UTM Faculty of Computing

SECP1513 TECHNOLOGY AND INFORMATION SYSTEM

Improving the UTM bus schedule by implementing live location tracking

Group Members

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Youtube video link: https://youtu.be/UNTfqRo4Zr4

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Introduction

Public transportation is an essential feature of urban life, especially for university students who depend on buses to get to and from campus. However, it often proves to be a source of frustration and inefficiency due to its unpredictable schedules, delays in traffic, and poor real-time information. We are proposing a mobile application that would track the location of buses in real time, provide estimated arrival time, and show routes to make the commuting experience easier for students.
The following report provides the design thinking process for developing the app, identifying the problem, ideation of solutions, collaboration within the team, and evidence collected at each stage.

Design Thinking Process

Empathize

Our team conducted surveys to collect data and identify pain points related to the utm bus system. A total of five students participated in the surveys, and four were interviewed in depth. From these activities, recurring themes of unreliable schedules, inconsistent bus arrival times, and difficulty finding stops emerged. For instance, many respondents mentioned that delays due to traffic often left them waiting for long periods without knowing when the next bus would arrive.
The survey and interview questions aimed to uncover the core challenges faced by students and their expectations for an improved system. Below are the key questions asked:

1. What are the biggest challenges you face when using university buses? Responses frequently highlighted frustration with delays and overcrowding during peak hours and also inaccurate bus schedules.

2. How do delays or schedule changes impact your day? Many participants shared that delays caused them to miss classes or arrive late for classes or appointment, disrupted their plans and cause them to choose grab service.

3. What features would make a bus tracking app most useful to you? Suggestions included real-time location tracking, estimated arrival times and notifications for approaching buses.

Our team visited multiple bus stops during peak hours to observe firsthand the challenges students face. Key observations included overcrowding at stops, which often led to confusion about boarding the correct bus. Additionally, a lack of clear signage and real-time updates contributed to inefficiencies. For example, during one observation session, we noted several students asking drivers or peers for route clarification, further delaying the boarding process.

Evidence:
Survey Documentation: Screenshots and of responses were attached below.

Define

Using the data gathered, our team defined the core problem which is "Students experience inconvenience and uncertainty in using utm buses due to a lack of real-time tracking and dynamic scheduling information." The problem was identified based on recurring themes noted during surveys and interviews. Students frequently mentioned frustration with inaccurate bus schedules, difficulty in locating buses during delays, and the lack of a clear system to update them about real-time changes. By analyzing these patterns, the team could clearly outline the points and validate them through visual summaries. Surveys confirmed, as several participants expressed a need for a reliable system to provide live updates. The log of these responses served as critical evidence to define the problem statement accurately and justify the development of a solution.

Evidence:
Visualisation Documantation: Visual summaries were attached below.

Ideate

In the ideation phase, the team conducted multiple brainstorming sessions and used creative techniques to generate innovative ideas. These sessions encouraged free-flowing discussions, where every member contributed thoughts and suggestions. Initially, several solutions were proposed:

1. Static App Displaying Bus Schedules: A simple app showing predetermined bus schedules.

2. Chatbot for Transportation Queries: An AI-powered chatbot capable of answering frequently asked questions about routes and timings.

3. Real-Time Bus Tracking App with Dynamic ETAs: A robust app displaying the live location of buses and estimated arrival times based on current traffic conditions.

The team assessed these ideas based on feasibility, potential impact, cost, and alignment with user needs. After evaluating through a decision matrix, the real-time tracking app emerged as the most promising solution. This concept was refined through structured discussions and detailed sketches of its features, such as live GPS tracking of buses, notifications for approaching buses and integration of route search functionality and traffic data analysis.

Evidence:
Brainstorming Notes: Comparative table analyzing the pros and cons of each proposed solution.

Prototype

Our team proceeded to develop a low-fidelity prototype to bring the chosen solution to life. This prototype was created using wireframing tools like Figma and included basic layouts and functionalities of the proposed app. The primary features included:

1. Live Bus Tracking Map: A map interface showing the real-time location of buses.

2. Notifications System: Alerts for buses approaching a specific stop.

3. Search and Route Planner: Allows user to view the route the bus will take and plan their travel efficiently.

The prototype development process was a collaborative effort captured in a video. This video demonstrates how our team worked together to conceptualize, sketch, and build the wireframe for the app. It highlights team discussions, the brainstorming process for app features, and the iterative steps taken to refine the design. The prototype was continuously improved based on initial feedback from our testing sessions. Wireframing sessions involved sketching potential layouts, ensuring intuitive navigation, and incorporating features.

Evidence:
Prototype Visual Documentation: Visual documentation of the app interface during various stages of development.

Test

The prototype was subjected to rigorous testing to assess its usability and functionality. Two students volunteered to use the app using the prototype, providing real-time feedback on their experience. This phase aimed to evaluate the app's effectiveness in solving the identified problem and gather suggestions for further improvement. The testing process, as shown in the video, involved students navigating through the app's features, such as live tracking, notification settings, and route planning. Observations from these sessions were documented to identify both strengths and areas for improvement. Key Findings:

1. Positive Feedback: Users found the live tracking feature highly accurate.
The notification system was particularly appreciated for its practicality.

2. Areas for Improvement: Several users requested a dark mode option for the app.
Suggestions included adding a feature to save frequently used routes and stops.

Evidence:
Testing Session Videos: Recorded interactions of users navigating the app.

Problem

University students face significant challenges using the UTM bus system due to unreliable schedules, traffic-related delays, and insufficient real-time information. These issues lead to prolonged wait times and uncertainty, particularly during peak hours when overcrowding further complicates the boarding process. The lack of dynamic scheduling updates and clear route information forces students to rely on informal communication with drivers or peers to navigate bus services. This inefficiency often disrupts daily plans, causing students to miss or be late for classes, and in some cases, opt for private ride services like Grab instead.

Solution

To address these challenges, we propose a real-time bus tracking mobile application that offers dynamic scheduling and live updates. The app will feature GPS-based location tracking of buses, estimated arrival times considering current traffic conditions, and route search functionality. Additionally, it will provide notifications for approaching buses to ensure students can better plan their commutes. This solution aims to reduce waiting times, minimize uncertainty, and improve the overall user experience for students relying on campus transportation services.

Reflections (Individual)

a. What is your goal/dream with regard to your course/program?
My goal is to become a skilled software engineer specializing in user-centric application development. I aspire to create impactful digital solutions that address real-world problems and improve daily lives.

b. How does this design thinking impact on your goal/dream with regard to your program?
The design thinking process has deepened my understanding of how to approach complex problems systematically and prioritize user needs. It has reinforced the importance of empathy, collaboration, and iterative improvements in creating effective solutions. These skills are directly aligned with my goal of excelling in software development and designing applications that truly resonate with end-users.

c. What is the action/improvement/plan necessary for you to improve your potential in the industry?
To enhance my potential in the industry, I plan to expand technical skills by continuously learning and applying new technologies like machine learning, cloud computing, and advanced backend systems. I also plan to engage in projects by collaborating on diverse projects to gain practical experience and improve problem-solving abilities. Next, building a professional network by attending industry visits and connecting with professionals to stay informed about trends and opportunities. One of the improvement is enhancing soft skills such as improving communication, teamwork, and adaptability through workshops and real-world collaborations.

