SMART VEHICLE GARAGE SYSTEM

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Many people, especially our classmates and team members itself, have made valuable comment suggestions on this proposal which gave us an inspiration to improve our assignment. We thank all the people for their help directly and indirectly to complete our assignment.

ABSTRACT

This research accentuates on the smart vehicles garage system as well as the security issues of a vehicle garage system. We designed a very cheap smart garage system which basically based on Internet of things (IoT) with improved, efficient, elevated security system. This developed system can easily be applicable in our regular purposes. Again this system can be effortlessly controlled by user from both inside and outside of the garage. We can use IoT technology to control and operate our garage door! The IoT-based smart garage door eliminates the need for carrying bulky keychains. All you need is to configure and integrate your smartphone with the home IoT network, and you can effortlessly open or close your garage door with just a few clicks of a button. This smart garage door system incorporates laser and voice commands and smart notifications for monitoring purposes. The smart notification option can trigger alerts in real-time to notify as and when the garage door opens or closes, which is a nifty addition. This research paper enriches with:

(i) Garage automation which allows user to control the door and electrical components of the garage.

(ii) Vehicles security which provides users improved security system from morning to all day long.

(iii) Vehicles tracking which enables the user to track the vehicles inside the garage and also outside the garage.

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INTRODUCTION

In this research we designed a secured garage system using number plate or license plate of the vehicles. This system ensured well managed security system for vehicles in a smart way. We developed a smart garage door lock system based on Radio Frequency Identification (RFID).Here, we have revealed a Smart vehicles parking system using RFID. This developed system also referred a smart way for vehicles garage system. In this research we introduced a Laser based system for vehicles detection in security purpose as well as car parking mapping system. Here, we also developed a system for campus vehicles parking and transportation system. We developed a automated garage system on real-time parking stall. We also developed an IoT based smart parking system using Raspberry pi and pi cam. this model is designed for using server to access information using internet. We developed a smart garage system using FPGA, RFID and camera. We also need to develop android application for smart parking. Hence, we depicted a smart solution for parking using an android application and sensor based car.

Literature Reviews/Comparative study

In our research, we developed our system with three interconnected sections.

Firstly, this research focuses on the automation of garage including garage door and electrical components.

Secondly, this research ensures security system of the vehicles garage.

Finally, this research emphasizes on tracking the location of the vehicles using android application.

A. GARAGE AUTOMATION

In this section, users are able to control all the electronics components as well as door wirelessly. The door is controlled by using internet and GSM/GPRS module. So this system is totally based on IoT. When the user click on the button of the application, it sends a unique code to the arduino and arduino processes the corresponding code. Then the door will be opened automatically. Again, after entering into the garage, the users have ability to close the door by clicking another button. If the users want to switch on the light of the garage or any Electrical components

B. SECURITY

We designed a strong and improved but very cheap security system in our research. Our security system is controlled wirelessly by an android application. Basically we divide our system into two important section which can be operated both from inside and outside of the garage.

IP-Camera

In this security system user can easily visualize the condition of smart garage through android application. User has ability to record the live streaming and

store them in mobile or other storage devices. Again, user can also access this live streaming anywhere in the world using internet.

Laser Security

This is one of the cheapest security system in our research. We surrounded our parking area through Laser beam and passing this beam using some reflector such as glasses. We placed a Laser shield acting as transmitter and also a LDR which plays a role as receiver. When a stranger cross the Laser Shield, it produce some alarming messages to the arduino and arduino sends it to the application. When the application received the message, the phone start ringing to alert the users for security issues

C. LOCATION TRACKING

This features allows user to detect the location of the vehicles. User can easily find the vehicles in the Google Map using Global Positioning System (GSM). If user place a GPS module in the vehicle, he/she can easily track the location using our developed application.
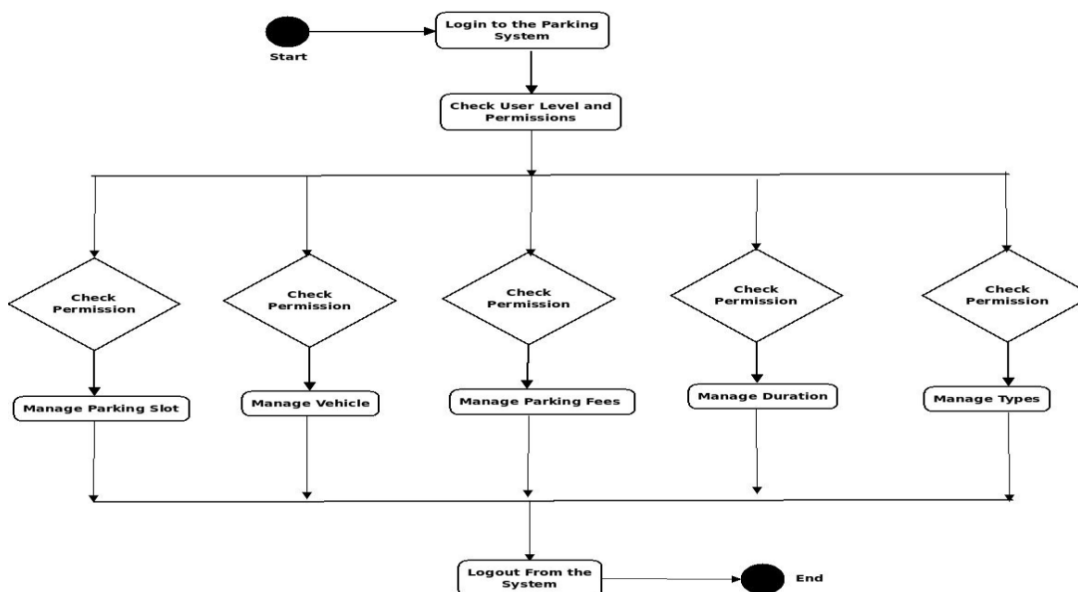
UML DIAGRAMS FOR SMART VEHICLE GARAGE SYSTEM

Activity Diagram:

This is the Activity UML diagram of Smart Vehicle Garage System which shows the flows between the activity of Car Number, Car, Car Owner, Parking Fees, Parking Space. The main activity involved in this UML Activity Diagram of Smart Vehicle Garage System are as follows:

