DOI: https://doi.org/10.24297/ijct.v20i.8859

Intelligent Key (IKey) The key of Securing Cars

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Abstract

With the advancement of technology, applications have become an indispensable part of daily life to solve many problems. Technology is one of the important contents that promotes communication between people and enhances the acquisition and acquisition of information. Therefore, the development of information technology is the reason for the major scientific and knowledge revolution, which has an impact on the convenience of human life in various scientific journals.

To recognize our responsibility, we came up with the idea of replacing physical objects with applications that increase usability in our life. As we strive to develop a smart car control application, the application can save the driver from the car key. Therefore, the application controls certain functions in the car, such as opening and closing doors and starting and stopping the engine. By connecting the app to the car and ensuring that the user does not need to carry the car key. As a result, now we are able to provide convenience and luxury to our customers and end-users.

Keywords: Android Mobile Application, smart car application, remote access.

Introduction

Daily life was not as simple as it was before due to the tremendous development that occurred in our world in short periods, so technology had a very big role in this development, as technology touches everything people do daily even if their interests or actions differ, for example, The impact of technology on the scientific process has become very large, as many colleges and graduate programs have created platforms for online learning, and in another example: technology has become an integral part of the medical field where information is gathered, researches and treatments are applied, and even strengthens communication between researchers and doctors, and For the day, technology interfered in the field of cars as well, as auto manufacturers realized the importance of integrating technology elements into their cars, starting with radio, phone chargers, electric glass ... etc. There are also many improvements have been made to cars to ensure a higher degree of safety such as the anti-lock braking system, and Today most of the cars currently produced are equipped with high-quality entertainment systems to provide a pleasant and wonderful climate for the driver.

From this standpoint, we are working on Android And IOS phones to control car door lock and unlock, start the car, stop the car, and control the opening and closing of windows remotely, and all these services are provided in the IKey app, we have been very keen to make the cost of the application affordable Everyone[11].

We worked on this system because of the urgent need of people who suffer from losing their car keys and because of some of the buttons broken inside their cars that allow them to access some services inside the car, and then the car owner may have to change these buttons at a high cost and the process of breaking the buttons may also happen once another other is done by paying the money back on these buttons, and for this, we may need an IKey app to use it to provide these services to solve these problems owners of cars without having to pay money on these buttons and the IKey application will be placed on the Play Store.

Materials and Methods

- **Scrum Model**

We intend to use the Scrum model in developing our system. That can be viewed as a framework based on an agile way. Which is the most popular used in software development. Scrum process suits projects that require rapid change or necessary requirements. Typically, the Scrum method passes through a set of iterations called "Sprints" where each Sprint lasts maximally to four weeks [1]. Each Sprint starts with a summary plan meeting and end with a conclusion. The following figure shows the scrum process improves the performance of the team

members, enhances communication between them, and allows discovering the problems and mistakes in the early stages, so it can be corrected quickly and easily [5]. According to these previous features, Scrum methodology has been selected to serve in the project's success and to improve the project quality.
See figure 1.

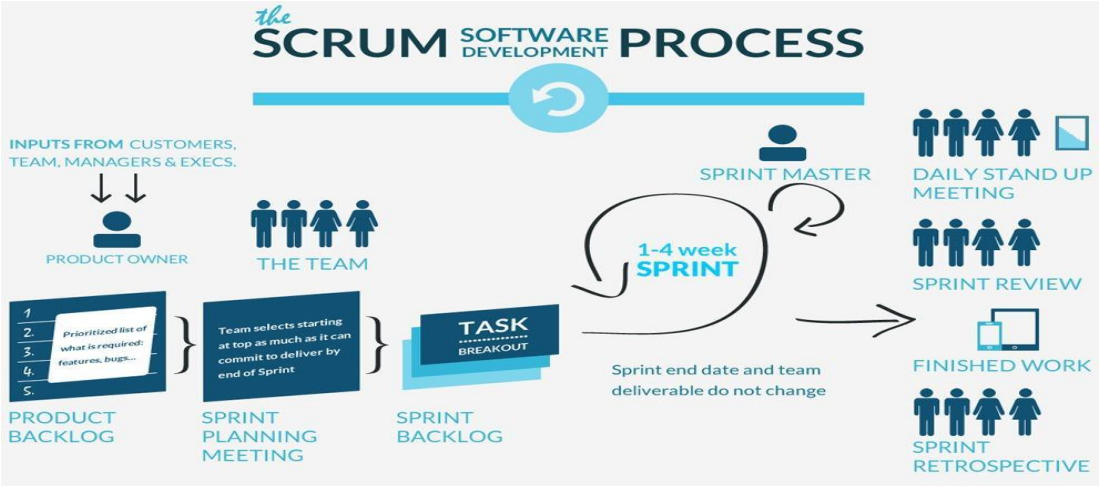


Figure 1: Scrum software development process [5]

- **Why Scrum Model**

The development team did Scrum work simultaneously instead of sequentially. The code of programmers "on the fly" and do not wait until the answers of all questions and everything is crystal clear before they begin to program. In the event of the life of the project or even after, everything is flexible and changeable. It is true that testing code which is constantly done and not just after all coding has been written.