Task for Each Member

Roles and Responsibilities

1. Project Manager(Wang): Coordinated tasks and timelines, ensuring milestones were met.

2. Designer(Kreshshale): Created the app's interface and ensured usability.

3. Software Developer(Khaireen): Developed the backend for GPS tracking and notifications.

4. Data Analyst(Khalisha): Ensured data accuracy.

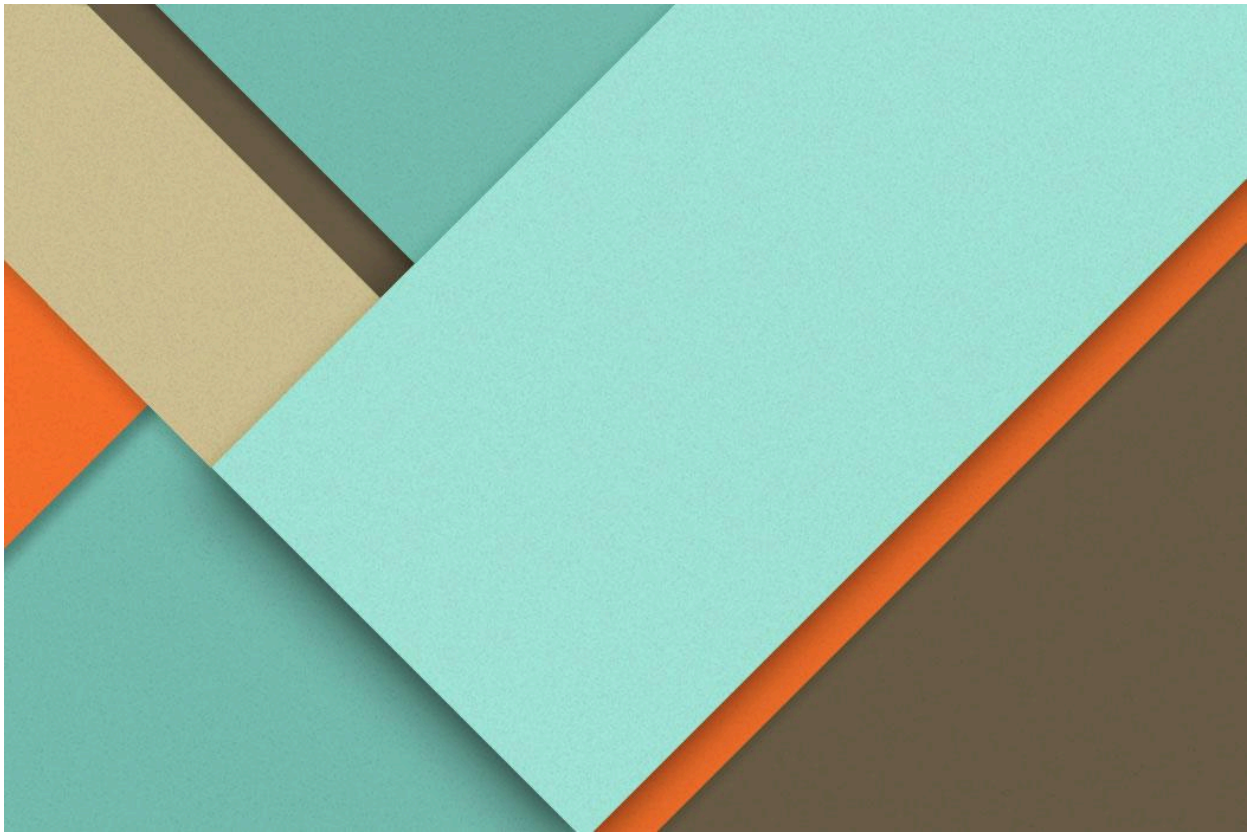
5. Tester(Shahed): Conducted usability and functionality testing.

Evidence of Contributions:
Individual contributions to prototype development and testing.

Conclusion

The design thinking process was instrumental in addressing the challenges faced by utm students relying on the bus system. By following a structured approach, the team could empathize with users, define a clear problem statement, ideate innovative solutions, and develop and test a functional prototype. Each phase was enriched with user feedback and collaborative team efforts, ensuring that the proposed app met the real needs of students.

The final solution, a real-time bus tracking application, has the potential to significantly improve the daily commuting experience by providing accurate ETAs, live bus locations, and route planning functionalities. The process demonstrated the value of empathy and iterative design in creating user-centered solutions. It also provided a platform for team members to develop their skills in problem-solving, communication, and technical development. Looking ahead, this project lays the groundwork for future innovations in public transportation systems. The lessons learned during this process will guide similar projects, emphasizing the importance of understanding user needs and delivering practical solutions. The app, once implemented, will not only save time for students but also reduce stress and improve overall satisfaction with utm transportation services. The experience has been both enriching and enlightening, highlighting the transformative potential of design thinking in addressing real-world problems.



Survey Documentation

5 responses

Summary | Question | Individual

Name:

5 responses

Neneyy

wang

Khalisha Afifah

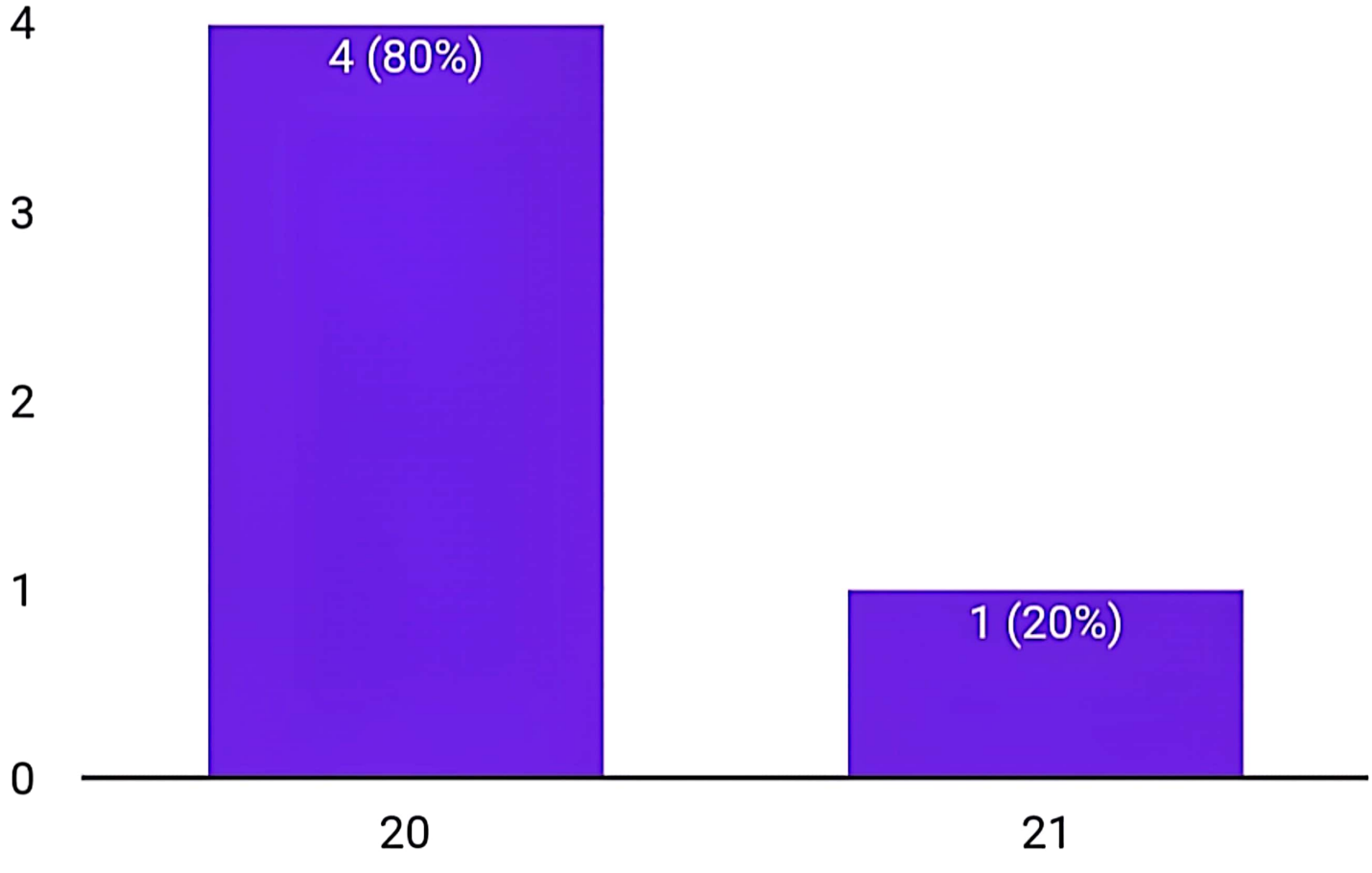
chairu

Ariana

Age:

Copy chart

5 responses



Untitled section

Background (year and course):

5 responses

SECJH (Y1S2)

1

software engineering 2023 (y1s2)

secjh y1s1

Computer Science (year 2)

What are the biggest challenges you face when using utm buses?