- Car Number Activity
- Car Activity
- Car Owner Activity
- Parking Fees Activity
- Parking Space Activity

Features of Activity Diagram

- Admin User can search Car Number, view description of a selected Car Number, add Car Number , update Car Number and delete Car Number .
- Its shows the activity flow of editing, adding and updating of Car
- User will be able to search and generate report of Car Owner, Parking Fees, Parking Space
- All objects such as (Car Number , Car, Parking Space) are interlinked
- Its shows the full description and flow of Car Number , Parking Fees, Parking Space, Car Owner, Car

LOGIN ACTIVITY DIAGRAM OF SMART VEHICLE GARAGE SYSTEM

This is the **Login Activity Diagram of Parking System**, which shows the flows of Login Activity, where admin will be able to login using their username and password. After login user can manage all the operations on Parking Slot, Customers, Duration, Type, Vehicle. All the pages such as Duration, Type, Vehicle are secure and user can access these page after login. The diagram below helps demonstrate how the login page works in a Parking System. The various objects in the Type, Parking Slot, Customers, Duration, and Vehicle page—interact over the course of the Activity, and user will not be able to access this page without verifying their identity.
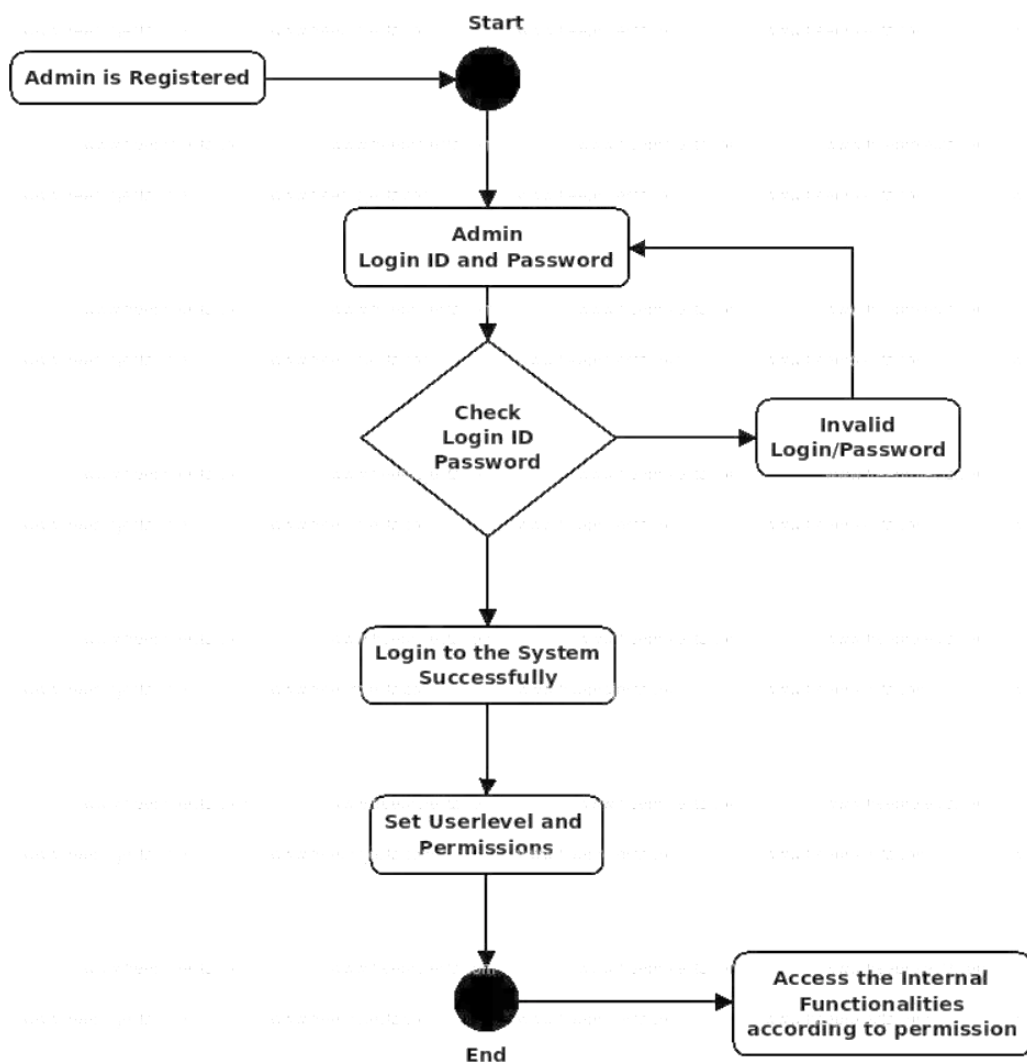
Class Diagram of Smart Vehicle Garage System

Smart Vehicle Garage System Class Diagram describes the structure of a Smart Vehicle Garage System classes, their attributes, operations (or methods), and the relationships among objects. The main classes of the Smart vehicle Garage System are Car, Parking, Parking Slots, Parking Space, Parking Fees, Car Owner.

Classes of Smart Vehicle Garage System Class Diagram:

