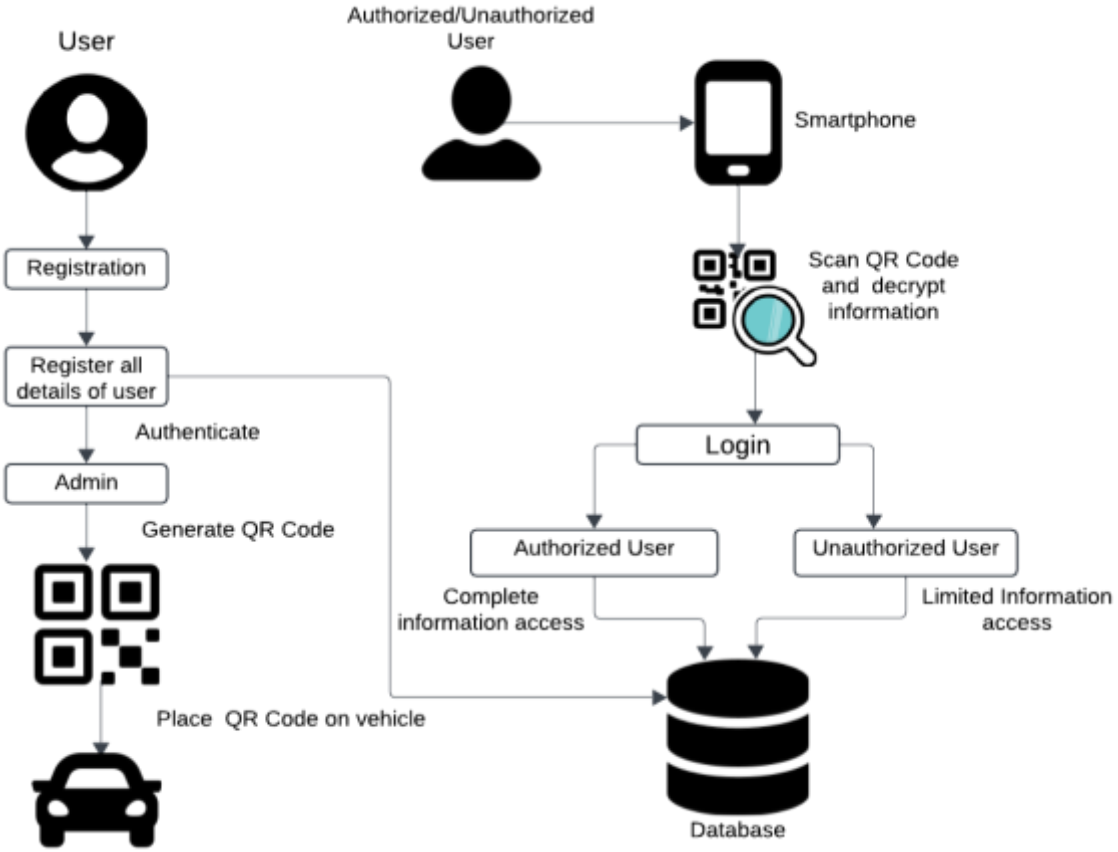

Figure 1: System Architecture

This architecture illustrates how the project is structured in its entirety, and the integration and management of user data with the aid of QR-code scanning technologies. The process begins by the user providing his or her personal details including name, address, email, aadhaar card, driving license and next of kin's information. Once the information is entered it is verified and approved by admin. After the verification process has been completed, a QR Code is created that encodes the user's verified credentials and the information regarding the vehicle. This QR code is then affixed on the automobile, for instance on the number plate, so that the owner and the vehicle can be distinctly identified.

The QR code provides access to the user's details. On scanning through a smartphone or scanning device, the system differentiates access depending on whether the user is of an authorized type or not. Authorization is provided to the users, such as police, traffic, or ambulance officials, to log in using their credential to get full access to sensitive details such as documents and vehicle details, user complete details. Additionally, OTP verification is implemented with an emergency contact for more secure access to sensitive documents. Unofficial users can only access limited information: name of the owner and the number of the emergency contact. In case of an intended accident, they can also share the live location of the scanned vehicle with the emergency contact. The database of the system operates as a secure depot for all user information, uploaded documents, vehicles, and QR code mapping. It uses encryption to keep the data, as well as record logs for accountability of actions. The management of emergencies is a central feature of the system: in case of accidents, they may call the emergency number up through the QR code, notify the owner's family, or decide on the hospital that will receive treatment. This architecture nicely balances security and privacy on one side with usable accessibility on the other, such that QR codes provide high assurance about vehicle and user identification in varied contexts.