5 responses

Delays and overcrowding during peak hours

I don't know if the driver is on time.

Irregular Schedules

The biggest challenges I face when using UTM buses are overcrowding during peak hours and long waiting times.

Inaccurate bus schedule

How do delays or schedule changes impact your day?

5 responses

It makes me late to the class or appointment and disrupted my plans

I will choose whether to pay a high price for grab

Delays or schedule changes significantly disrupt my day. They make it difficult to plan my activities and often result in being late for classes

Delays or schedule changes disrupt my routine significantly, especially when I have early morning classes.

Late to classes and unable to attend it on time

What features would make a bus tracking app most useful to you?

5 responses

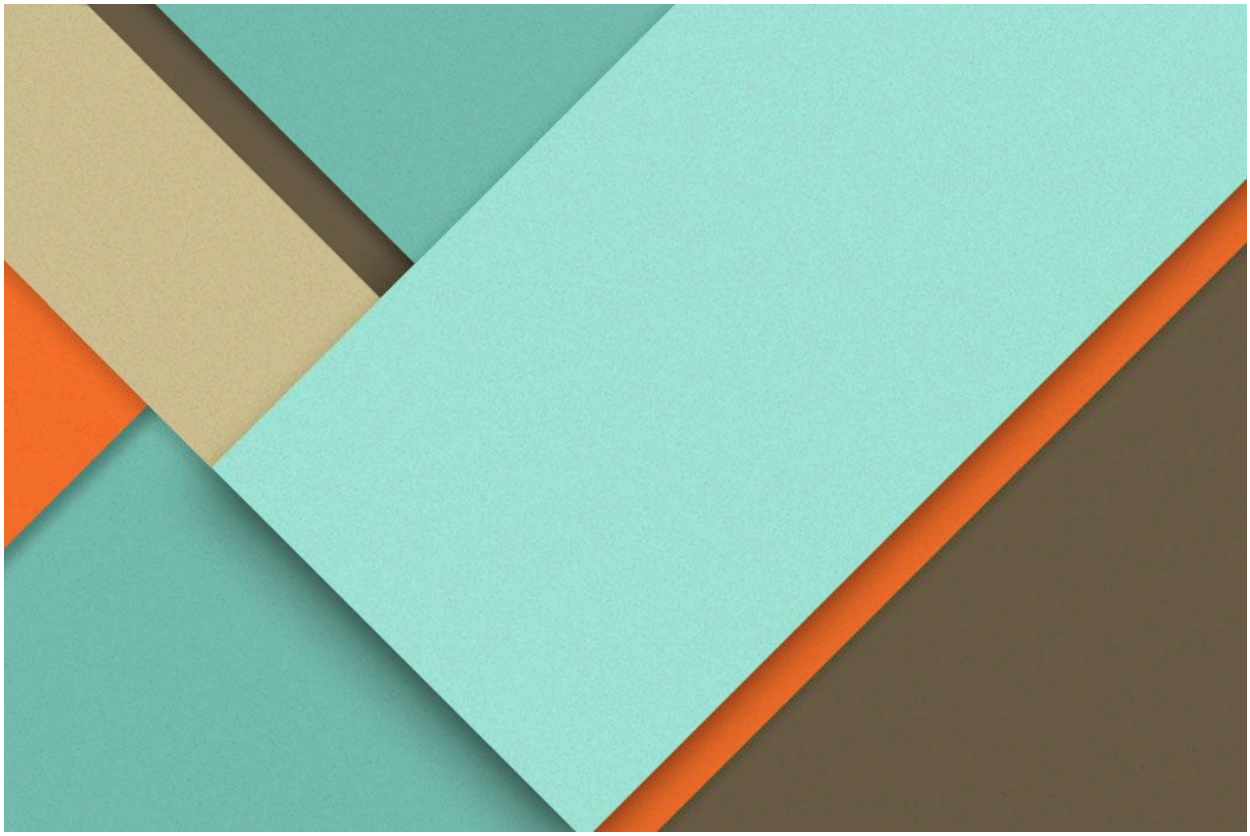
Real time maps and real time capacity of bus

Shows the distance from the bus stop to the destination

Real-Time Tracking, Push Notifications, Arrival Time Estimates

A bus tracking app would be most useful if it had real-time tracking of bus locations, estimated arrival times, and alerts for schedule changes or disruptions.

Having live location tracking of the bus



Visualisation Documentation

Challenges

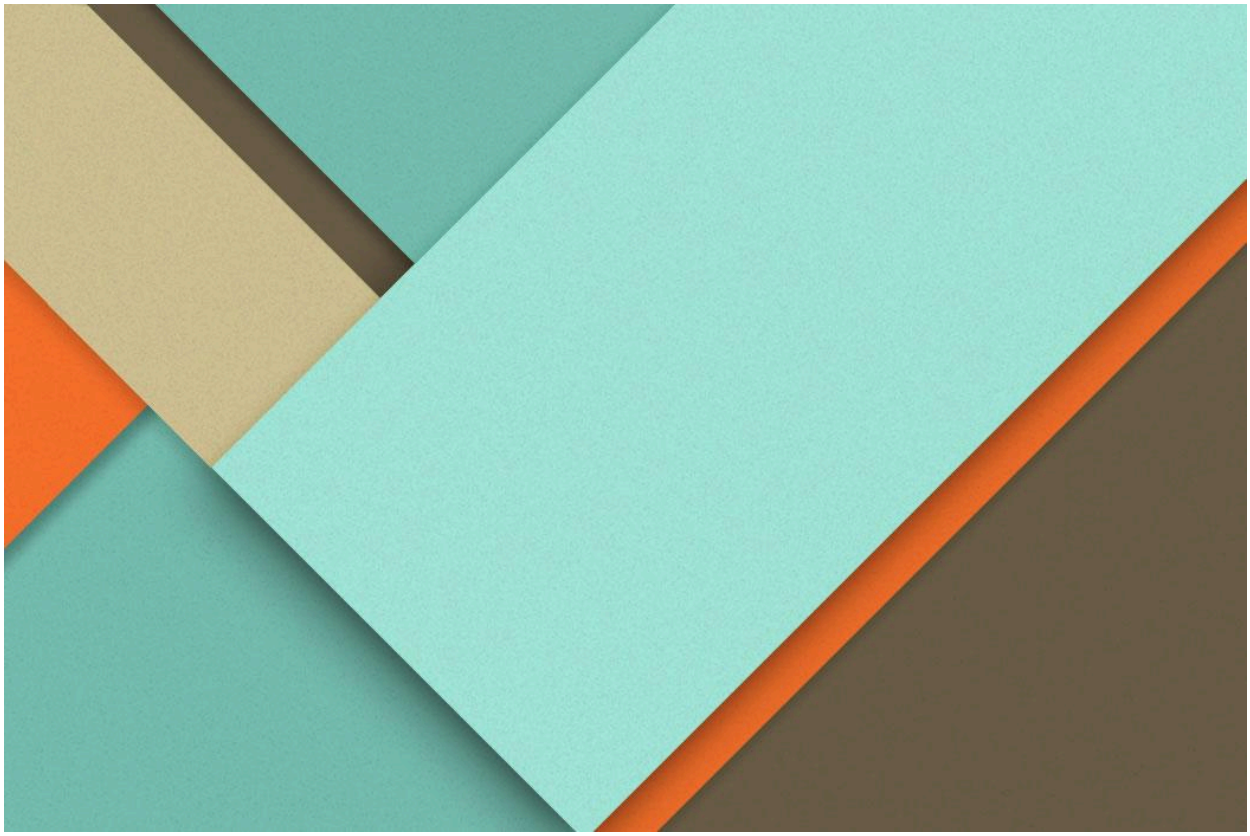
- Delays and overcrowding during peak hours
- I don't know if the driver is on time
- Irregular schedules
- The biggest challenges I face when using UiTM buses are the overcrowding during peak hours and long waiting times.
- Inaccurate bus schedule.