- **Car Class** : Manage all the operations of Car
- **Parking Class** : Manage all the operations of Parking
- **Parking Slots Class** : Manage all the operations of Parking Slots
- **Parking Space Class** : Manage all the operations of Parking Space
- **Parking Fees Class** : Manage all the operations of Parking Fees
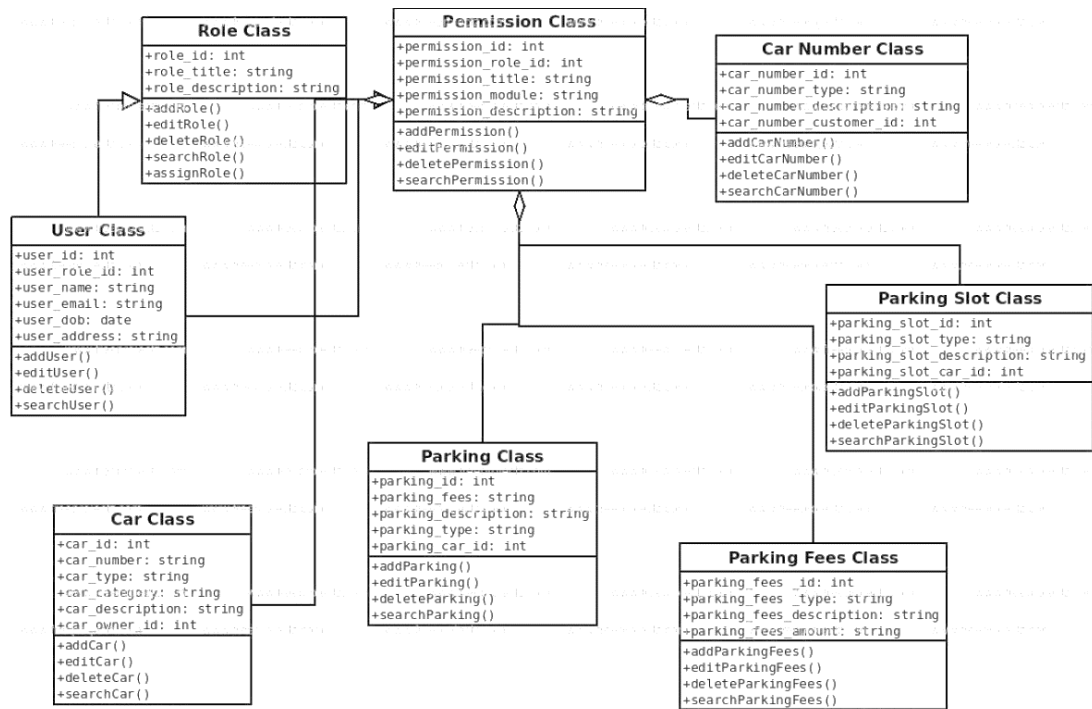- **Car Owner Class** : Manage all the operations of Car Owner

Classes and their attributes of Smart Vehicle Garage System Class Diagram:

- **Car Attributes** : car_id, car_owner_id, car_number, car_company car_type, car_description
- **Parking Attributes** : parking_id, parking_car_id, parking_fees, parking_type, parking_description
- **Parking Slots Attributes** : parking_slot_id, parking_slot_car_id, parking_slot_type, parking_slot_description
- **Parking Space Attributes** : parking_space_id, parking_space_car_id, parking_space_type, parking_space_description
- **Parking Fees Attributes** : parking_fees_id, parking_fees_amount, parking_fees_type, parking_fees_description
- **Car Owner Attributes** : car owner_id, car owner_name, car owner_mobile, car owner_email, car owner_username, car owner_password, car owner_address

Classes and their methods of Smart Vehicle Garage System Class Diagram:

- **Car Methods** : addCar(), editCar(), deleteCar(), updateCar(), saveCar(), searchCar()
- **Parking Methods** : addParking(), editParking(), deleteParking(), updateParking(), saveParking(), searchParking()

- **Parking Slots Methods** : addParking Slots(), editParking Slots(), deleteParking Slots(), updateParking Slots(), saveParking Slots(), searchParking Slots()
- **Parking Space Methods** : addParking Space(), editParking Space(), deleteParking Space(), updateParking Space(), saveParking Space(), searchParking Space()
- **Parking Fees Methods** : addParking Fees(), editParking Fees(), deleteParking Fees(), updateParking Fees(), saveParking Fees(), searchParking Fees()
- **Car Owner Methods** : addCar Owner(), editCar Owner(), deleteCar Owner(), updateCar Owner(), saveCar Owner(), searchCar Owner()

Role Class
+role_id: int
+role_title: string
+role_description: string
+addRole()
+editRole()
+deleteRole()
+searchRole()
+assignRole()

Permission Class
+permission_id: int
+permission_role_id: int
+permission_title: string
+permission_module: string
+permission_description: string
+addPermission()
+editPermission()
+deletePermission()
+searchPermission()

Car Number Class
+car_number_id: int
+car_number_type: string
+car_number_description: string
+car_number_customer_id: int
+addCarNumber()
+editCarNumber()
+deleteCarNumber()
+searchCarNumber()

User Class
+user_id: int
+user_role_id: int
+user_name: string
+user_email: string
+user_dob: date
+user_address: string
+addUser()
+editUser()
+deleteUser()
+searchUser()

Parking Slot Class
+parking_slot_id: int
+parking_slot_type: string
+parking_slot_description: string
+parking_slot_car_id: int
+addParkingSlot()
+editParkingSlot()
+deleteParkingSlot()
+searchParkingSlot()

Parking Class
+parking_id: int
+parking_fees: string
+parking_description: string
+parking_type: string
+parking_car_id: int
+addParking()
+editParking()
+deleteParking()
+searchParking()

Car Class
+car_id: int
+car_number: string
+car_type: string
+car_category: string
+car_description: string
+car_owner_id: int
+addCar()
+editCar()
+deleteCar()
+searchCar()

Parking Fees Class
+parking_fees _id: int
+parking_fees _type: string
+parking_fees_description: string
+parking_fees_amount: string
+addParkingFees()
+editParkingFees()
+deleteParkingFees()
+searchParkingFees()

Component Diagram for Smart Vehicle Garage System

This is a **Component diagram of Smart Vehicle Garage System** which shows components, provided and required interfaces, ports, and relationships between the Parking Slots, Car, Parking Fees, Parking and Car Number . This type of diagrams is used in Component-Based Development (CBD) to describe systems with Service-Oriented Architecture (SOA). **Smart Vehicle Garage System UML component diagram**, describes the organization and wiring of the physical components in a system.

