SMART PARKING(IOT)

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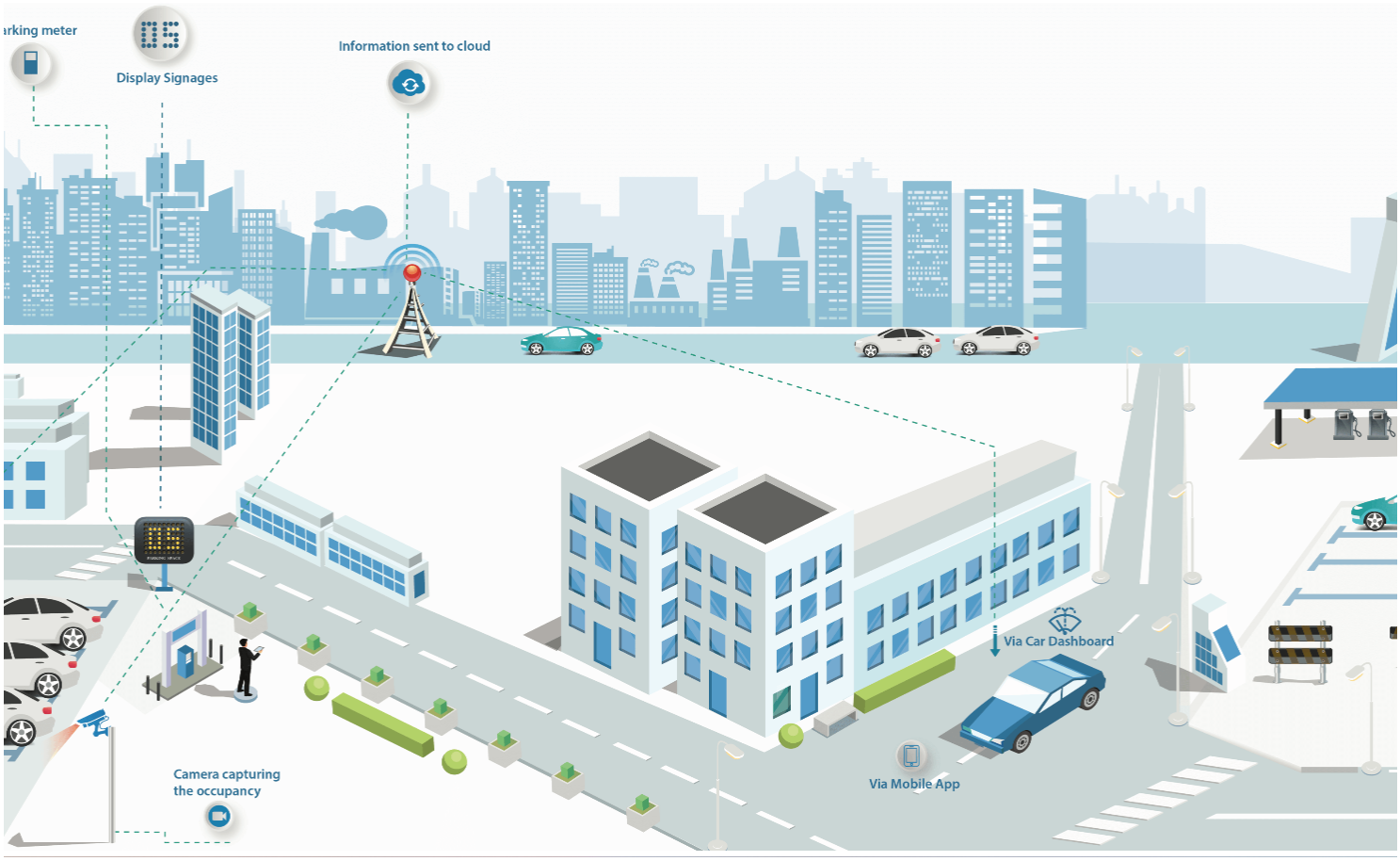