With Scrum, according to the importance of tasks, they are prioritized, and this means that the task that is completed first will probably affect the following tasks.

The team members, usually 5 to 9 persons in the Scrum development team, interface nearly and have the motto "all for one and one for all". Their final goal in everyone is to finish as soon as possible useable segments of prioritized.

Due to that a Scrum team does not have a leader to tell them what they should do and when they identify more with the project as their own. This helps boost their morale. They also have a ScrumMaster, who mentors and protects them from outside negative pressure. Also due to techniques like pair programming, the rate of increased knowledge is bigger than it would be if they coded alone. For all these reasons, morale and job satisfaction is greater.

The diagram in Fig. 2 shows the schema of the system with the following entities:

1. **Account** (AccountNum, UserName, Password, Email, PhoneNumber)
2. **Car** (CarNumber, CarName. Color, Company, AccountNum)
3. **Person** (PhoneNumber, FirstName, LastName)
4. **Process** (Number, Type, AccountNum, CarNumber)

- **Relational Database Schema**

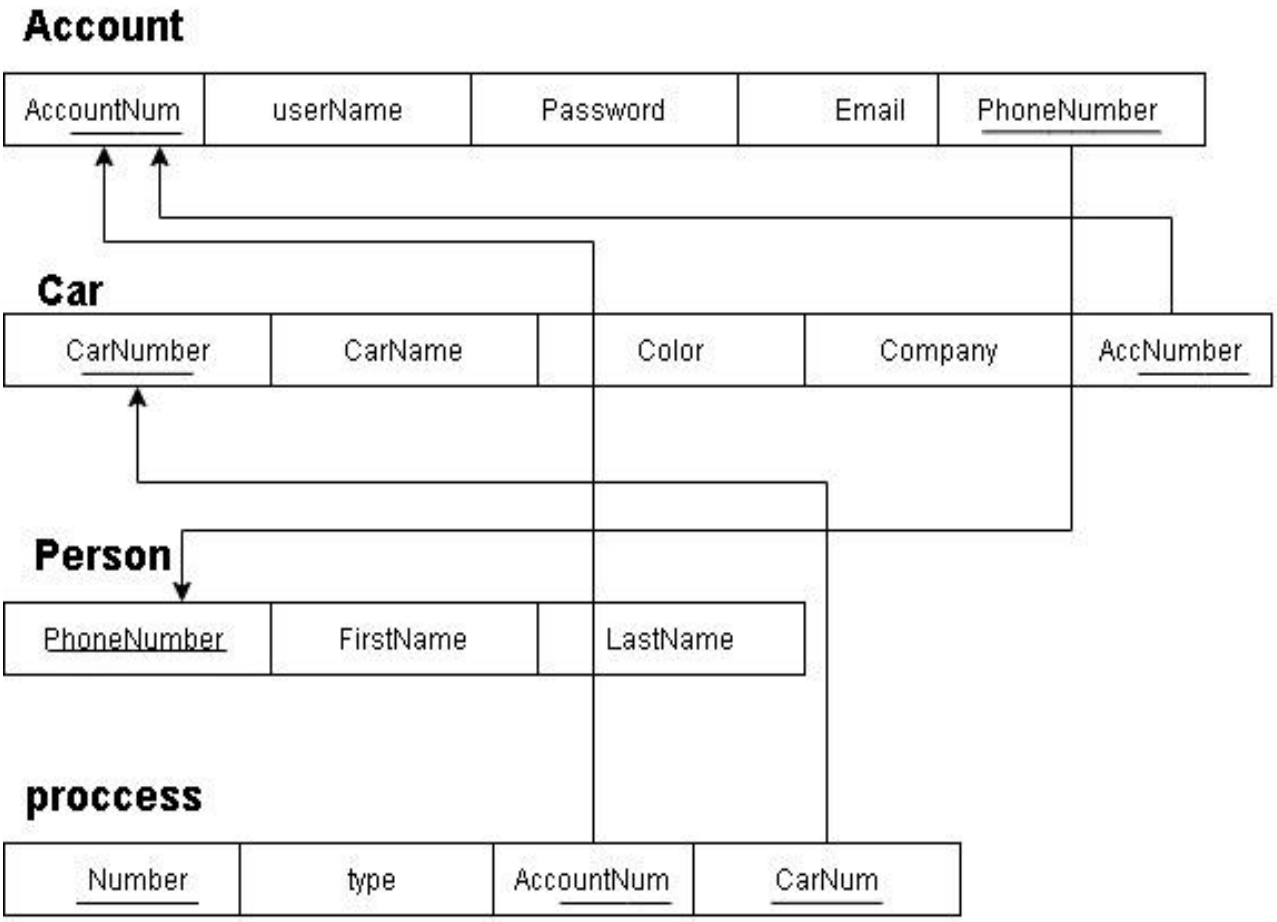


Figure 2: Schema diagram of the System

- **Entity Relationship Diagram**

ER-Diagram is a primary tool, which helps in Database Design. The overall logical structure of a database can be expressed graphically by ER-Diagrams