Impact

- It makes me late to the class or appointment and disrupted my plans
- I will choose whether to pay a high price for grab
- Delays or schedules changes significantly disrupts my day. They make it difficult to plan my activities and often result in being late for classes.
- Delays or schedule changes disrupt my routine significantly, especially if I have morning classes
- Late to class and unable to attend it on time.

Useful Features

- Real time maps and real time capacity of bus
- Real-time tracking, push notifications, arrival time estimates.
- Shows the distance from the bus stop to the destination
- A bus tracking app would be most useful if it had real-time tracking of bus locations, estimated arrival times, and alerts for schedule changes or disruptions.
- Having life location tracking of the bus.



Brainstorming notes

Chatbot for Transportation Queries:

Pros

- 24/7 accessibility (instant responses)
- User-friendly

Cons

- miscommunication (if chatbot provide incomplete / incorrect responses)

Static App Displaying Bus Schedules:

Pros:

- Cost-effective and also each to develop (do not require GPS integration / real time data processing)

- Don't need internet connection

Cons:

- Lack of Real-Time Updates

- users may still experience uncertainty when buses are delayed

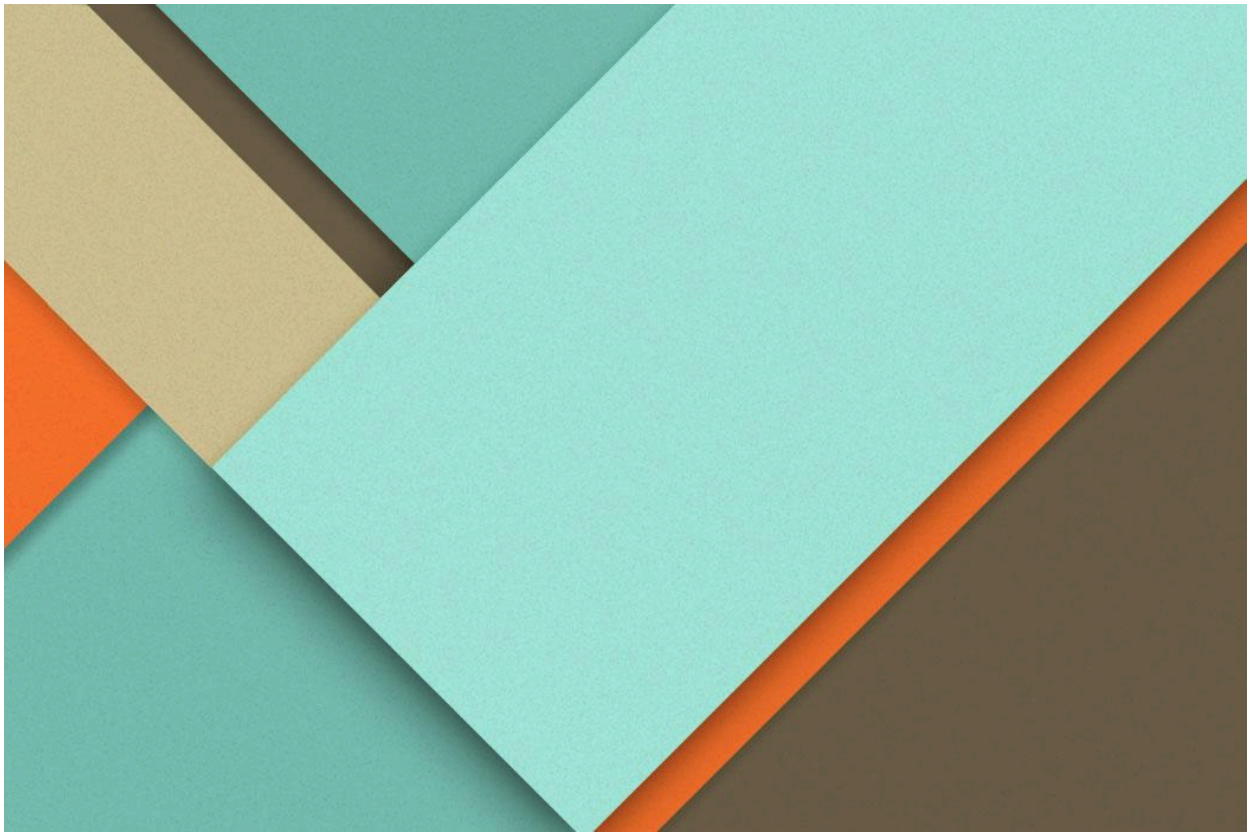
Real-Time Bus Tracking App with Dynamic ETAs:

Pros

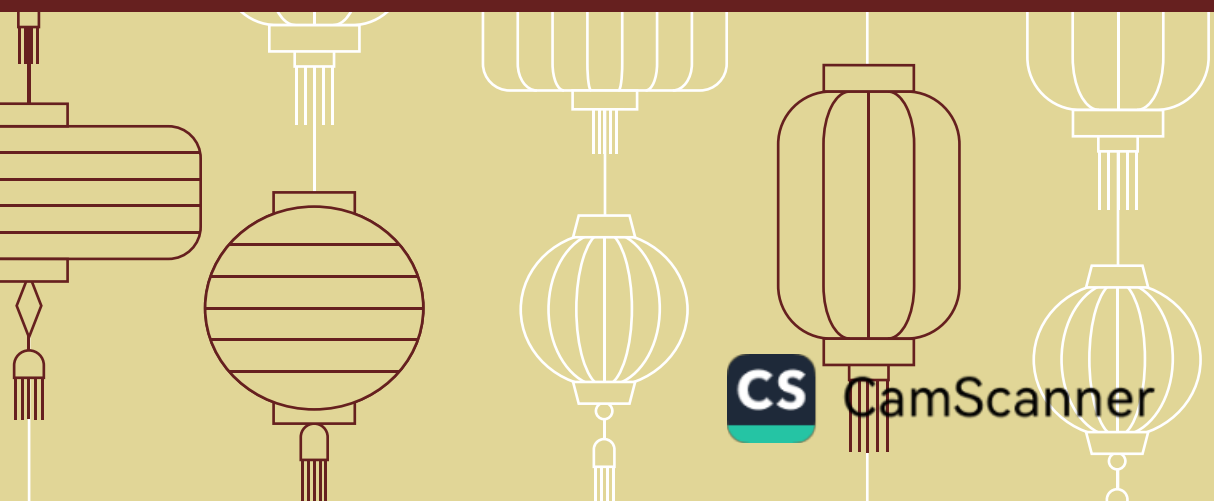
- Reduce uncertainty & waiting time
- Increase efficiency by allowing students to ~~make~~ choose alternative routes during delays