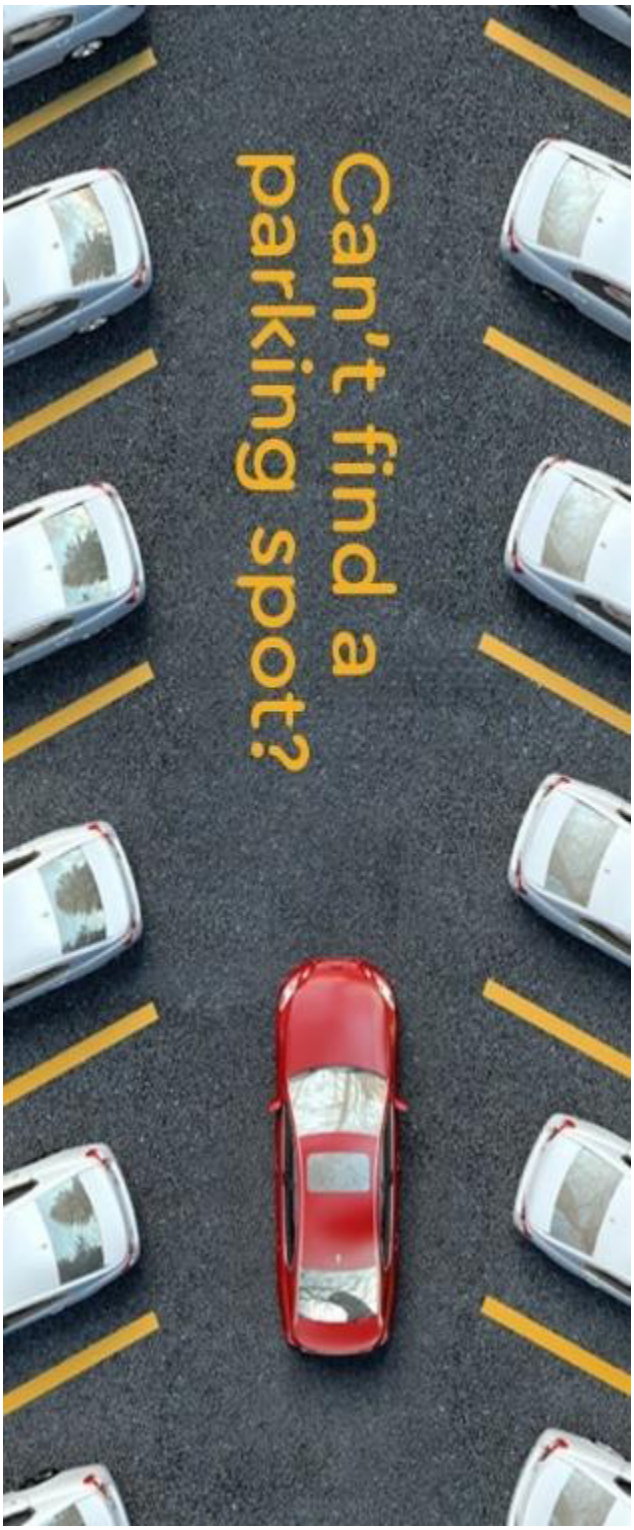

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INTRODUCTION:

SMART PARKING APP DEVELOPMENT

Creating a mobile app in Flutter to display real-time parking availability data received from a Raspberry Pi involves several steps. Below is an extended guideline on how to design the app's functions to receive and display this data.

DEVELOPMENT PART 2

DEVELOPING THE MOBILE APP USING PYTHON:

1. Set Up Your Development Environment:
   - ❖ Install Python on your development machine.
   - ❖ Install the required development tools for your chosen framework (e.g., Kivy or BeeWare).

2. Choose a Framework:
   - ❖ Select a Python mobile app framework that suits your project's needs. Kivy and BeeWare are popular choices.

3. Design Your App:
   - ❖ Plan the user interface and overall design of your mobile app.
   - ❖ Create wireframes or mockups to visualize the app's layout.

4. Coding Your App:
   - ❖ Write Python code to implement the app's functionality and user interface.
   - ❖ Utilize the framework's libraries and features for creating mobile apps.

5. Testing and Debugging:
   - ❖ Test your app on both Android and iOS emulators.
   - ❖ Debug and fix any issues or errors that arise during testing.

6. User Interface (UI):
   - ❖ Implement the UI components using the framework's widgets and elements.
   - ❖ Ensure a responsive design that adapts to different screen sizes and orientations.

7. App Logic:
   - ❖ Write Python code to handle user interactions, data processing, and other app-specific functions.

8. Data Storage:
   - ❖ Implement data storage solutions, such as using SQLite databases, for storing app-related data.

9. Connectivity:
   - ❖ Incorporate features for internet connectivity, if your app requires it, such as API calls or cloud services integration.
10. Testing on Physical Devices:

- ❖ Test your app on physical Android and iOS devices to ensure compatibility and performance.

11. Optimization and Performance:
- ❖ Optimize your code and resources for better performance and battery efficiency.

12. Deployment:
- ❖ Package your app for the Google Play Store (Android) and App Store (iOS).
- ❖ Follow the platform-specific guidelines for app submission and publication.

13. Maintenance and Updates:
- ❖ Continue to maintain and update your app as needed to fix bugs, add new features, and ensure compatibility with newer OS versions.