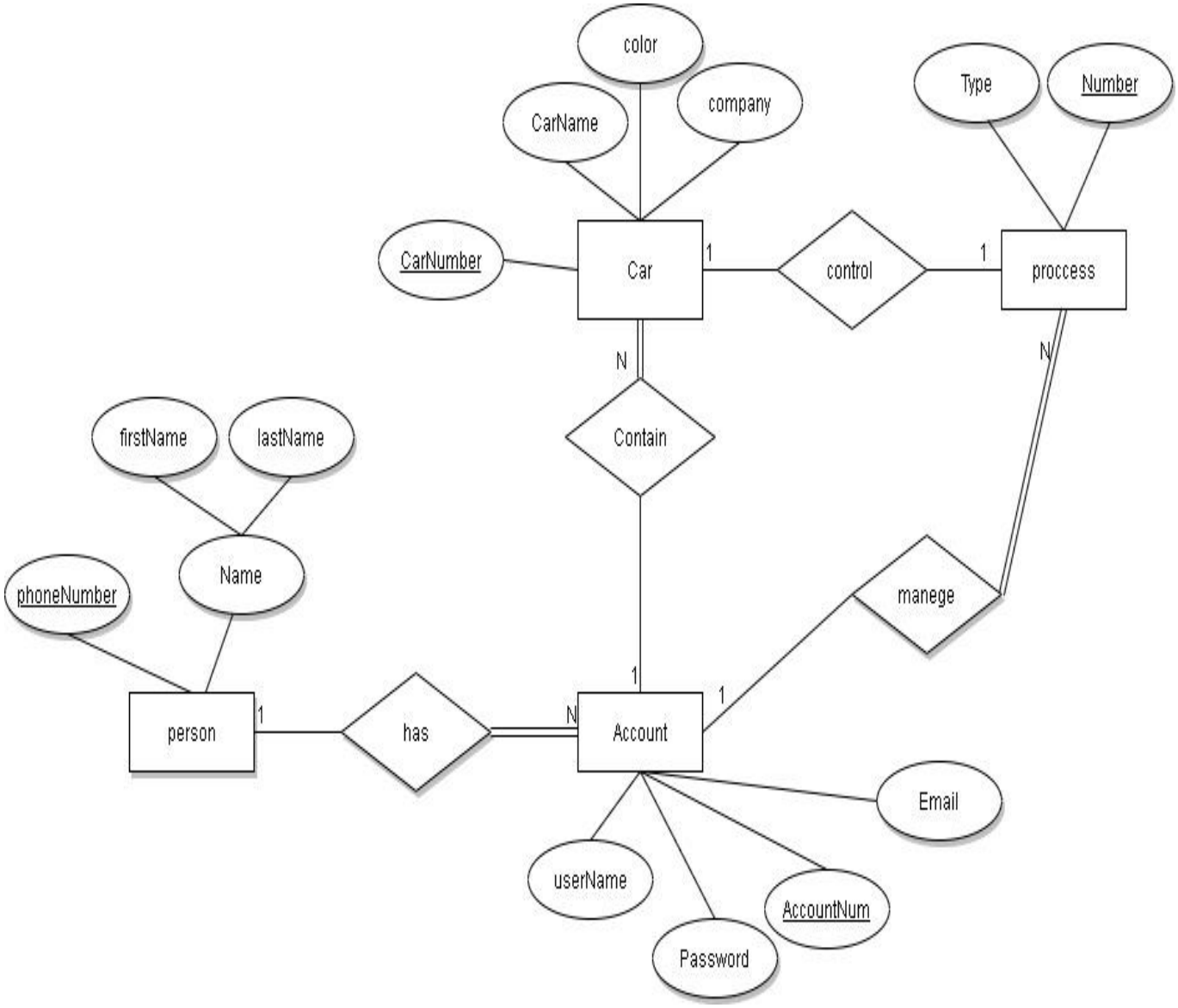


Figure 3: ERD of the system

The Fig. 4 shows the relationship between entities, which can be summarized as follows:

Each person has many attributes (PhoneNumber, Name).

Each Person in the members Entity has one or more Account.

Each Account have many attributes (AccountNum, UserName, Password, Email).

Each Account in the members Entity Contain one or more Car.

Each Account in the members Entity manage one or more Process.

Each Account in the members Entity owned by one Person.

Each car has many attributes (CarNumber, CarName. Color, Company).

Each car in a member entity is linked to one Account.

Each car in a member entity controlled by one Process.

Each Process have many attributes (Number, Type).

Each Process in a member entity is managing by one Account.

Each Process in a member entity is control in one car.