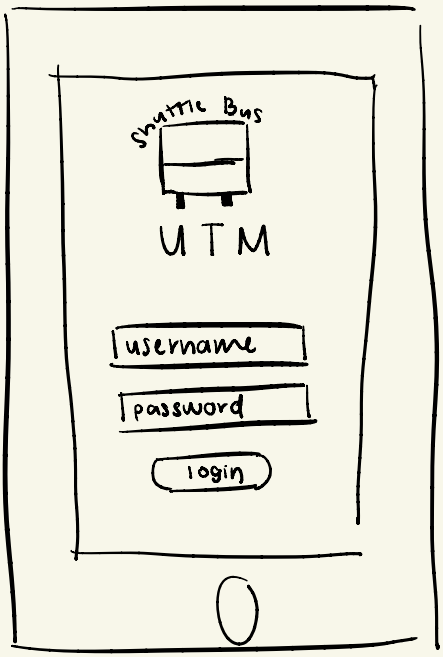
Cons

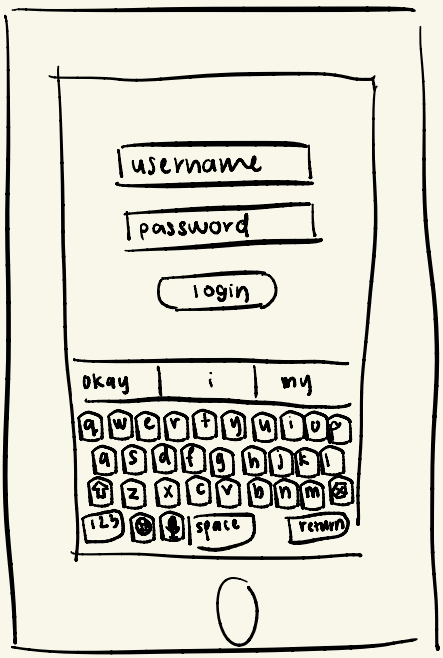
- relies heavily on consistent GPS & internet connection



Prototype visual documentation







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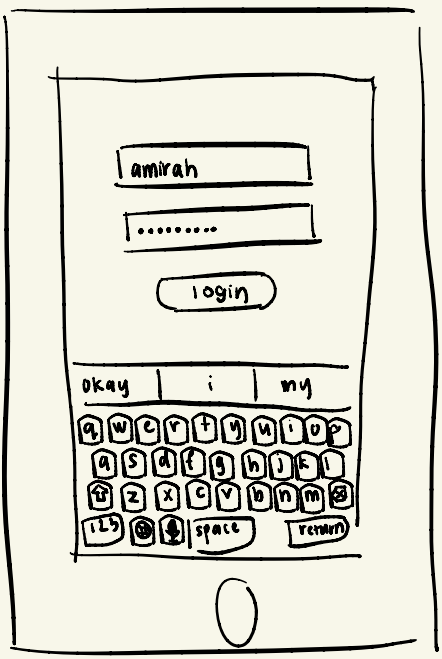
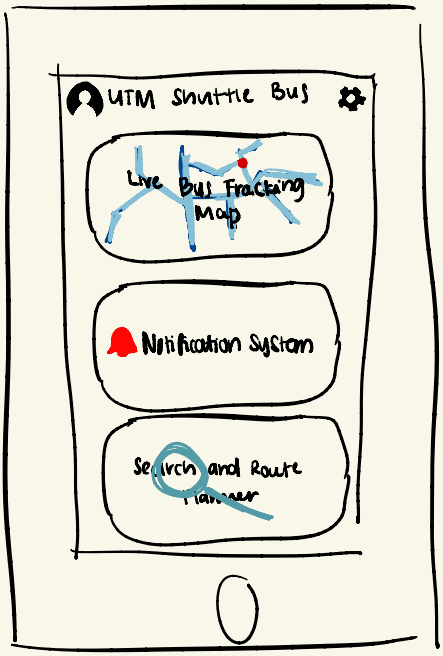
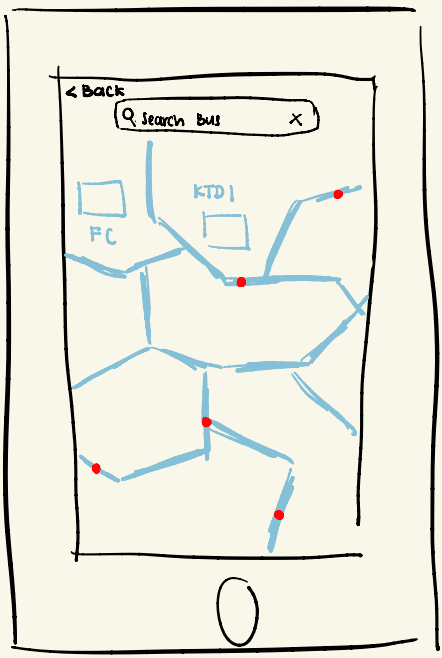


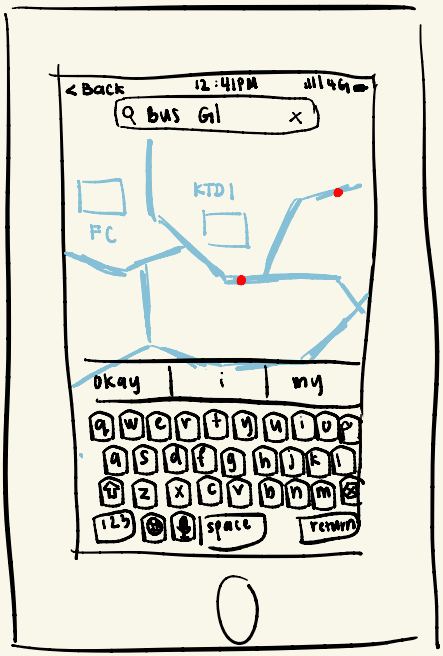


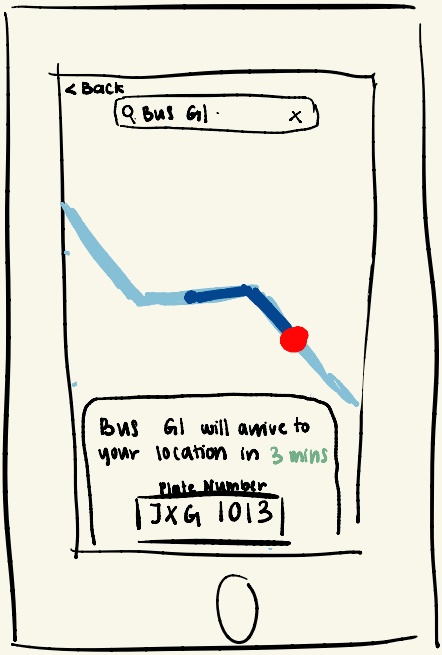
Live Bus Tracking



Search for Bus

type Bus Gl





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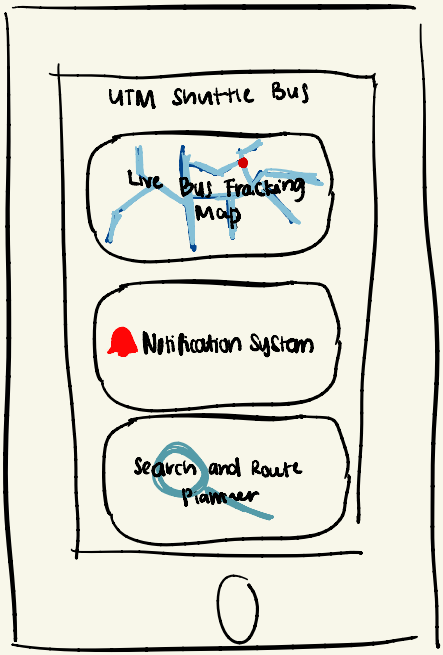