Components of UML Component Diagram of Smart Vehicle Garage System:

- Parking Slots Component
- Car Component
- Parking Fees Component
- Parking Component
- Car Number Component

 Featues of Smart Vehicle Garage System Component Diagram:

- You can show the models the components of Smart Vehicle Garage System.
- Model the database schema of Smart Vehicle Garage System
- Model the executables of an application of Smart Vehicle Garage System
- Model the system's source code of Smart Vehicle Garage System
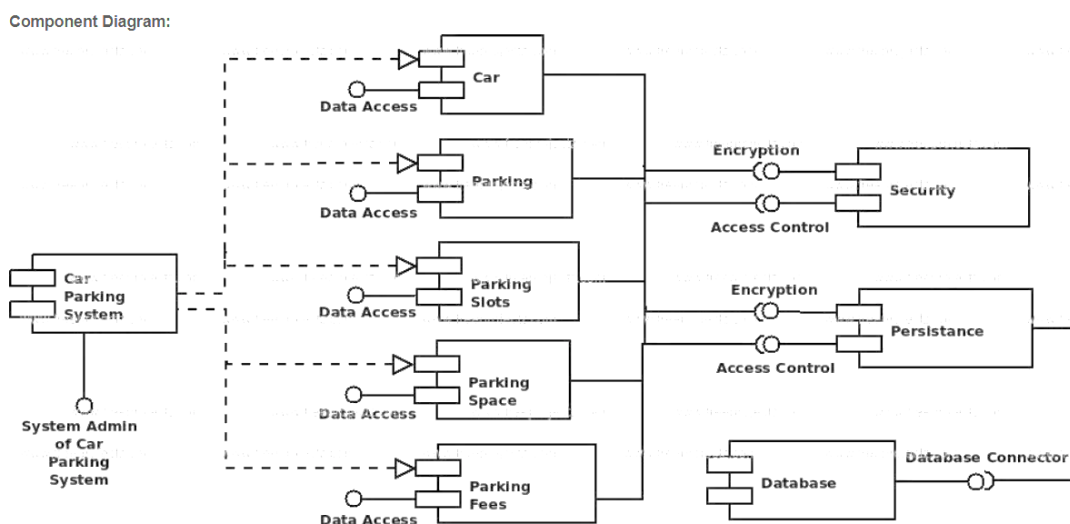
Smart Vehicle Garage System Dataflow Diagram

Online Smart Vehicle Garage System Data flow diagram is often used as a preliminary step to create an overview of the Smart Vehicle Garage without going into great detail, which can later be elaborated.it normally consists of overall application dataflow and processes of the Smart Vehicle Garage process. It contains all of the userflow and their entities such all the flow of Car, Parking, Parking Space, Parking Slots, Parking Fees, Car Owner, Car Number. All of the below diagrams has been used for the visualization of data processing and structured design of the Smart Vehicle Garage process and working flow.

Zero Level Data Flow Diagram (0 Level DFD) Of Online Smart Vehicle Garage System :

This is the Zero Level DFD of Online Smart Vehicle Garage System, where we have eloborated the high level process of Smart Vehicle Garage. It's a basic overview of the whole Online Smart Vehicle Garage System or process being analyzed or modeled. It's designed to be an at-a-glance view of Parking Fees,Car Owner and Car Number showing the system as a single high-level process, with its relationship to external entities of Car,Parking and Parking Space. It should be easily understood by a wide audience, including Car,Parking Space and Parking Fees In zero leve DFD of Online Smart Vehicle Garage System, we have described the high level flow of the Smart Vehicle Garage system.

High Level Entities and proccess flow of Online Smart Vehicle Garage System:

- Managing all the Car
- Managing all the Parking
- Managing all the Parking Space
- Managing all the Parking Slots
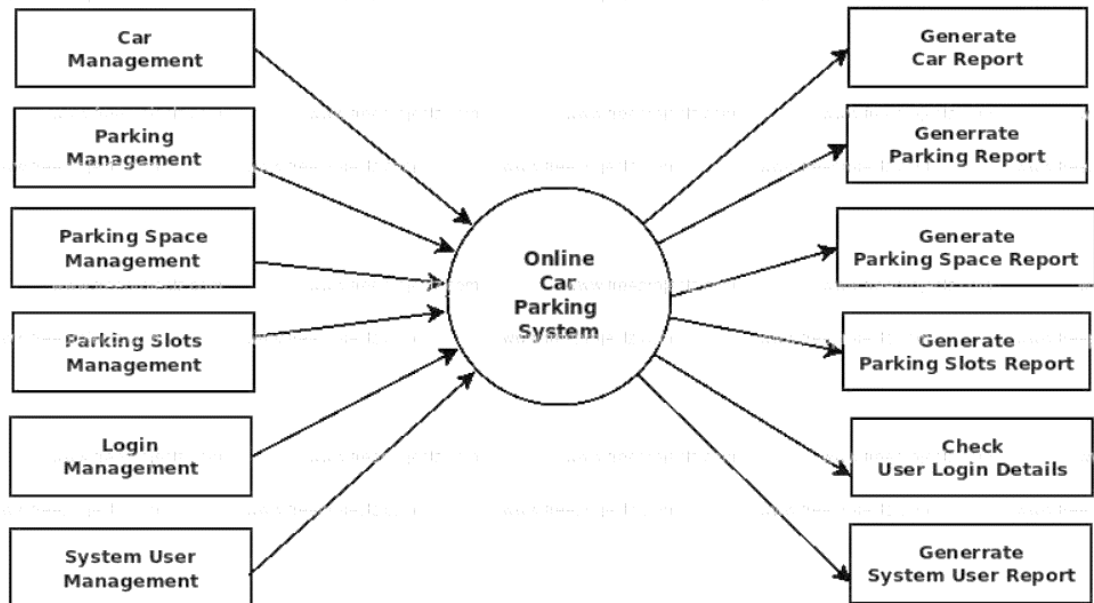- Managing all the Parking Fees
- Managing all the Car Owner
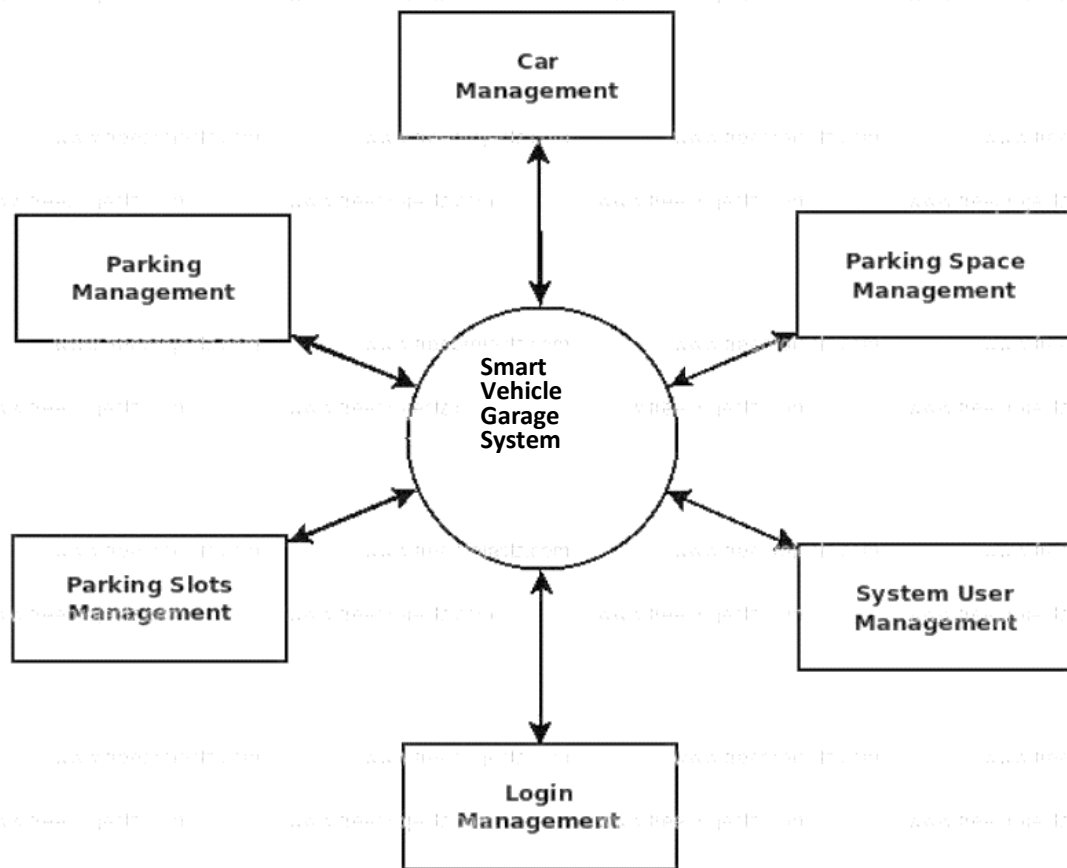
First Level Data Flow Diagram(1st Level DFD) Of Online Smart Vehicle Garage System :