- **UML Class Diagram**

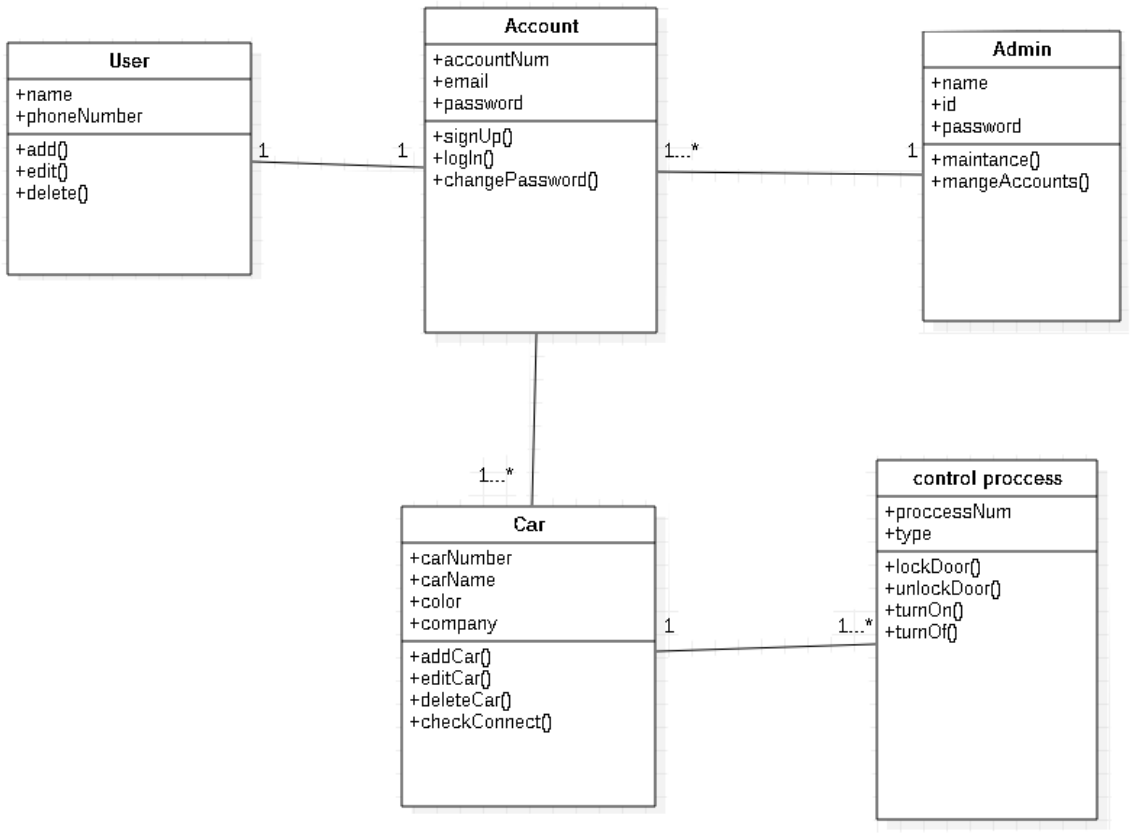


Figure 4: Class diagram of the system

- **UML Use Cases Diagrams**

The use- case diagram is a significant step in the system design phase, to imagine how the system will work and the actors will deal with the system show in figure 5.