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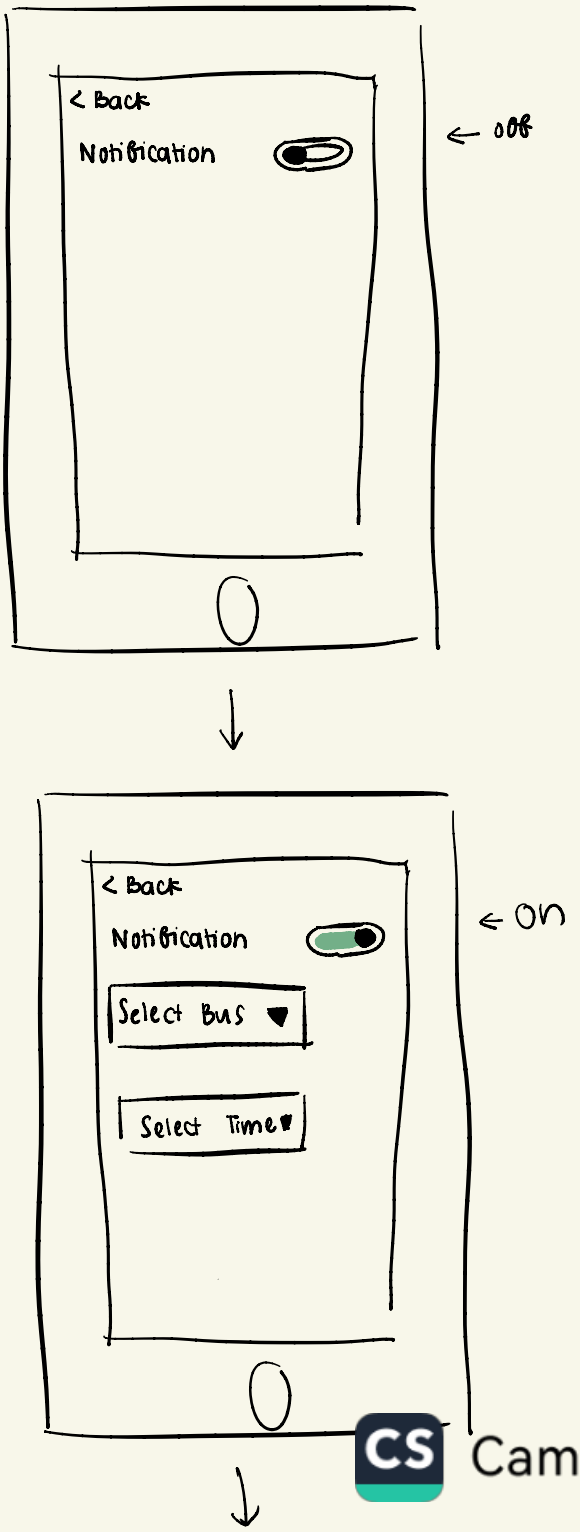
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Notification
off
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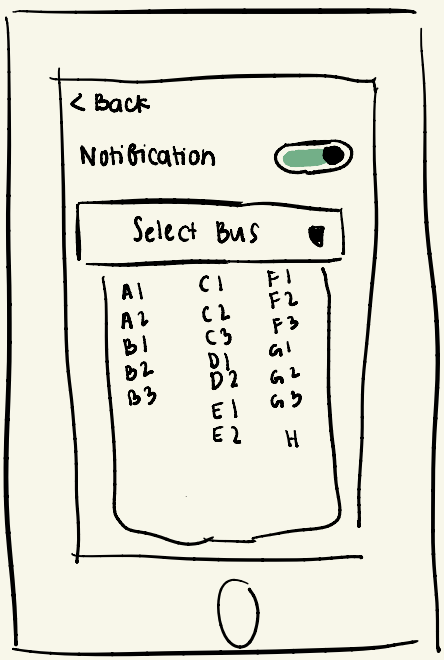
Select Bus
Select Time



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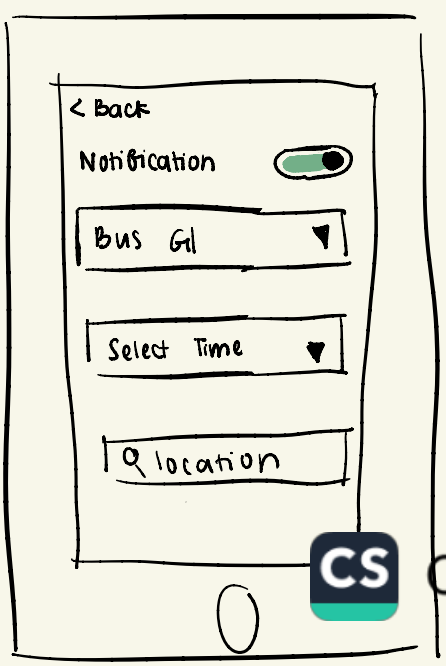

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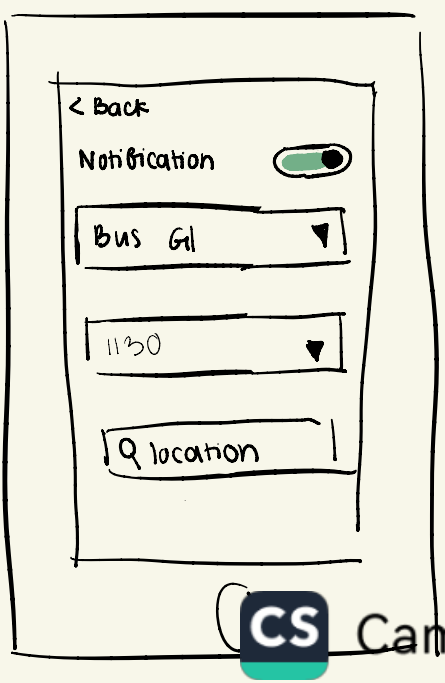