First Level DFD (1st Level) of Online Smart Vehicle Garage System shows how the system is divided into sub-systems (processes), each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the Online Smart Vehicle Garage System system as a whole. It also identifies internal data stores of Car Number, Car Owner, Parking Fees, Parking Slots, Parking Space that must be present in order for the Smart Vehicle Garage system to do its job, and shows the flow of data between the various parts of Car, Parking Space, Car Owner, Car Number, Parking Fees of the system. DFD Level 1 provides a more detailed breakout of pieces of the 1st level DFD. You will highlight the main functionalities of Smart Vehicle Garage.

Main entities and output of First Level DFD (1st Level DFD):

- Processing Car records and generate report of all Car
- Processing Parking records and generate report of all Parking
- Processing Parking Space records and generate report of all Parking Space

- Processing Parking Slots records and generate report of all Parking Slots
- Processing Parking Fees records and generate report of all Parking Fees
- Processing Car Owner records and generate report of all Car Owner
- Processing Car Number records and generate report of all Car Number

**Second Level Data Flow Diagram(2nd Level DFD) Of Online Smart Vehicle Garage System :**

DFD Level 2 then goes one step deeper into parts of Level 1 of Smart Vehicle Garage. It may require more functionalities of Smart Vehicle Garage to reach the necessary level of detail about the Smart Vehicle Garage functioning. First Level DFD (1st Level) of Online Smart Vehicle Garage System shows how the system is divided into sub-systems (processes). The 2nd Level DFD contains more details of Car Number, Car Owner, Parking Fees, Parking Slots, Parking Space, Parking, Car.

Low level functionalities of Online Smart Vehicle Garage System

- Admin logins to the system and manage all the functionalities of Online Smart Vehicle Garage System
- Admin can add, edit, delete and view the records of Car, Parking Space, Parking Fees, Car Number
- Admin can manage all the details of Parking, Parking Slots, Car Owner
- Admin can also generate reports of Car, Parking, Parking Space, Parking Slots, Parking Fees, Car Owner
- Admin can search the details of Parking, Parking Fees, Car Owner

- Admin can apply different level of filters on report of Car, Parking Slots, Parking Fees
- Admin can tracks the detailed information of Parking, Parking Space, Parking Slots, , Parking Fees
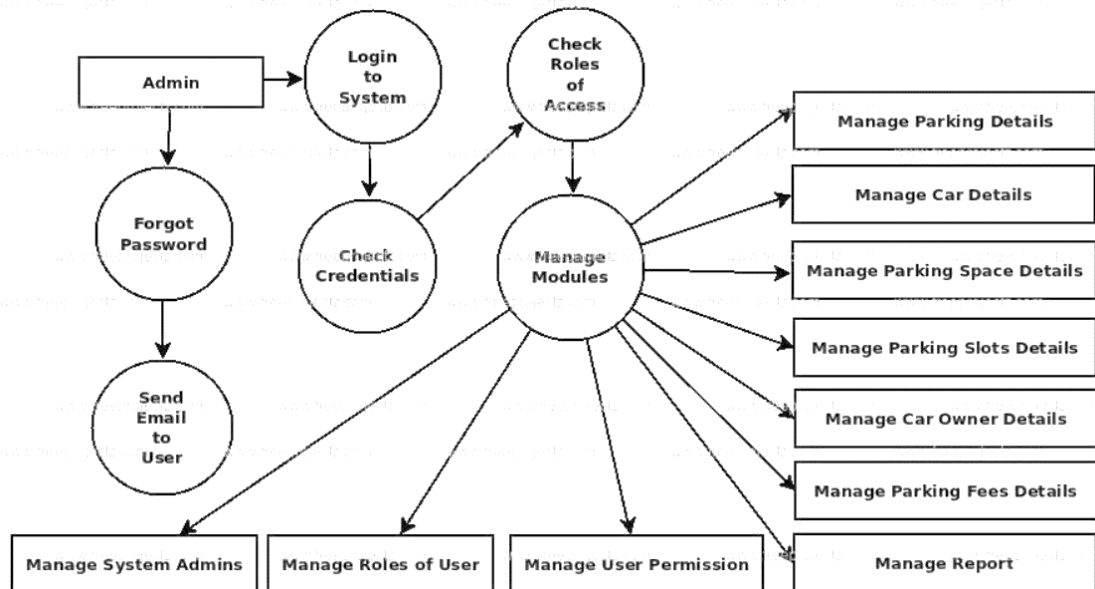
Smart Vehicle Garage System ER Diagram