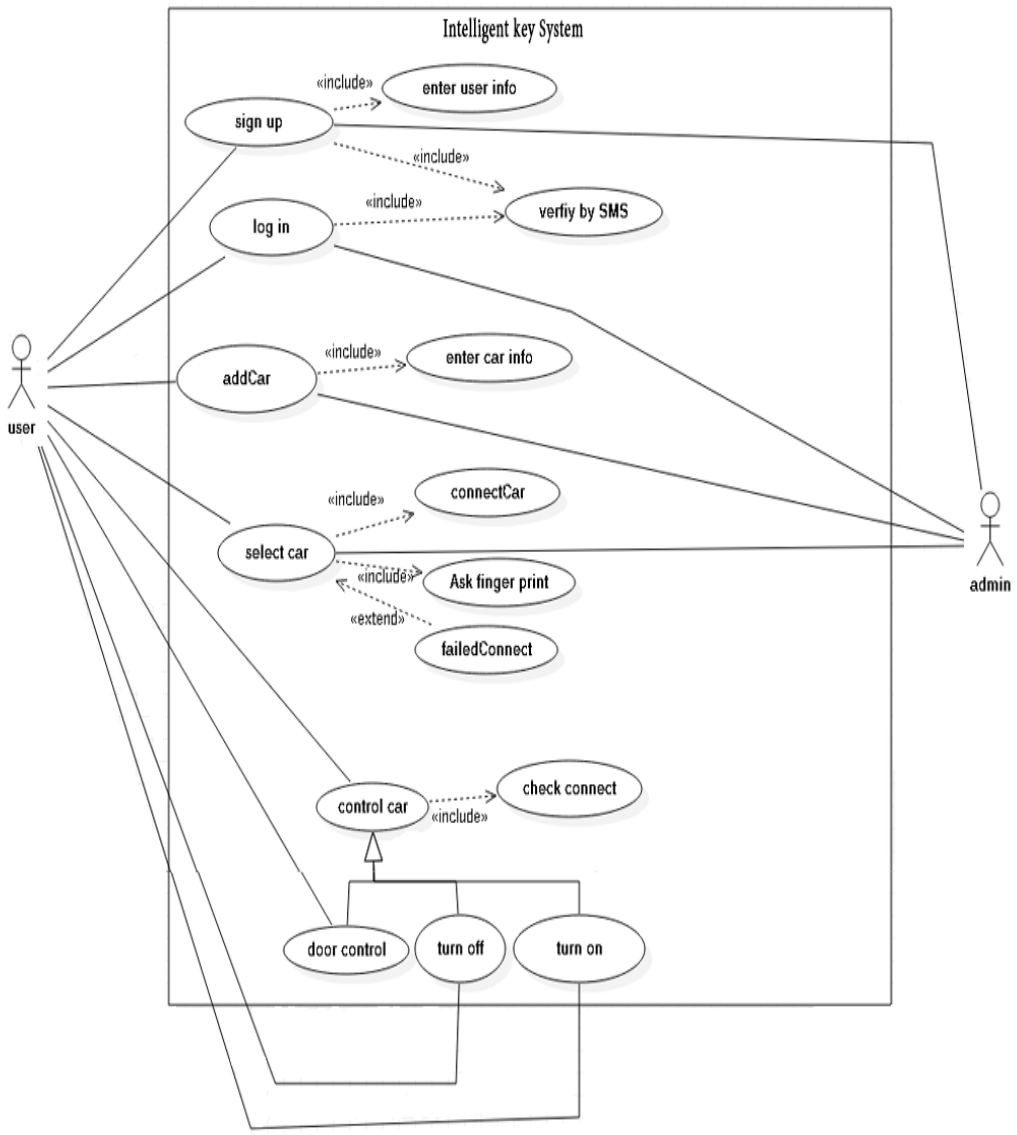


Figure 5 : The use case diagram of the system

- **use case description:**

Use Case Name:	Sign up
Actor:	User, Admin
Include use case:	Enter user info, Verify
Description:	This use case allows the user to register into the system in order to access the relevant functions according to the user's type. The various user types are User, Admin.

Table 1: Use Case Sign up

Use Case Name:	Enter user info (Include use case of Sign up)
Actor:	User, Admin
Description:	This use case allows the user to enter the information to the database through the system

Table 1: Enter user info

Use Case Name:	Log in
Actor:	User, Admin
Include use case:	Verify
Description:	This use case allows the user to login into the system in order to access the relevant functions according to the user's type. The various user types are User, Admin.

Table 2: Log in

Use Case Name:	Verify (Include use case of Sign up and log in)
Actor:	User, Admin
Include use case:	Verify
Description:	In this use case, the system will send the authentication code to the user's mobile phone, which in turn the user will insert this code into the system in order to verify the identity of the user

Table 3 : Verify

Use Case Name:	Add car
Actor:	User, Admin
Include use case:	enter car info
Description:	This use case allows the user to add multiple cars in his account. and admin will confirm add the car process was a success

Table 4: Add car

Use Case Name:	enter car info (Include use case of add car)
Actor:	User, Admin
Description:	This use case allows the user to insert car information to the database through the system, the admin can update or delete this data

Table 5: enter car info

Use Case Name:	Select car
Actor:	User
Include use case:	Connect car, ask fingerprint
Extension Point:	failed connect
Description:	This use case allows the user to select a car to control car function

Table 6: Select car

Use Case Name:	Connect car (Include use case of select car)
Actor:	User
Description:	This use case allows the user to connect with car to control car function

Table 7: Connect car

Use Case Name:	ask fingerprint (Include use case of select car)
Actor:	User
Description:	In this use case, the system will ask a fingerprint from the user to verify the identity of the user

Table 8: ask fingerprint

Use Case Name:	failed connect (Extends use case of select car)
Actor:	User
Description:	This use case enables the system to send a message with connect error to the user.

Table 9: failed connect

Use Case Name:	Control car
Actor:	User
Include use case:	Check Connect
Generalization use case:	Door control, turn of and turn on
Description:	This use case allows the user to control car function

Table 10: Control car

Use Case Name:	Check Connect (Include use case of control car)
Actor:	User
Description:	This use case the system will check if the application was connected with the car

Table 11: Check Connect

Use Case Name:	Door control (Generalization use case of control car)
Actor:	User
Description:	This use case will enable user can control the lock and unlock of car doors