FRAMEWORK BY FLUTTER:

- Here are the steps to create a real-time parking availability app using Flutter:

- ❖ Set Up Your Development Environment:

Install Flutter and Dart on your development machine. Follow the official Flutter installation guide for your specific operating system.

- ❖ Create a New Flutter Project:

Use the flutter create command to set up a new Flutter project.

```
flutter create parking_app
```

- ❖ Design the User Interface (UI):

Design the app's user interface, including screens, widgets, and layouts. Consider using Flutter's extensive library of pre-built widgets.

- ❖ Implement Real-Time Data Retrieval:

Integrate with a real-time data source or API that provides parking availability information. This source could be sensors in parking lots, a web API, or any other relevant data provider.

- ❖ Display Real-Time Parking Availability:

Create components to display parking availability information. You can use widgets like Text, ListView, and GridView to show the status of parking spaces. Update this information in real-time.

dependencies:
flutter:
sdk: flutter
http: ^0.13.3
provider: ^6.0.2
Run flutter pub get to fetch the added dependencies.

- ❖ User Interactivity:

Implement features for users to interact with the app, such as filtering by location, reserving parking spaces, or getting directions to available spots.

- ❖ User Authentication (Optional):

Implement user authentication to allow features like reserving parking spaces or saving preferences.

- ❖ Testing:

Test your app on both Android and iOS simulators/emulators as well as physical devices.

- ❖ Optimization:

Optimize your app for performance, ensuring smooth real-time updates.

- ❖ Deployment:

Prepare and package your app for the Google Play Store (Android) and the Apple App Store (iOS).

- ❖ Publish and Maintain:

Publish your app and periodically update it to address any issues, improve user experience, and adapt to new requirements or operating system versions.

DATA RECEIVED FROM RASPBERRY PI:

Designing an app to receive and display parking availability data received from a Raspberry Pi involves several key functions and features.

1. Data Reception:

   - The app should be able to receive real-time parking availability data from the Raspberry Pi. This data could be transmitted over the network using a communication protocol such as MQTT or HTTP.

2. User Authentication (Optional):

   - Implement user authentication if the app requires user-specific functionality, like reserving parking spaces or saving preferences.

3. Display Available Parking Spaces:

   - Create a user interface to display parking spaces. You can use a list or grid view to show the availability of each space.
   - Use visual cues like colors (e.g., green for available spaces, red for occupied) or icons to represent space status.

4. Real-Time Updates:

   - Set up a mechanism for real-time updates of parking availability data. This can be achieved by periodically polling the Raspberry Pi or by using a push-based mechanism where the Raspberry Pi sends updates to the app whenever there's a change.

5. Filter and Sort Options:

   - Provide options for users to filter and sort parking spaces based on various criteria, such as location, distance, availability, and pricing.

6. Parking Space Details:

   - Allow users to tap on a parking space to view more details, including its location on a map, pricing, and any additional information.

7. Notifications and Alerts:

- Implement notifications or alerts to inform users when a parking space they've reserved is about to expire or if there are sudden changes in availability.

8. Reserve Parking Spaces (Optional):

- If your app allows users to reserve parking spaces, provide a reservation feature with payment processing, and send booking confirmations.

9. Maps Integration:

- Integrate maps to show the locations of parking spaces and provide directions to the selected space.

10. User Profile and Preferences:

- Enable users to create profiles and set preferences, such as favorite locations, vehicle information, or notification settings.

11. History and Reporting:

- Maintain a history of users' parking activities, including past reservations, payments, and usage statistics.

12. User Feedback:

- Include a feature for users to provide feedback or report issues with the app or parking facilities.

13. Data Privacy and Security:

- Ensure that user data is handled securely and that sensitive information is encrypted, especially when dealing with user profiles and payment data.

14. Testing and Quality Assurance:

- Thoroughly test the app on different devices, both Android and iOS, to ensure a consistent user experience.

15. User Education:

- Provide users with instructions and information on how to use the app effectively.