This ER (Entity Relationship) Diagram represents the model of Smart Vehicle Garage System Entity. The entity-relationship diagram of Smart Vehicle Garage System shows all the visual instrument of database tables and the relations between Parking, Parking Space, Car, Car Owner etc. It used structure data and to define the relationships between structured data groups of Smart Vehicle Garage System functionalities. The main entities of the Smart Vehicle Garage System are Car, Parking, Parking Slots, Parking Space, Parking Fees and Car Owner.

Smart Vehicle Garage System entities and their attributes :

- **Car Entity** : Attributes of Car are car_id, car_owner_id, car_number, car_company car_type, car_description
- **Parking Entity** : Attributes of Parking are parking_id, parking_car_id, parking_fees, parking_type, parking_description
- **Parking Slots Entity** : Attributes of Parking Slots are parking_slot_id, parking_slot_car_id, parking_slot_type, parking_slot_description
- **Parking Space Entity** : Attributes of Parking Space are parking_space_id, parking_space_car_id, parking_space_type, parking_space_description

- **Parking Fees Entity** : Attributes of Parking Fees are parking_fees_id, parking_fees_amount, parking_fees_type, parking_fees_description
- **Car Owner Entity** : Attributes of Car Owner are car owner_id, car owner_name, car owner_mobile, car owner_email, car owner_username, car owner_password, car owner_address

Description of Smart Vehicle Garage System Database :

