

**UNIVERSITY OF BUEA**

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**FACULTY OF ENGINEERING AND TECHNOLOGY**

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**DEPARTMENT OF COMPUTER ENGINEERING**

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**CEF 440: MOBILE PROGRAMMING**

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**Project Title:**

**DESIGN AND IMPLEMENTATION OF A PASSENGER  
POSITIONING SYSTEM**

**Project Tasks:**

**Tasks2: REQUIREMENTS**

**Tasks3: ANALYSIS**

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# INTRODUCTION

## ABSTRACT

Despite the large and growing population in many cities today, many areas with new roads do not have a fluent flow of taxis through them. As such, people living in such areas often have to trek for very long distances to get taxis to take them where they are heading. Furthermore, these people often have to use a longer time to get to where they are going which might make them late. Drivers waste petrol going through areas with customers hence losing a lot of money. In cases of an emergency, it gets difficult to go to your destination fast. As a result, there is a need for a system that manages drivers and passengers to get them in contact and in close proximity when need arises. This system aims at getting passengers in contact with drivers so they can communicate and get to their rescue in times of emergency. This system could be accomplished by building an app to do this management. Also, messages can be exchanged by both parties via text messages or email. This system will greatly improve passengers time management since they won't worry about trekking for long distances anymore before getting a taxi. This system will also help drivers conserve their petrol as they can in an area and only wait for a notification to go get a passenger.

## PROBLEM STATEMENT

With the current increase in the price of fuel, taxi drivers lose a lot of profits wondering around areas with little or no customers. To remedy this situation, we propose a system that manages passengers and drivers so that both parties can easily find each other.

## PROJECT OBJECTIVES

Generally, the passenger positioning system aims at creating a user-friendly mobile application that allows passengers easily book a taxi to get to their destinations. Also it aims at : Providing accurate and real-time information of public transport vehicles Providing features that allow passengers to view available taxis within a radius Reducing time passengers wait for taxis to come to their locations. Provides passengers a chance to select their route.

# SYSTEM REQUIREMENTS

## FUNCTIONAL REQUIREMENTS

**User registration and authentication:** The app should allow users to register and sign in with their credentials, or use their social media accounts for authentication. The system should also be able to particularly authenticate a driver and differentiate between them and passengers. To make sure that only valid drivers are registered in the system.

**GPS positioning:** The app should be able to obtain the user's location and display it on a map interface. The app should also be able to refresh the location periodically, to make sure it's up to date.

**Ride request:** The app should have a feature to allow passengers to request a ride, specify the destination and the preferred pickup location.

**Ride Acceptance:** Drivers should be able to accept or reject ride requests and the passengers should be notified accordingly.

### Driver matching

The app should be able to match the user with the closest available driver and provide an estimated time of arrival.

### Tracking

The app should show the user the driver's location and an estimated time of arrival in real-time.

### FareCalculation

The app should calculate the fare based on distance traveled and time taken for the ride.

## Messaging

The app should allow users to communicate with the driver or the customer service team through the app's messaging system.

## History

The app should keep a history of the user's rides and allow them to view their ride history, including the cost of the ride, the distance traveled, and the driver's information.

## Reviews and ratings

The app should allow users to rate their drivers and leave feedback. The app could also show the driver's ratings and reviews to the user before accepting the ride request.

## Languages

The app should support multiple languages to cater to non-native speakers.

## NON FUNCTIONAL REQUIREMENTS

- 1. Accuracy:** The system must be able to accurately determine the location of the passenger within the vehicle.
- 2. Reliability:** The passenger positioning system must be reliable and consistent in its operation, providing accurate data consistently throughout the journey.
- 3. Scalability:** The system must be scalable, able to handle a large number of passengers and vehicles at the same time.

**4. Adaptability:** The passenger positioning system must be adaptable to different types of vehicles, including cars, buses, and trains.

**5. Safety:** The system must have built-in safety features to protect passengers and prevent accidents. It should also comply with all relevant safety regulations.