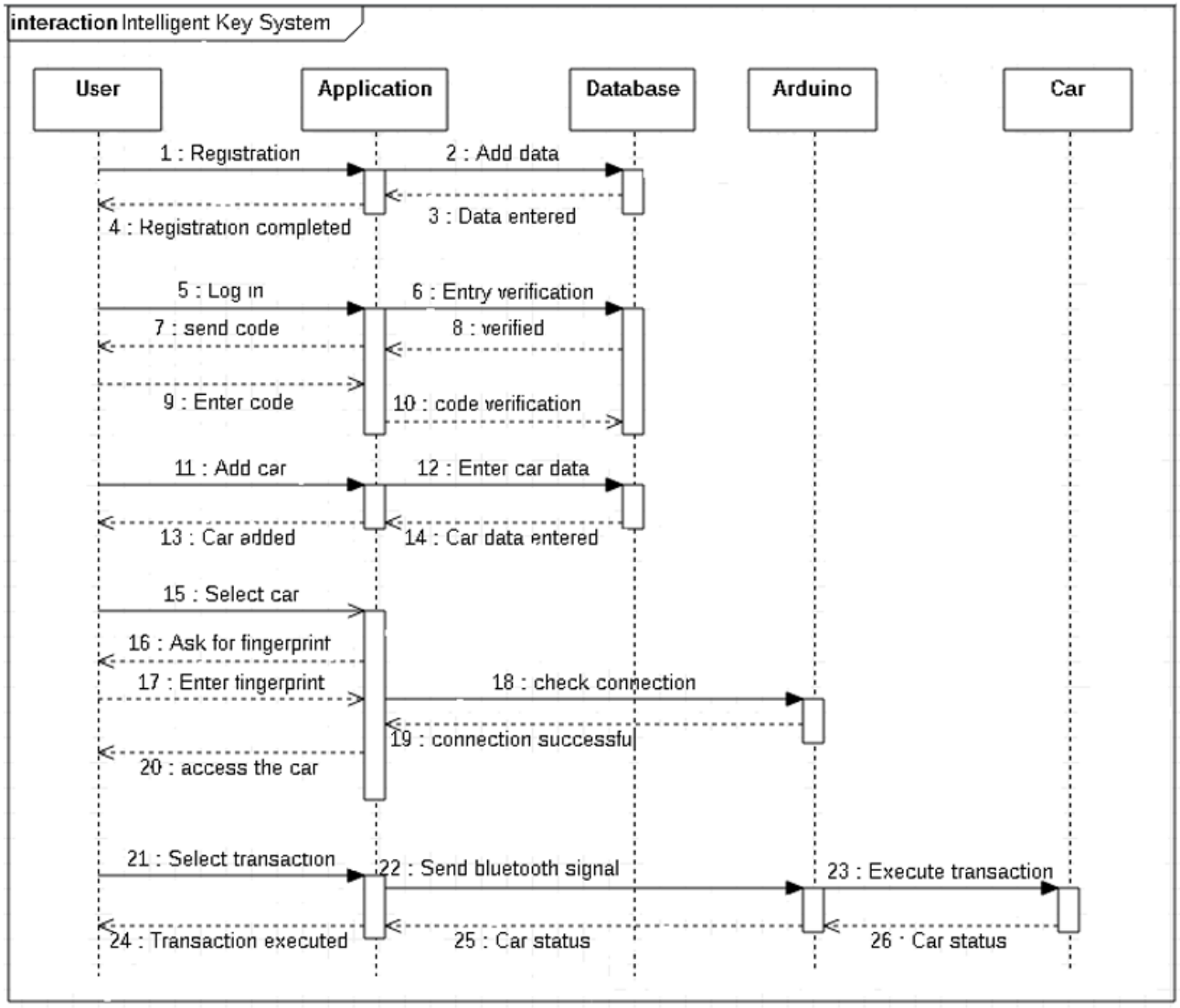
Table 12: Door control

Use Case Name:	Turn on (Generalization use case of control car)
Actor:	User
Description:	This use case will enable the user to start the car engine

Table 14: Turn on

Use Case Name:	Turn off (Generalization use case of control car)
Actor:	User
Description:	This use case will enable the user to stop the car engine

Table 15: Turn off



- **Sequence diagram**

sequence diagram simply depicts interaction between objects in a sequential order. The order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram show in figure 6.

Figure 6 : The Sequence diagram of the system

- **Activity diagram**

Activity diagram is a graphical representation of the workflow and the sequence of activities used to describe the functioning of the system show in figure 7.