- The details of Car is store into the Car tables respective with all tables
- Each entity (Car Owner, Parking Slots, Parking Fees, Parking, Car) contains primary key and unique keys.
- The entity Parking Slots, Parking Fees has binded with Car, Parking entities with foreign key
- There is one-to-one and one-to-many relationships available between Parking Fees, Parking Space, Car Owner, Car
- All the entities Car, Parking Fees, Parking Slots, Car Owner are normalized and reduce duplicacy of records
- We have implemented indexing on each tables of Smart Vehicle Garage System tables for fast query execution.
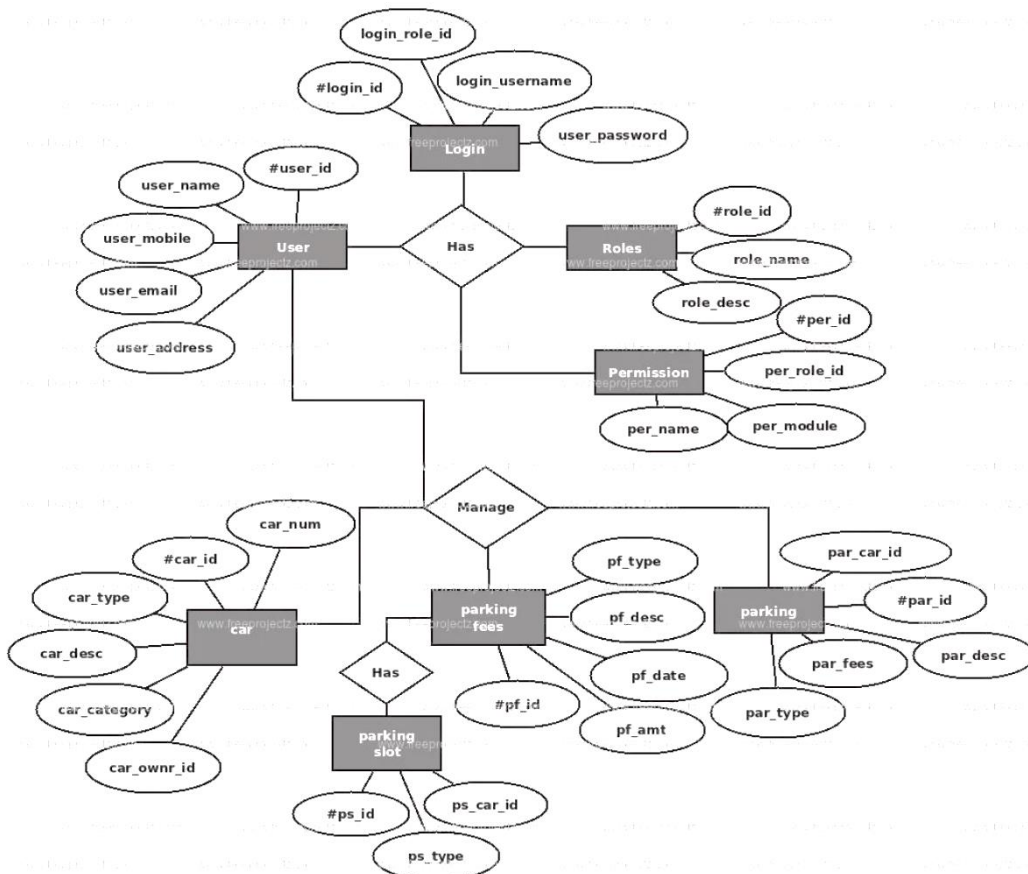
Methodology
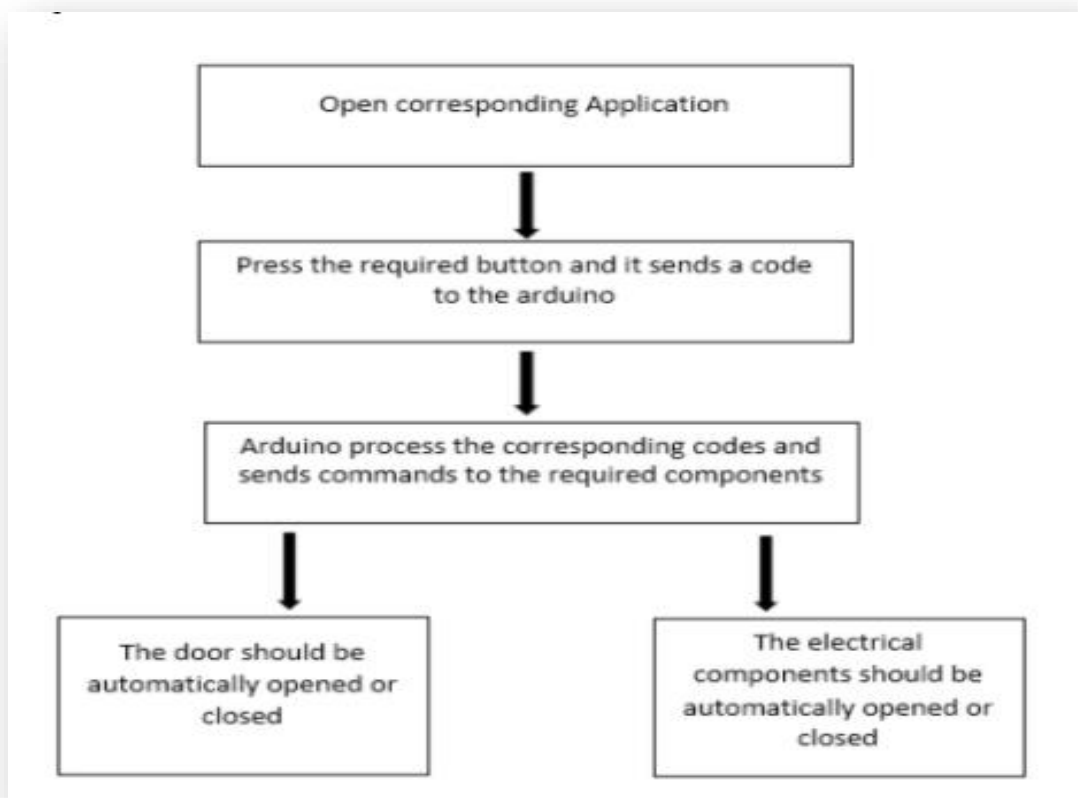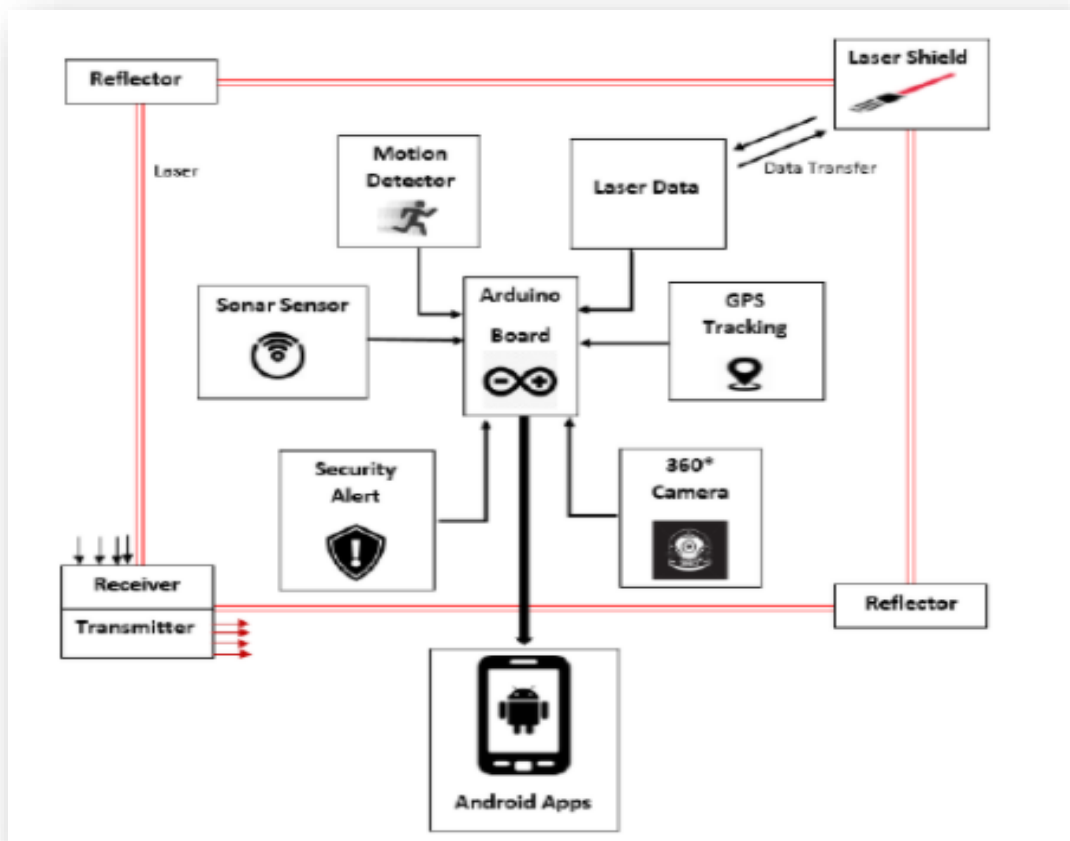
PROBLEM FORMULATION

Problem:

Opening and closing of garage doors is always a tedious job, where a person have to carry bulky key chains.

Lost of garage keys.

Getting out of your car to open the garage door manually by letting your car ignition on which results in waste of fuel.

Solution:

The IoT-based smart garage door eliminates the need for carrying bulky keychains. All you need is to configure and integrate your smartphone with the home IoT network, and you can effortlessly open or close your garage door with just a few clicks of a button.

REQUIRED TOOLS

- Microcontroller(Arduino Board) works on IOT Technology
- Sensors and actuators(motors)
- Receivers and transmitters
- Laser Shield
- Reflectors
- RFID TAG
- GPS
- Vehicles garage
- GSM
- Laser
- LDR (photo sensor)
- IP-Camera
- Android Apps

Feasibility Analysis

In our research, we emphasize one problem in our society that is vehicles garage system. Through this research we revealed a smart solution for this problem. We developed android control automated door. We also enrich our research with security system. We work hard for making this solution in a smart way. We believe that if this procedure is applied to our regular purpose. We will be benefited both in economic and technical ways. This whole system can easily be applicable with existing solution. Thus making this system more efficient. Moreover, this cheapest security system also makes our regular life easier, more satisfied and tension free.