Here's a simplified Python script for the Raspberry Pi to send data to the mobile app:

```
import paho.mqtt.client as mqtt
import time

# MQTT settings
MQTT_BROKER = "your_mqtt_broker_address"
MQTT_PORT = 1883
MQTT_TOPIC = "your_mqtt_topic"

# Initialize MQTT client
client = mqtt.Client()

def on_connect(client, userdata, flags, rc):
    if rc == 0:
        print("Connected to MQTT broker")
    else:
        print(f"Connection failed with code {rc}")

client.on_connect = on_connect
client.connect(MQTT_BROKER, MQTT_PORT, 60)

try:
    while True:
        # Your data collection logic here
        data = "Your parking availability data goes here"

        # Send data to the mobile app
        client.publish(MQTT_TOPIC, data)

        print(f"Data sent: {data}")
        time.sleep(10)  # Adjust the interval as needed

except KeyboardInterrupt:
    print("Script terminated by user")
    client.disconnect()
```

FRAMEWORK IN FLUTTER:

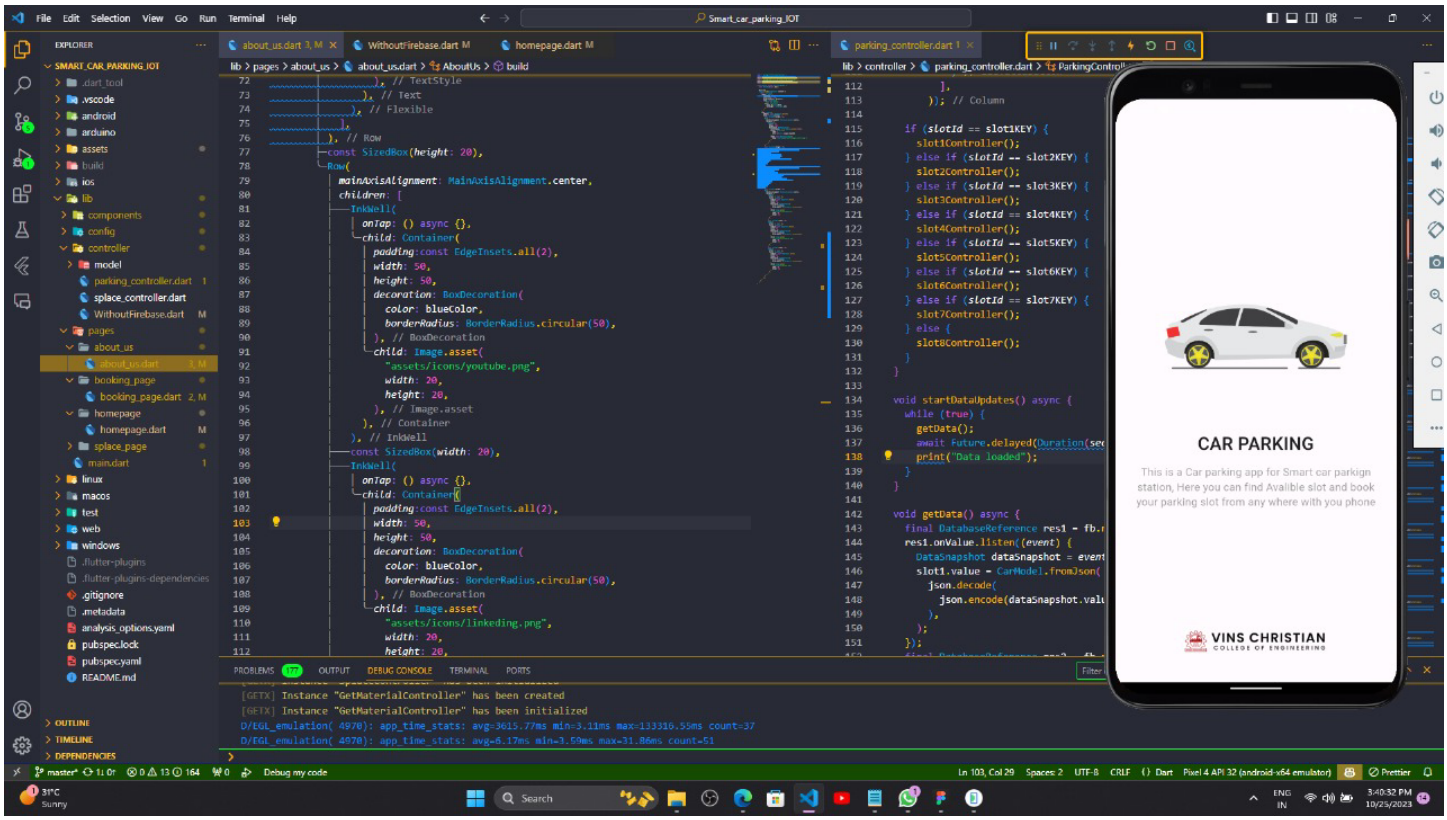


FIG:1

Design the app's user interface, including screens, widgets, and layouts. Consider using Flutter's extensive library of pre-built widgets.