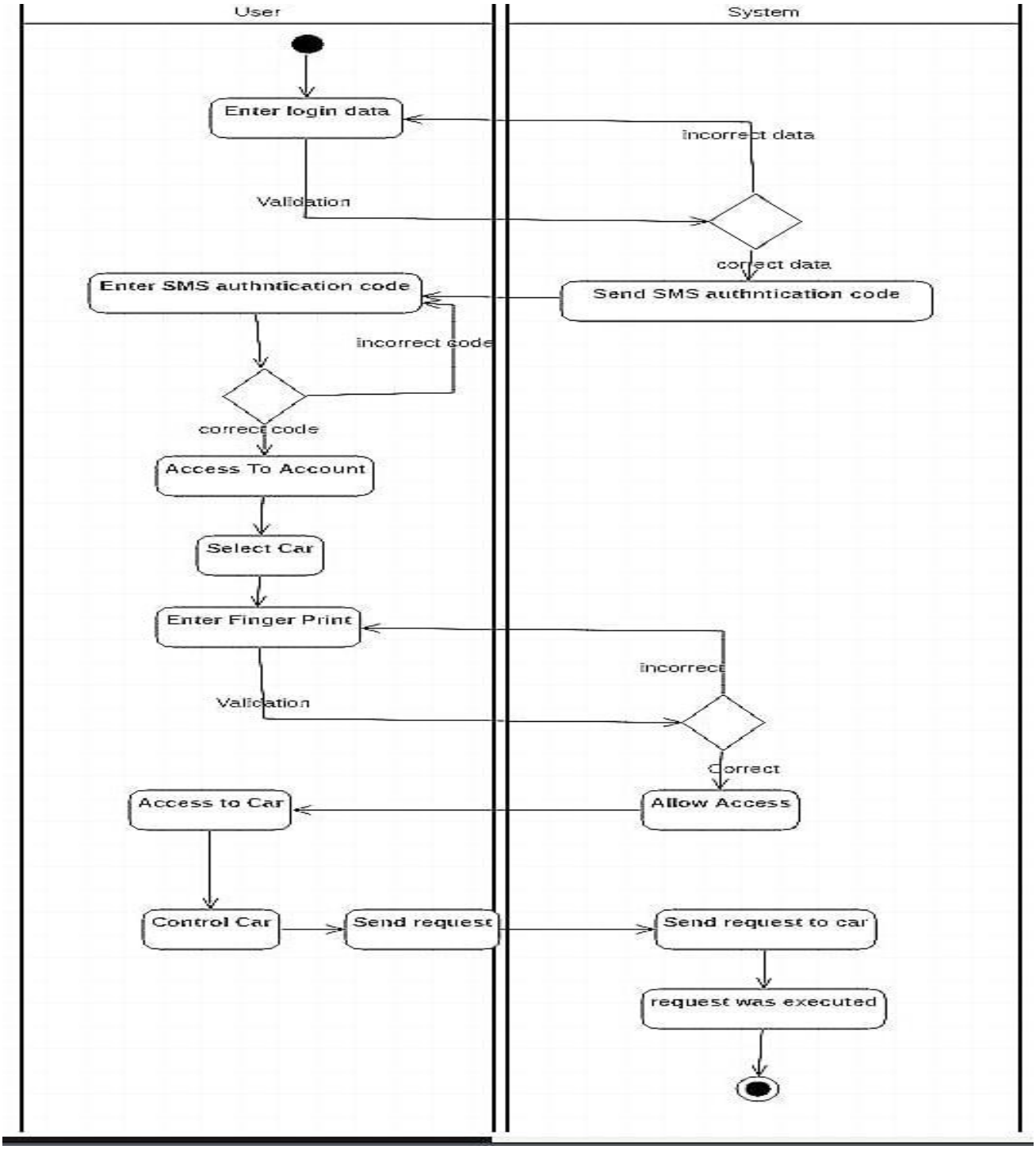
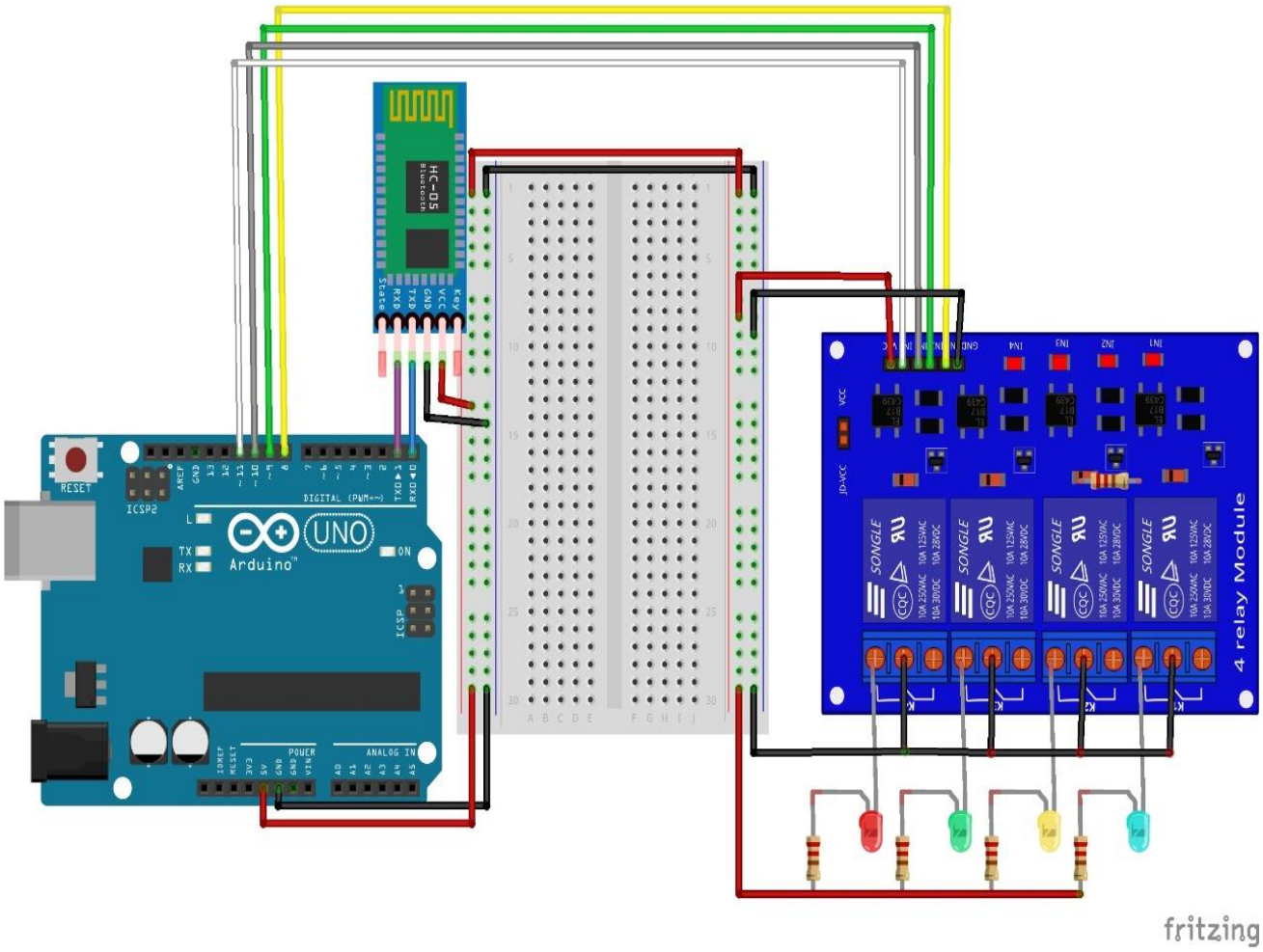