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3. System Modules Details

3.1. User Registration and Verification Module:

This module is designed to make it easy for users to provide their information, both personal and related to their vehicles. When users sign up, they'll enter details like their name, address, email, Aadhaar number, driving license, and an emergency contact number through a simple web interface. Any documents they upload are kept safe in an SQLite database. Once the information is submitted, an admin will review it and decide whether to approve or reject the registration. This process ensures that only verified users can move forward, helping to keep our data accurate and secure.

3.2. QR Code Generation Module:

After we verify the user's details, we create a unique QR code using Python's QR code library. This code holds all the validated information and connects it directly to the vehicle. We store the generated QR code in our database, and then it gets printed out to be attached to the vehicle's number plate. This module ensures that the QR code is a secure and convenient way to keep important information about the vehicle and its owner.

3.3. Login and Access Control Module

This module is all about managing who gets to access the system. It makes a clear distinction between those who are authorized and those who aren't:

Authorized Users: This group includes personnel like police officers and ambulance staff. They log in using their credentials, and to keep things secure, we've added an extra layer of protection with a one-time password (OTP) sent through Twilio's messaging service. This way, they can safely access sensitive information.

Unauthorized Users: These users can scan a QR code, but their access is limited. They'll only be able to see basic info, like the owner's name and emergency contact number. This setup ensures that we maintain user privacy and keep data secure by controlling access based on roles.

3.4. Information Retrieval and Emergency Management Module

When you scan the QR code:

If you're an authorized user, you'll be able to access a wealth of information, including important documents and real-time location data, once you've logged in successfully. On the other hand, if you're not authorized, you'll still see some basic details that will help you contact emergency services and share the vehicle's live location in case of an accident. This module uses Google API to pull in and share live location data, which helps ensure a quick emergency response and smooth coordination between everyone involved.

3.5. Database Management Module

In this module, we use SQLite to handle all the user and vehicle information. Everything from user credentials and vehicle details to QR code data and important documents is safely stored in the database. We prioritize your privacy, so we use encryption and Flask's session management to keep your data secure and protect it from unauthorized access. Plus, SQLite's lightweight design means that all data operations are quick and efficient.

3.6. Document Verification and OTP Module

When accessing sensitive data, authorized users require OTP verification, which is sent to the registered emergency contact number. This module ensures that only authenticated personnel can download or view sensitive documents, safeguarding user privacy. Twilio's messaging service is used to implement this feature.

3.7. Live Location Tracking Module

This module allows you to share your location in real-time during emergencies. By using the Google API, authorized users can easily access the vehicle's current location and share it with emergency contacts. This feature is designed to help ensure quick responses in situations like accidents or vehicle theft.

3.8. Security and Data Privacy Module

This module is the backbone of our system. It uses encryption to protect database fields, manages user sessions, and controls access based on user roles. This means that unauthorized users can't get to sensitive information, while those who are authorized have to go through several layers of authentication to prove their identity. This setup not only safeguards the system from potential security breaches but also ensures we meet data protection standards.

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4. Implementation Details

4.1. Technologies Used:

- **Connecting the Backend and Frontend**

We use Flask as a lightweight framework to handle things like HTTP requests, manage user sessions, and render templates. Flask makes development easier by providing handy tools for routing, interacting with databases, and integrating with other services.

- **Managing the Database**

For our database needs, we've chosen SQLite because it's simple and portable. It helps us efficiently manage user data and store documents. Plus, its lightweight nature is perfect for quick prototyping and works well even in environments with limited resources.

- **Verifying One-Time Passwords (OTP)**

To keep things secure, we've integrated Twilio's Messaging Service to send OTPs to users' emergency contacts. This way, we can ensure that sensitive information and document access are verified safely.