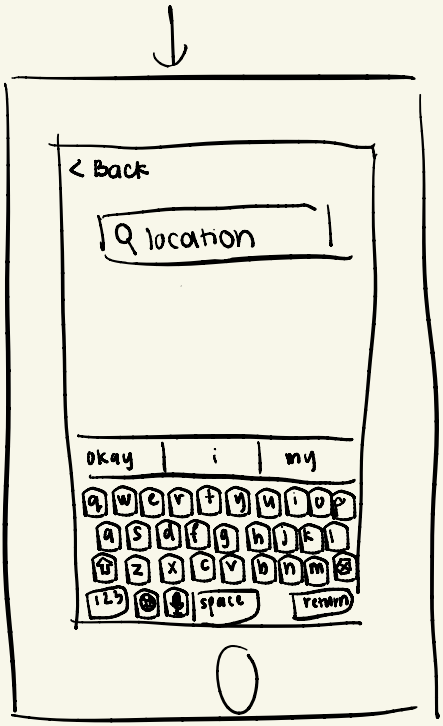

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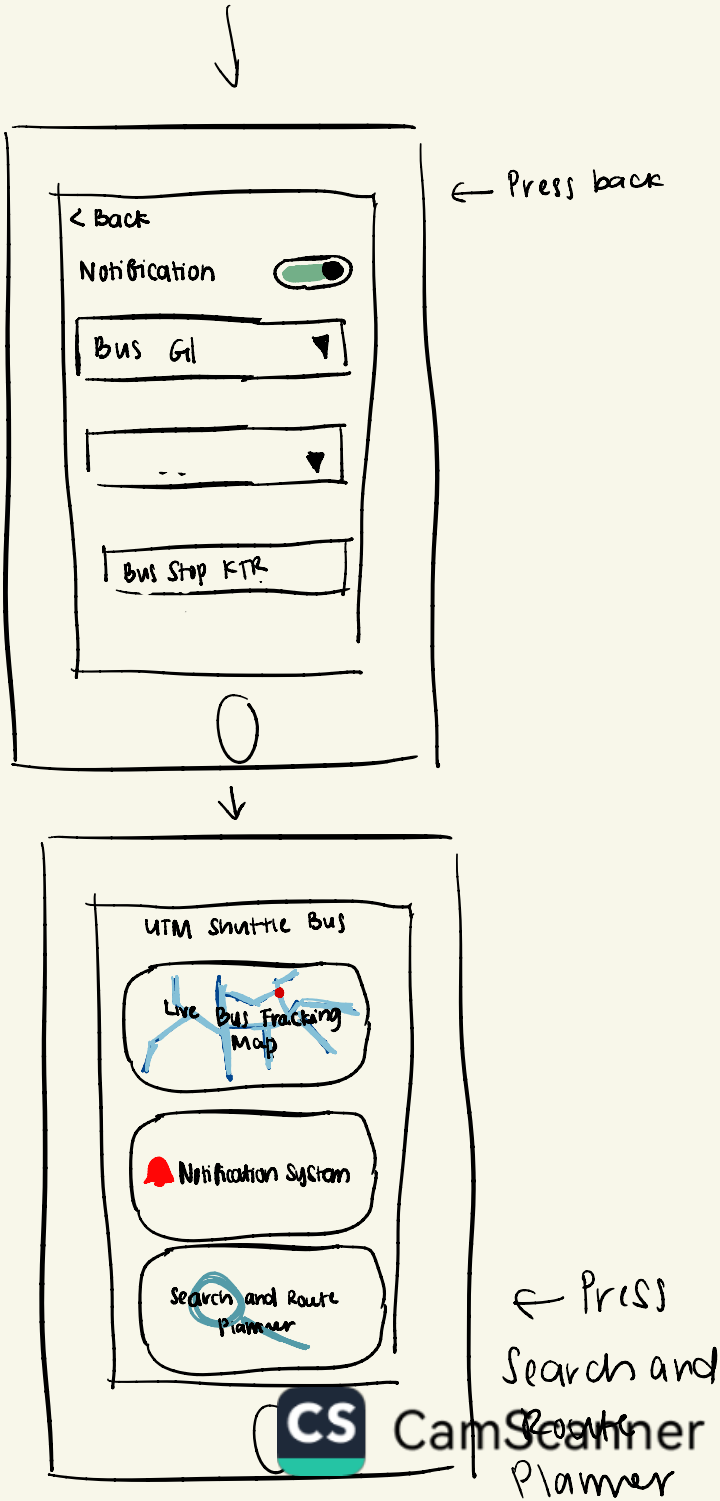
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Notification
Bus G1
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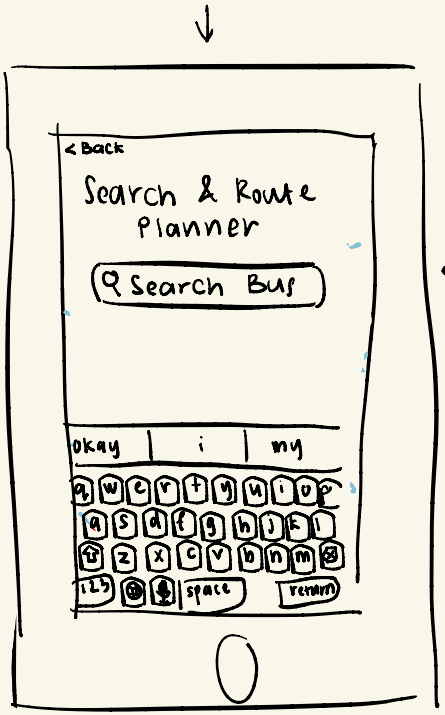
UTM Shuttle Bus
Live Bus Tracking Map
Notification System
Search and Route Planner
← Press Search and Route Planner



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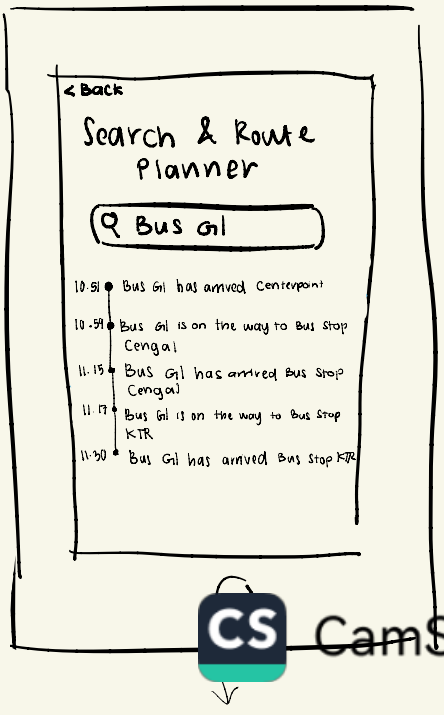

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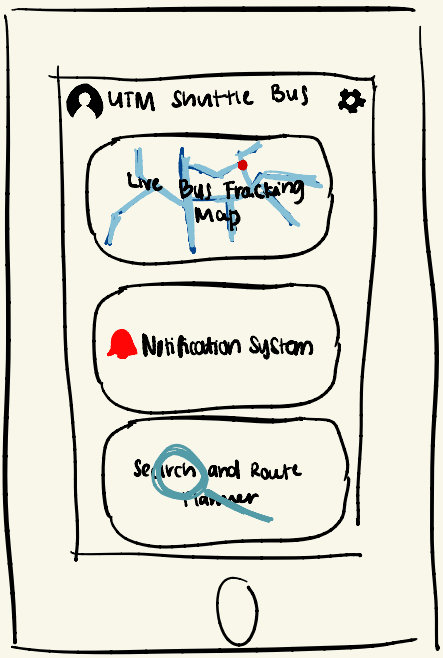

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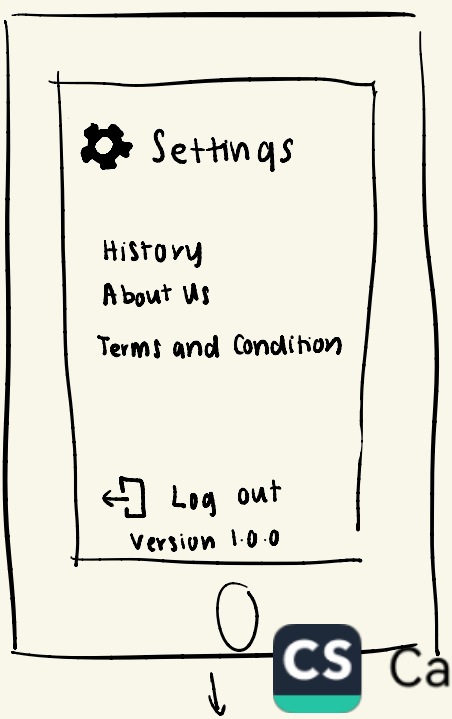