Figure 7: Activity diagram Results and Discussion



- **Hardware diagram**

Figure 8: Hardware diagram

Contains:

1. Arduino Uno
2. Relay
3. Preboard
4. Bluetooth
5. Wires
6. Lights

Result and Discussion

- **Bluetooth: technology for short-range wireless apps [2]**

It is a short-range wireless communication technology that uses radio waves to transmit information, such as Wi-Fi. But this wireless standard works on semi-permanent networks and across vast distances, unlike Bluetooth, usually over limited and more personal distances.

- **Mobile Application for Vehicular Auto Locking System [10]**

Currently, everyone tends to keep pace with technological progress, in all areas related to human in his life. Speaking of that, the car is one of the most important things that help a person perform his daily tasks. Therefore, these car companies have experienced significant economic growth in the past few years due to their latest technology features to provide an easy-to-use experience for their customers. Imagine that everyone who owns a car in the world can, through our vehicle lock system through the mobile application, open the car and lock it

using Bluetooth technology will be a great advantage for the auto industries and their customers in terms of human energy and time consumption.

- **Working Principle of Arduino And Using It As A Tool For Study And Research [8]**

Arduino is an open-source controller that can be easily programmed, erased and reprogrammed at any point in time. The Arduino platform was introduced to provide a cheap and inexpensive way for amateurs, students and professionals to create devices that interact with their environment using sensors and actuators.

- **An Android Remote Control Car Unit for Search Missions [6]**

AndroRC is a remote-control car (RC) unit controlled by a smartphone running on the Android application.

The Android application uses the embedded direction of the sensor on the smartphone to determine the four directions the user expects (forward, backward, left, and right); therefore, rotating the smartphone to different directions will cause the RC unit to advance accordingly . Control commands are sent to the RC unit via Bluetooth communication. The Android application also receives and displays information from the camera in real time via Wi-Fi. The AndroRC was characterized and checked in a desktop environment.

- **Viper SmartStart [3]**

Operate, control, and locate your connected vehicle from any virtual location. The connected vehicle provides you with easy control and comfort. Control your vehicle from your smartphone, check to see everything as it should, and track your tracks. Use your smartphone to manage, monitor, and protect vehicles, lock your vehicle doors when you realize they may be unlocked, and check the status of your car alarm system to see if it has been activated. The location is everything, you always know the location of your car by locating your vehicle at any time using the location upon request.

- **Nissan SmartCar [9]**

The app provides some functions to control the car remotely over the phone. Including control of car doors, such as opening and closing the door, and provides the feature of starting and stopping the car engine.

- **Keydiy [7]**

connect the car and phone Bluetooth module, use a smartphone to control the car, it can lock, unlock, and search the car.

it can also provide different kinds of pictures of car keys, people can control the car like using the real car keys.

- **Tesla plus [4]**

Remotely control your Tesla Model S/3/X with the best and most beautiful Tesla-app available. Control everything about your vehicle, Control temperature from the home screen, Schedule charging, start vehicle, Lock / unlock doors, Flashlights, Control temperature, set charge limit, Start/stop charging, Open/close sunroof.

- **Comparison**

App Name / Property					
Fast Registration/				✓	

Log in		✓			✓
Security					✓
Usable for all car	✓		✓		✓
Available in all countries	✓		✓	✓	✓

Table 16: Comparison

Conclusions

We designed and developed a system that integrates automotive systems with technology (especially smartphones) to increase the convenience of driver control for the driver. Moreover, the application we developed will solve many problems suffered by drivers, such as lost or forgotten keys.

Our vision for the future of the system is to expand applications locally and globally to serve as many users as possible.

An overview of what has been done in this report:

We looked at other applications and studies that deals with the problems of car control. We studied them and we have added many features that make our system unique.

Then, after careful knowledge of the project requirement, we analyzed and designed our system by Connect the Arduino system and all hardware parts to the car system. Finally, we have created an interactive prototype that explains the interfaces and the functions of our system and how it works.

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