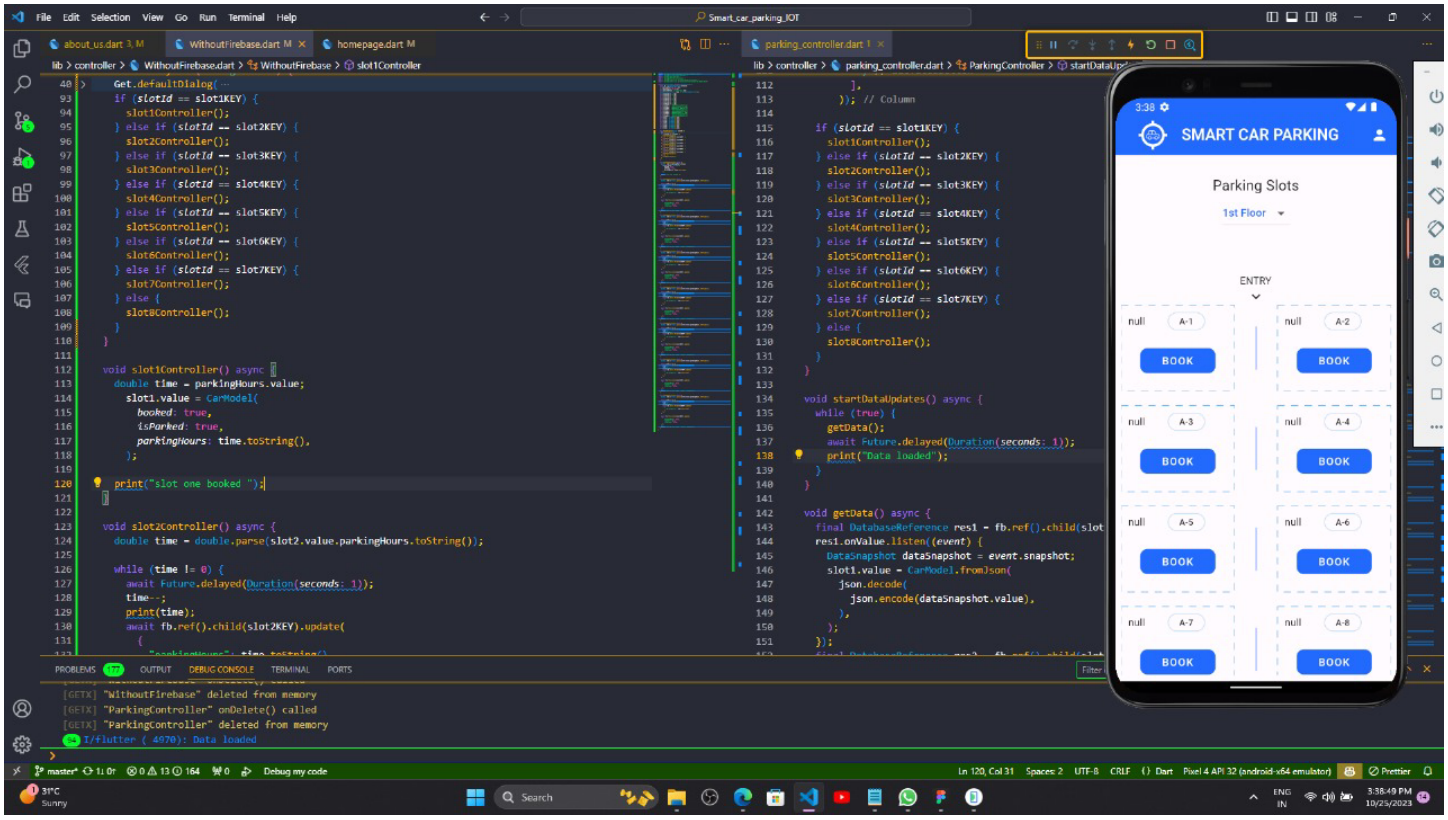


FIG :2

The Design of the Mobile APP For SMART PARKING frame work has been successfully Completed..Kindly refer above fluter code and pictures.

WORKING OF(SMART PARKING) APP:

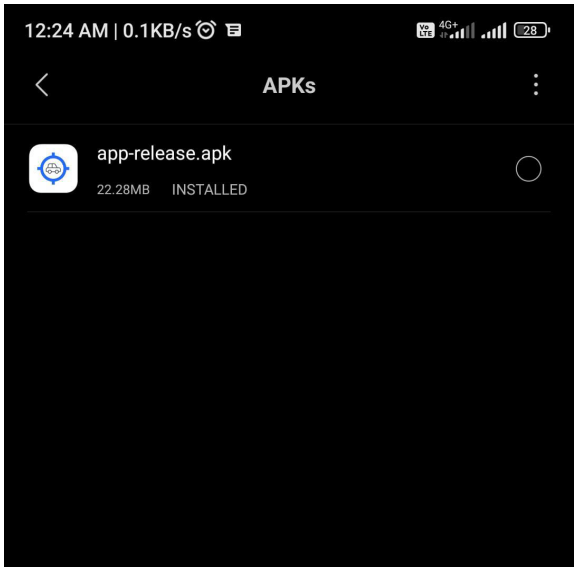


FIG:3 APP LOGO(smart_car_parking)