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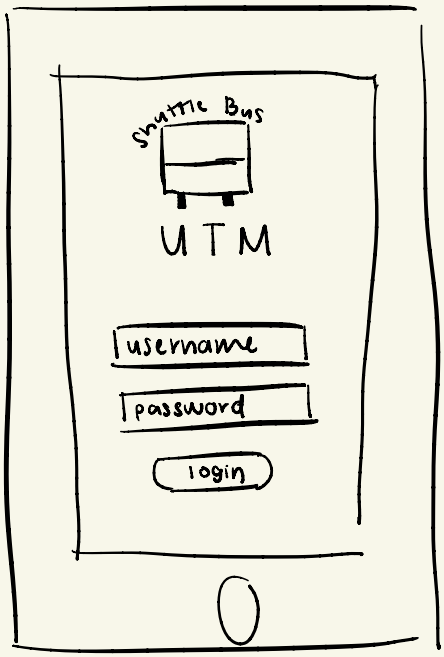

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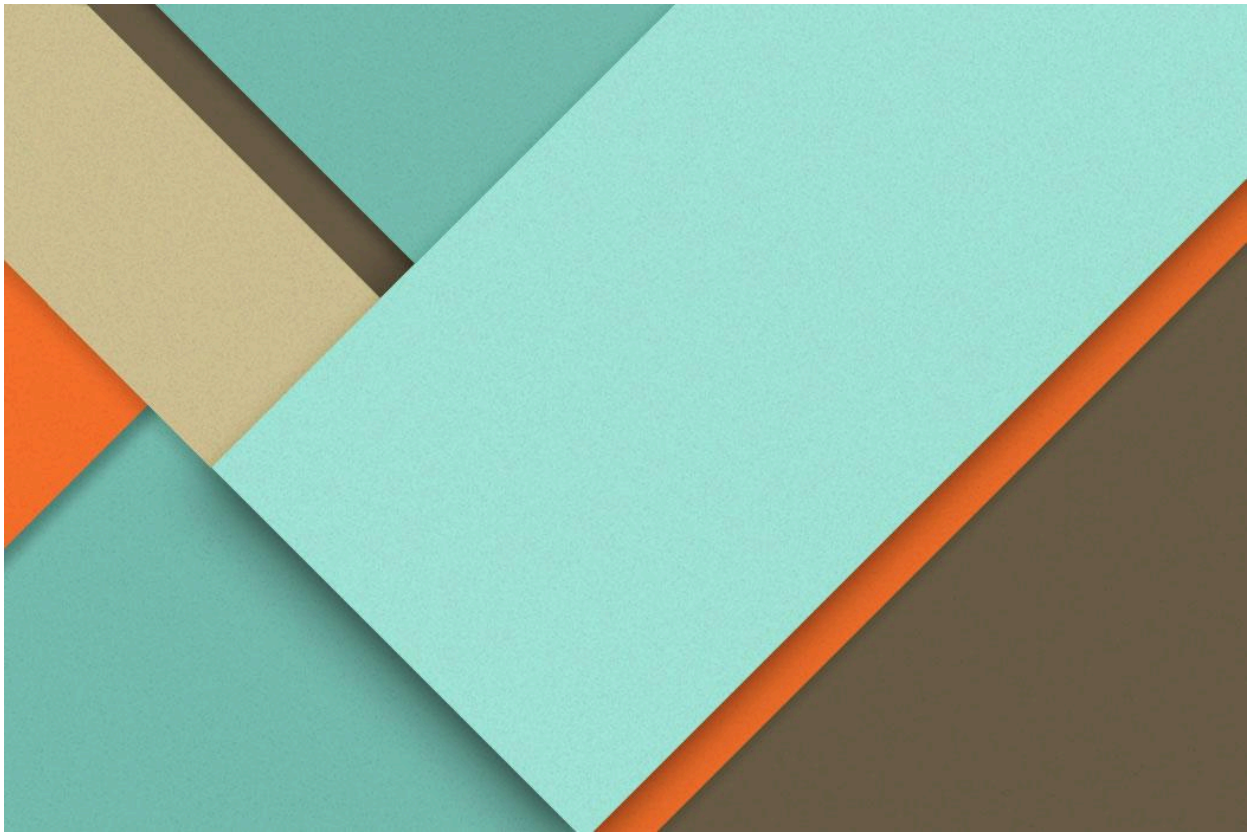

Testing video sessions

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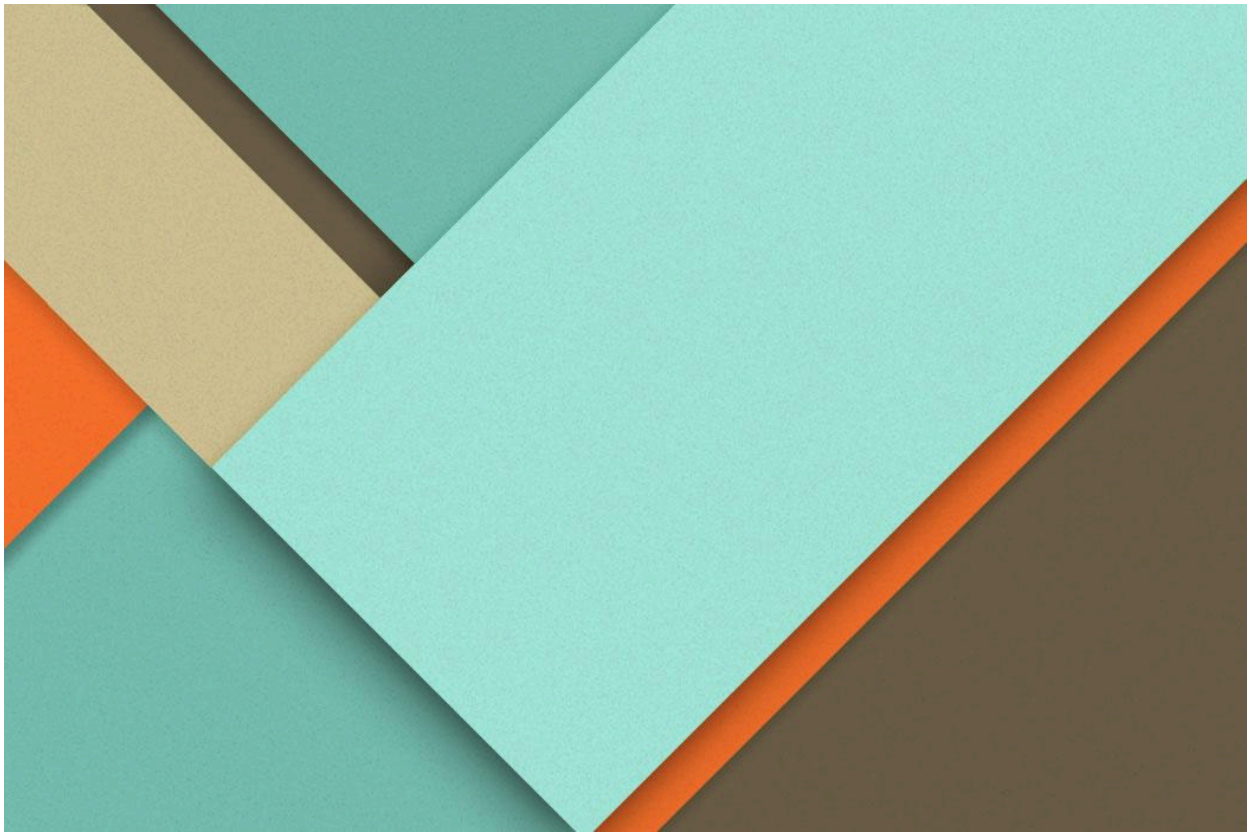

Evidence of Contributions


Shahed Bhuiyan
Kreshshale
Khalisha Afifah
yapeng wang
CamScanner