**6. Usability:** The system should be user-friendly and easy to understand, with clear instructions and interfaces.

**7. Integration:** The passenger positioning system should be able to integrate with other systems and technologies, such as GPS, sensors, and communication systems.

**8. Security:** The system must be secure, protecting sensitive passenger data and ensuring that only authorized individuals or systems have access to it.

**9. Maintainability:** The system should be easily maintainable, with minimal downtime and minimal maintenance requirements.

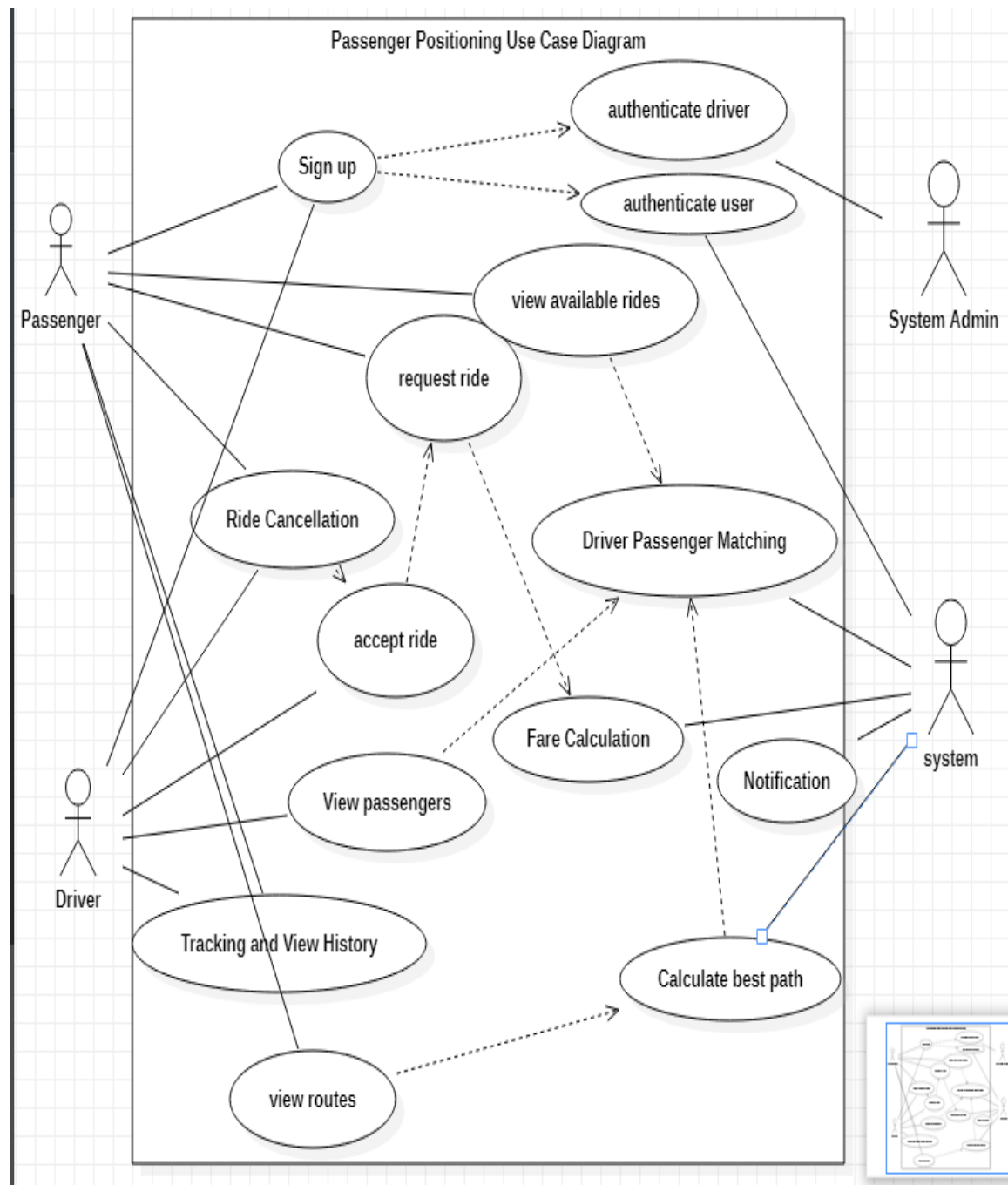
**10. Performance:** The passenger positioning system must be able to perform efficiently and provide real-time data without any lags or delays.