- **Sharing Live Locations**

We use the Google API to fetch and share live location data with emergency contacts during critical situations. This integration allows for real-time tracking, which really boosts our emergency response system.

- **Choosing a Programming Language**

We went with Python for its versatility and the wide range of libraries it offers. For instance, we use a QR code library to generate unique QR codes and a random number generator module to create those OTPs.

4.2. Workflow

- **User Registration**

To get started, users can access a web-based interface created with Flask. Here, they can fill in their details, upload any necessary documents, and register their vehicle.

Once they hit submit, the system checks the information for accuracy and saves it in an SQLite database. Flask takes care of the communication between the front-end form and the database, making everything run smoothly.

- **Verification**

After registration, an admin or RTO officer logs in to review the submitted details and documents. If everything checks out, the system generates a unique QR code using a Python library. This QR code is then linked to the vehicle and stored in the database. If there's any missing or unverified information, users will be prompted to resubmit their details.

- **QR Code Generation**

A Python script takes care of creating the QR code, which encodes all the validated user information, like their name, address, and emergency contact. This QR code is securely saved in the database and can be printed out for display on the vehicle's number plate.

- **Accessing Information via QR Code:**

  - **Authorized Users:** When authorized personnel scan the QR code with their smartphone or device, they need to log in using their credentials. For added security, an OTP is sent to the registered emergency contact. Once they successfully verify the OTP, they can access sensitive information, including the Aadhaar card, driving license, and vehicle details.
  - **Unauthorized Users:** While unauthorized users can scan the QR code, they're limited to seeing just the vehicle owner's name and emergency contact number.

- **Emergency Assistance**

In the event of an accident, authorized personnel can use Google API integration to share the vehicle's live location with the registered emergency contact. This feature helps ensure quick communication with the owner's family, which can be crucial in critical situations.

- **Data Storage and Security** All user and vehicle information is stored in an SQLite database, which serves as the central repository. To keep everything secure, the database is encrypted to prevent unauthorized access. Additionally, Flask's session management ensures that interactions between users and the system remain safe and secure.

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4.3. Front End / Back End Technologies

Front End Technologies:

- **HTML/CSS:** This will be used to create a responsive and visually appealing layout. The complexity of the project demands a well-structured interface for different user types.
- **JavaScript:** It will be used for client-side validation as well as dynamic page rendering.
- **Bootstrap:** This is to assure that the design is clean and mobile responsive with pre- built components.

Back End Technologies:

- **Python:** The core business logic, such as user registration, verification by RTO officers, QR code generation, login system, OTP verification, and document access, will be handled.
- **SQL Lite Database:** A relational database will be used to store user details, documents, vehicle information, and QR codes. The database will require normalization to ensure efficiency and data integrity.
- **Flask Framework:** Flask allows the system to handle different URL routes such as registering a new user or verifying the documents.

4.4. Coding Language: Coding Language: Python will handle the core functionalities and will manage backend integration.

Software and Hardware Requirements

Software:

- Operating System: Windows/Linux
- IDE: VS Code
- Database: SQL Lite
- Web Browser: Chrome/Firefox
- Libraries: sqlite3, utils, flask, werkzeug

Hardware:

- Minimum 4 GB RAM for the development environment.
- A server with at least 8 GB RAM and adequate storage for deployment.

IV. CONCLUSION

For the vehicle owners, this digital identity verification system presents a huge leap in the verification procedures of vehicles registration. The tool makes public safety possible by giving the right of access and unique identification that will allow swift communication in case of an emergency. This technology simplifies the whole process of owning a vehicle because it eliminates physical paperwork and makes communication with the government easy. Overall, machine technology integrates efficiency, safety, and comfort with the aim of helping preserve the environment and social dreams. It promises to ensure a safe and user-friendly experience for every vehicle owner and law enforcement agencies, making way for modern business models in managing vehicles.

V. FUTURE WORK

This system is all about making the vehicle registration process smoother and ensuring that accurate vehicle information is readily available during emergencies. Plus, it helps protect user privacy by restricting unauthorized access. Looking ahead, there are some exciting possibilities for expansion, such as:

- Adding more types of vehicles, like cars and commercial trucks.
- Connecting with other government databases, like insurance records.

These enhancements could really improve the overall efficiency and effectiveness of the system.

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