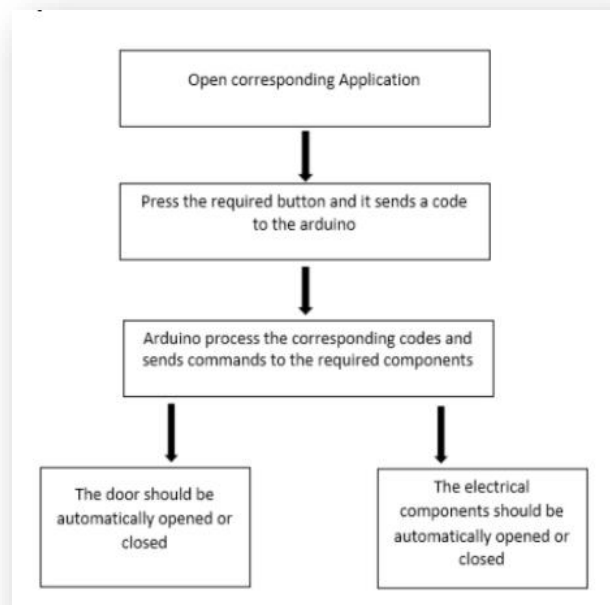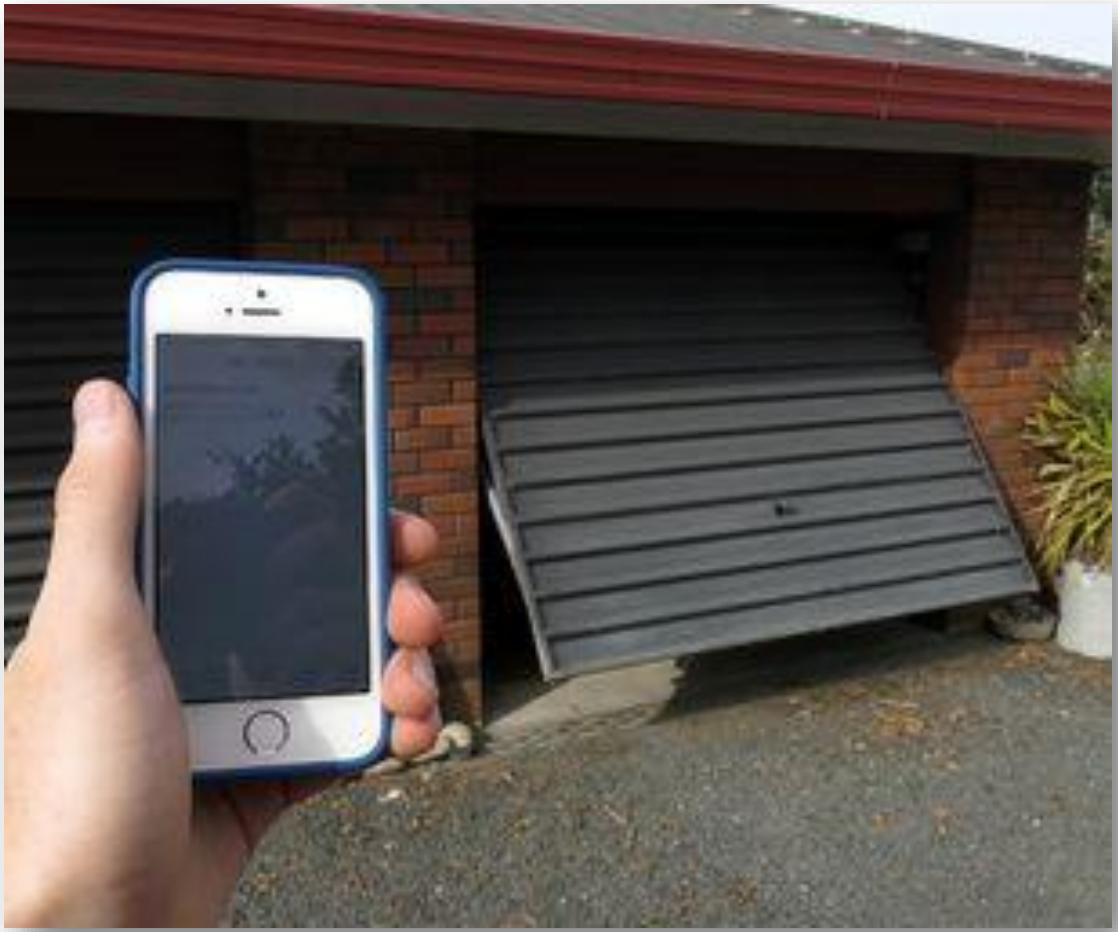# Complete Work Plan Layout
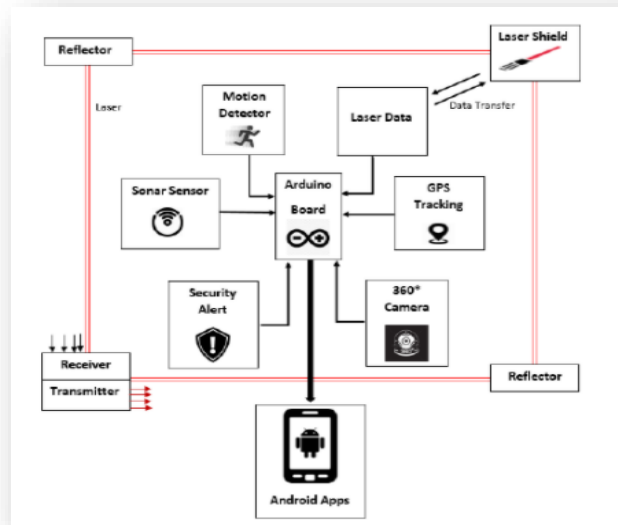
Fig. (1)

Fig (2)

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