## **SOFTWARE SPECIFICATION**

This software will be a cross-platform mobile application that will make use of internet connection. This is because several users of the system have devices that vary from one operating system to another.

In order to build the application the technology used will be dart + flutter + firebase. This stack will combine the power of Flutter's UI toolkit with Firebase's backend services including authentication, real-time database, and cloud storage.

## USE CASE DIAGRAMS



## **TEXTUAL DESCRIPTION OF USE CASES**

### **SIGNUP**

The actors involved in the sign up are both the drivers and the passengers. Each user of the system will have to register through this process in order to use the features of this application. This use case includes authentication for each of the users.

### **AUTHENTICATE DRIVER**

For a driver, a sign up is only complete when the driver has been authenticated. This is the process by which the system administrator admin confirms that this person is truly a driver. This will include a process of verifying drivers license and formal state documents for drivers.

### **AUTHENTICATE USER**

The system will have to authenticate the user upon sign up through email.

### **CREATE/UPDATE RIDE**

The driver should be able to create a ride in order to specify a route, or a destination from a particular origin. In addition, the system should be able to update the ride as he accepts ride request from users based on their origin and destination.

### **VIEW AVAILABLE RIDES**

Every passenger of the system should be able to view the available rides. This includes searching for rides for a particular route or destination. This permits the passenger to see the taxis that are around and fit for a probable ride. The available rides come directly

### **VIEW ROUTES**

Both the passenger and the driver should be able to view the complete map of the system. Having the users position marked and routes from the position to another including routes linking two separate points.

## **RIDE REQUEST**

A passenger should be able to request for a ride. This ride request includes both the normal ride and an emergency ride. Here a passenger signals that he needs a ride. He could specify a destination and or origin. Ride request will be created and dropped either by the system on acceptance or user in case of a change of mind

## **ACCEPT RIDE**

After rides have been created and are being updated, the driver should be able to accept a ride request from a passenger.

## **RIDE CANCELLATION**

In case of a change of mind, a ride can be cancelled by either of the users

## **NOTIFICATION**

The system, through the history of the users(both drivers and passengers), should be able to provide notification that can prompt riding. It could tell the users about traffic through a particular route, inform the users about an optimum passenger route or even a minimum time period route. Based on the history of the user, it could also let them know if schools are closed and many students are leaving a particular school or that there's an occasion at a particular place.

## **FARE CALCULATION**

The system should be able to calculate the fair of a passenger based on the route, type of service and driver bidding so as to inform the user about the probable amount to be paid at the end of the ride. This is done before the ride request and acceptance cycle is complete.

## **TRACKING AND VIEW HISTORY**

The system should be able to provide real time information about a particular user at any given point in time. It should also be able to store information about the most used features, passenger type, and routes of the driver while storing the preference of rides of the user too.



## **VIEW PASSENGERS**

The driver should be able to see the passenger density spread accord the municipality

## **CALCULATE BEST PATH**

The system should be able to calculate the best route possible for a given origin-destination pairs for multiple passengers

## **DRIVER PASSENGER MATCHING**

This is the main function by which the system uses to notify passengers and drivers about available rides, available passengers and best paths.

## **EXISTING PLATFORMS**

### **THE REVIEW**

These are systems adapted to serve both the local and international population.

In my review, I will be focusing on the local applications that is those developed by Cameroonians and used by Cameroonians as well as the International applications representing those used out of the national borders.

### **LOCAL APPLICATIONS:**

#### **GOZEM APP CAMEROON**

This is a cross platform mobile application that provides various transport, e-commerce, delivery and financial services for users in west and central Africa. In Cameroon, its headquarters is in Douala and was developed by the GOZEM team.