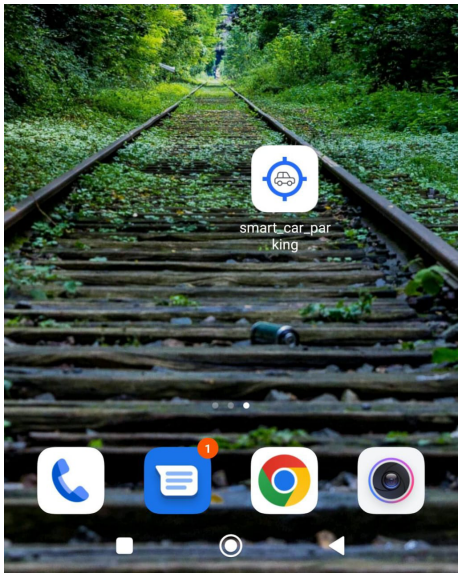


FIG:4 APP INSTALLED IN MOBILE

PROCESS IN MOBILE APP WITH SCEENSHOT:

FIG:5 FRONT PAGE OF APP

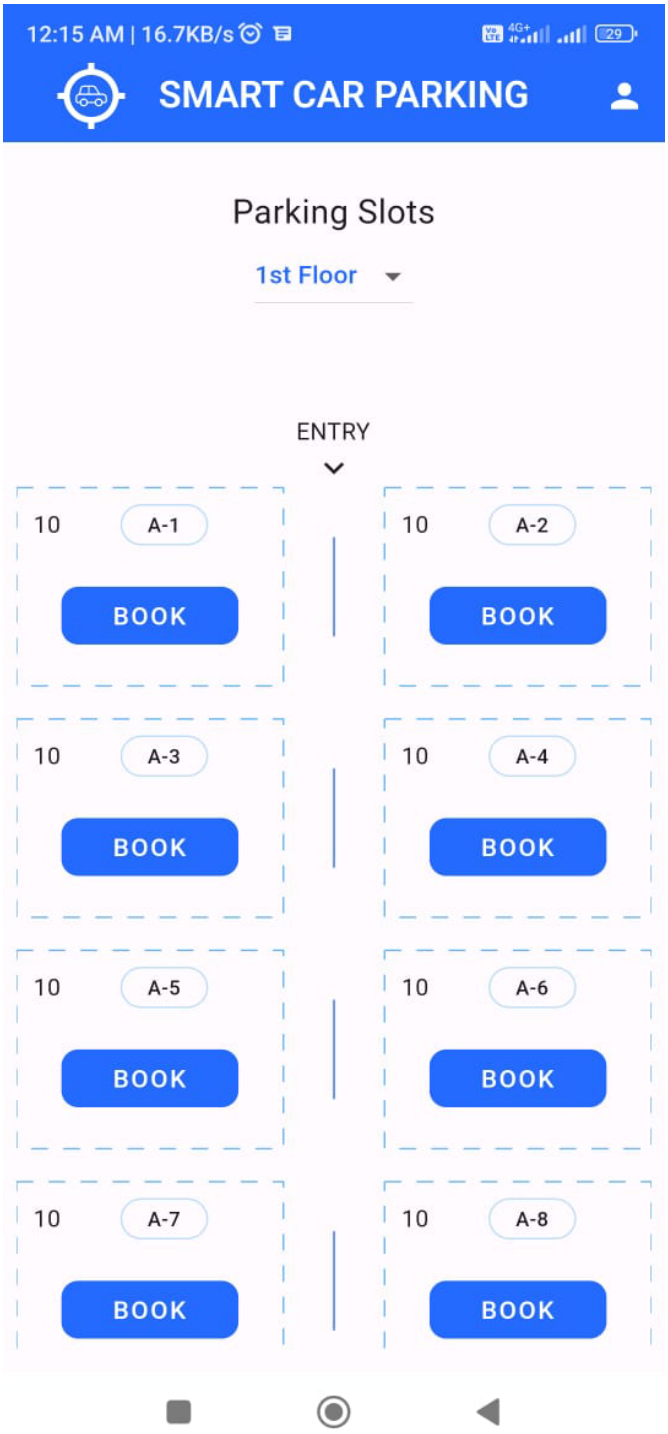
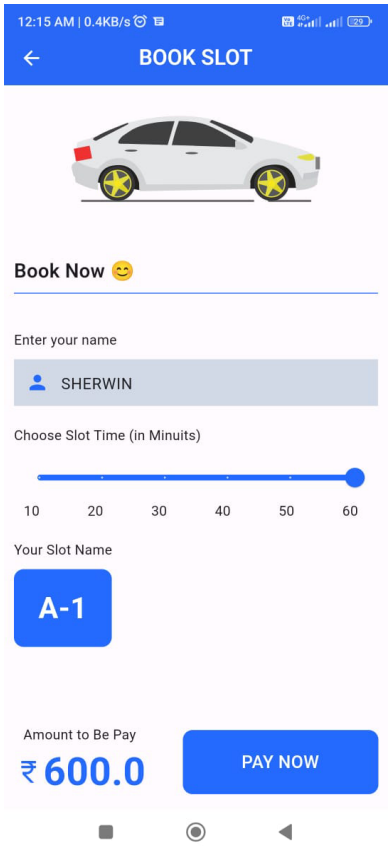