The hotspot of GOZEM activities is Douala with mixed customer appreciation.

#### **POSITIVE FEATURES**

- Good user interface
- Reasonable price tariffs
- Easily accessed by users and is responsive
- Passengers location is tracked after their requests for a ride
- Transportation to the desired destination is done using google maps

- In built payment methods for transportation and subscription

## **WEAKNESSES**

- Poor customer service
- Inadequate knowledge on how to use the application by the drivers
- Changes of some functionalities through updates which alters certain satisfactions

## **BEEGROUP**

Bee is an on demand service application founded by BEE SARL in 2018 firstly in Cameroon and hoping to expand to other African nations. It offers transportation, logistics and delivery services by ensuring a passenger –driver interaction and a passenger –driver meet up. It is mainly located in Douala with a minimal market population

## **POSITIVE FEATURES**

- User accounts and driver accounts
- Destination entry from passengers
- Price estimation mechanisms
- Drivers notification and availability
- Destination locations by drivers using google maps

## **WEAKNESSES**

- Numerous bugs and difficulties in access by the users
- The IOs version is not yet functional
- General Instability such as deliberate closure from the app.

## **YANGO**

It is an android application that provides information for Passenger –Driver interactions. It links the drivers to their passengers with the transportation service offered by third parties. It is mainly used in Douala, Yaoundé and Bafoussam. Its parent company is a Russian company . that cuts across other African countries.

## **POSITIVE FEATURES**

- ✓ Destination entry from passengers
- ✓ Google maps location of passengers and contact of nearest car drivers
- ✓ Passengers have the ability to see where the driver is and at what time it will arrive
- ✓ Works in all platforms and can be easily downloaded and used.

## **WEAKNESSES**

- Good user interface and user experience
- Poor customer service
- Frequent bugs
- Poor usage from drivers

## **ZGO**

It is a ride-hailing application that provides passenger –driver positioning services. It was developed in 2023 and is present in BUEA and other cities in Cameroon.

## **POSITIVE FEATURES**

- Destination entry from passengers
- Google maps location of passengers and contact of nearest car drivers
- Passengers have the ability to see where the driver is and at what time it will arrive
- Works in all platforms and can be easily downloaded and used.
- In built payment mechanism

## **WEAKNESSES**

- Frequent bugs and slow downs.

## **INTERNATIONAL APPLICATIONS**

At the international level, other applications were identified including the following. Below is the list of the top 10 best rideshare applications in 2023.

- 1) UBER
- 2) LYFT
- 3) GOJEK
- 4) CAREEM
- 5) OLA
- 6) VIA
- 7) BLABLA CAR
- 8) BRIDJ
- 9) GOKID
- 10) HITCH

## **VERIFICATION AND VALIDATION OF REQUIREMENTS**

The methods that were used in order to accomplish this were brainstorming, requirement review and survey analysis.

Amongst ourselves we thought through each requirement and reviewed each requirement to be sure that it is really necessary for the system.

## **PHYSICAL AND ONLINE DATA COLLECTION MECHANISMS**

In addition to the review, we conducted a survey to be sure that what we are building actually reflects what the users want.

Here are the survey questions

1. Have you ever used a passenger positioning application before?
2. How important is real-time information about the location of your bus/train to you?
3. How often do you experience delays or disruptions in your public transportation schedule?
4. Which features are most important to you in a passenger positioning application?
5. What would make you stop using a passenger positioning application?

6. How reliable do you expect the real-time information to be?
7. How important is the accuracy of the estimated arrival time of your taxi?
8. How much of a delay would cause you to consider alternative transportation options?
9. Would you be interested in seeing a map of your taxis route and current location?
10. How important is it to have the ability to save and view your favourite stops/routes?

## **DATA COLLECTION RESULTS AND ANALYSIS**

**THE DATA COLLECTED AS WELL AS ITS ANALYSIS WILL BE PRESENTED IN ANOTHER DOCUMENT ATTACHED TO THIS REPORT.**