FIG:6 FREE SPACE CAN BE BOOKED



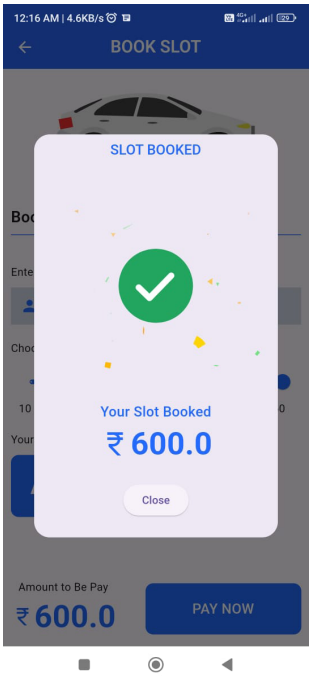


FIG:7,8 PARKING SPACE BOOKING

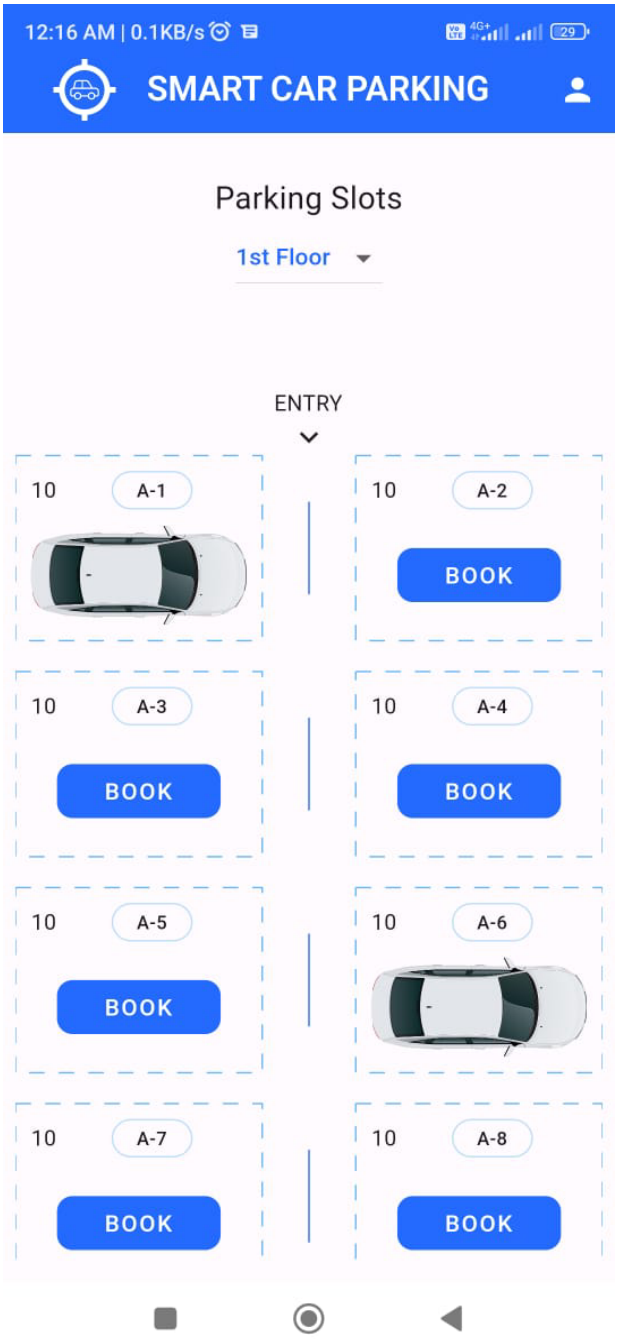


FIG:9 IT REPRESENT THE BOOKED SPACE

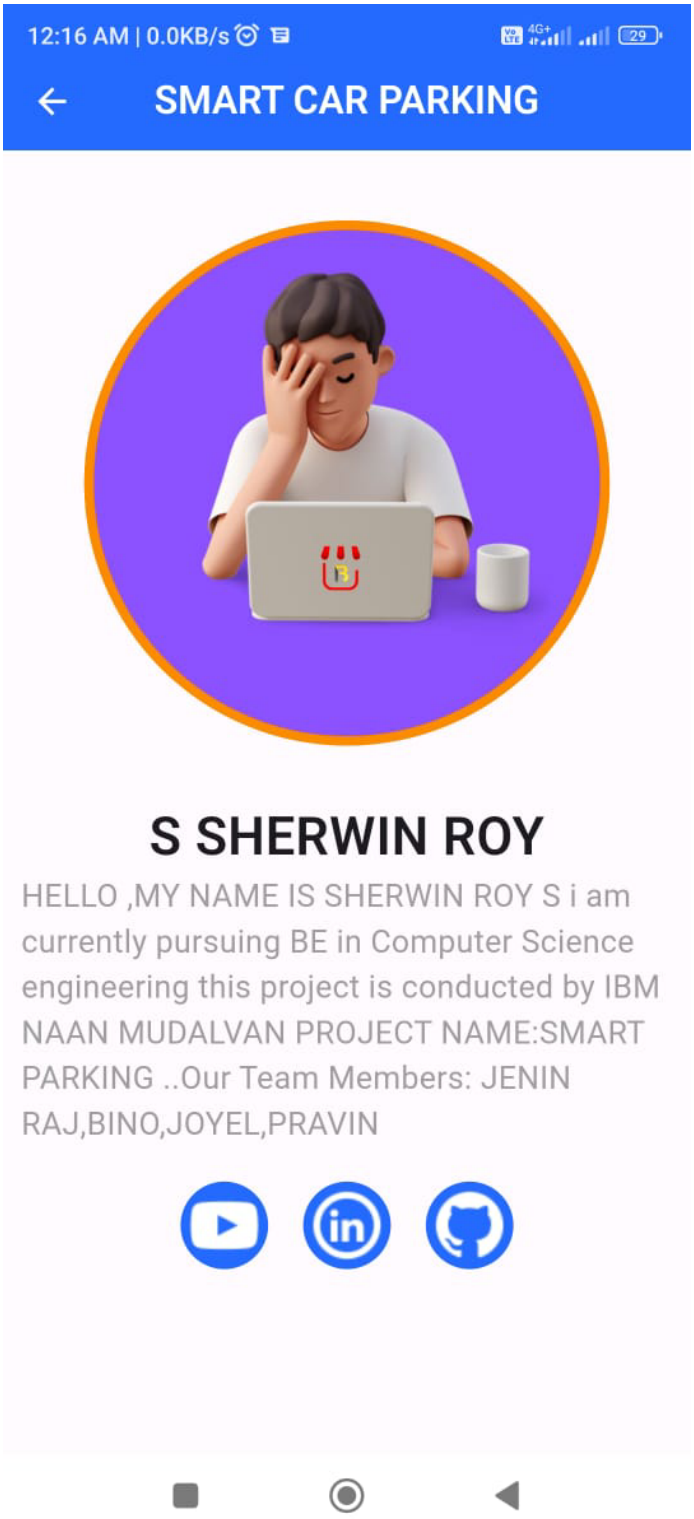


FIG:10 IT SHOWS THE MOBILE APP DASHBOARD

APP LINK:

https://github.com/Sherwinroy/Sherwinroy/tree/main/IOT_Phase4/APP

APP WORKING VIDEO:

https://youtube.com/shorts/_5Xx0uObm3g?si=W5h9OMCQ8nMIbqBw

CONCLUSION:

In conclusion, developing a real-time parking availability app using a mobile app development framework like Flutter is a significant and complex project that involves several critical steps. It requires creating a user-friendly interface, handling real-time data from a Raspberry Pi or other data source, and providing valuable features for users.

Key takeaways for this project include:

- ➔ **Mobile App Framework**
- ➔ **User Interface Design**
- ➔ **Data Handling**
- ➔ **Real-Time Updates**
- ➔ **User Authentication (Optional)**
- ➔ **Map Integration (Optional)**
- ➔ **User Profiles and Preferences**
- ➔ **Notifications and Alerts**
- ➔ **Testing and Deployment**
- ➔ **Ongoing Maintenance**

THANKING YOU