Clyde’s Cougar Excursion

Inception Document

Software Architecture, Security, and Testing Project, Fall 2024

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Vision and Business Case

Vision
We envision a real-time interactive AR scavenger hunt game application, with the opportunity for incoming students to delve into exploring the college's and city of Charleston's buildings and history with the use of rankings, collection of photographic references to such locations and integration with updates via the college's updates and third-party supporting systems.

Business Case
The College of Charleston has many new students that arrive at the college every Fall and Spring semester. With an increase of incoming students growing every semester, the college has only so many sources to be able to provide students with necessary information at a given time, for instance live tours that highlight only the well-known locations of the college and most necessary. With this in mind, this leaves many other places of the college and historical locations of the city of Charleston to not be known to students and remain void of their knowledge through their years and for understanding of the rich narrative that the college and city maintain.

Use Cases

Use-Case: User Login and Registration

Scope: AR Application
Level: User Goal
Primary Actor: Freshman College Student
Stakeholders and Interests:

- Student: The student wants to explore their new college and learn about all the important buildings
- College: Wants to ensure incoming students are well educated on college matters and history.

Preconditions:

- The student has been accepted to the college and has a functioning student email in the college's domain.

Success Guarantee (Post Conditions):

- The Student has successfully made an account with the app and can securely login without issue, using their student email.

Main Success Scenario (or Basic Flow):

1. The Student downloads the app from the appropriate app store.
2. The student will open the app and be greeted with the *Login* page.
3. The student opens the app and if they have not already registered they will press the "register" button.

4. The registration page will open where the student will enter their College of Charleston email address and create a custom password.
5. If the registration is successful they will then press “Login”, and be returned to the *Login* page.
6. The student will then enter their college of charleston email address and the password they chose.
7. They will then press the “Login” button, and if the credentials are correct they will be taken to the homepage of the app.

Extensions(or Alternate Flows):

A. If the student has already made an account with the app, then they have the ability to skip the registration process and go straight to the login process.
B. If the student creates a password but forgets it, they will have the option to press the “Forgot Password?” button and be taken back through the registration process

Special Requirements:

- A touch screen UI
- Account authorization (most likely with a unity or appstore database TBD)
- A smartphone with a touchscreen
- Pluggable domain values for college emails (for example the college has switched from gmail to outlook in recent years, the app should be able to accept both types in the future without issue)
- A wifi connection such as cofc-guest, eduroam, or some form of data

Technology and Data Variations List:

- Will need to run on both IOS and Android devices.

Frequency of Occurrence:

- Registration Happens Once, Login happens upon App opening.

Open Issues

- This aspect has not yet been coded and is still in the development phase.

Use-Case: Student Takes Picture

Scope: AR Application
Level: User Goal
Primary Actor: Freshman College Student
Stakeholders and Interests:

- Student: The student wants to explore their new college and learn about all the important buildings
- College: Wants to ensure incoming students are well educated on college matters and history.

Preconditions:

- The student has been accepted to the college and has a functioning student email in the college's domain.

- The student has created an account and is currently playing the game.
- The student is within the acceptable range of a location

Success Guarantee (Post Conditions):

- The Student has successfully completed a location event and now has access to both a photo of Clyde the cougar and the corresponding location information.

Main Success Scenario (or Basic Flow):

1. The student safely enters the acceptable range of a location event using the digital map.
2. The student receives a pop up notification that they have arrived and may take a photo.
3. The student enters the AR camera view and is greeted with a Clyde the Cougar model posing in front of the building.
4. The student presses the “Take Photo” button and may now view said photo in their scrapbook.
5. The student exits the AR mode and goes to their scrapbook.
6. The Student selects the photo and is met with both the photo and a detailed description of the school building, its history, and what they can do there.
7. The student exits the scrapbook and sees that they now have access to the next location

Extensions(or Alternate Flows):

A. The Student may view any previous locations in the scrapbook
B. The student may take a photo that they do not like and will have the ability to Retake it. Only the desired photo will be saved.
C. If the next location is far from the main campus (i.e. Harbor Walk) the game will provide a hint about the free Carta bus.

Special Requirements:

- A touch screen UI
- Account authorization (most likely with a unity or appstore database TBD)
- A smartphone with a touchscreen
- Pluggable domain values for college emails (for example the college has switched from gmail to outlook in recent years, the app should be able to accept both types in the future without issue)
- A wifi connection such as cofc-guest, eduroam, or some form of data

Technology and Data Variations List:

- Will need to run on both IOS and Android devices.

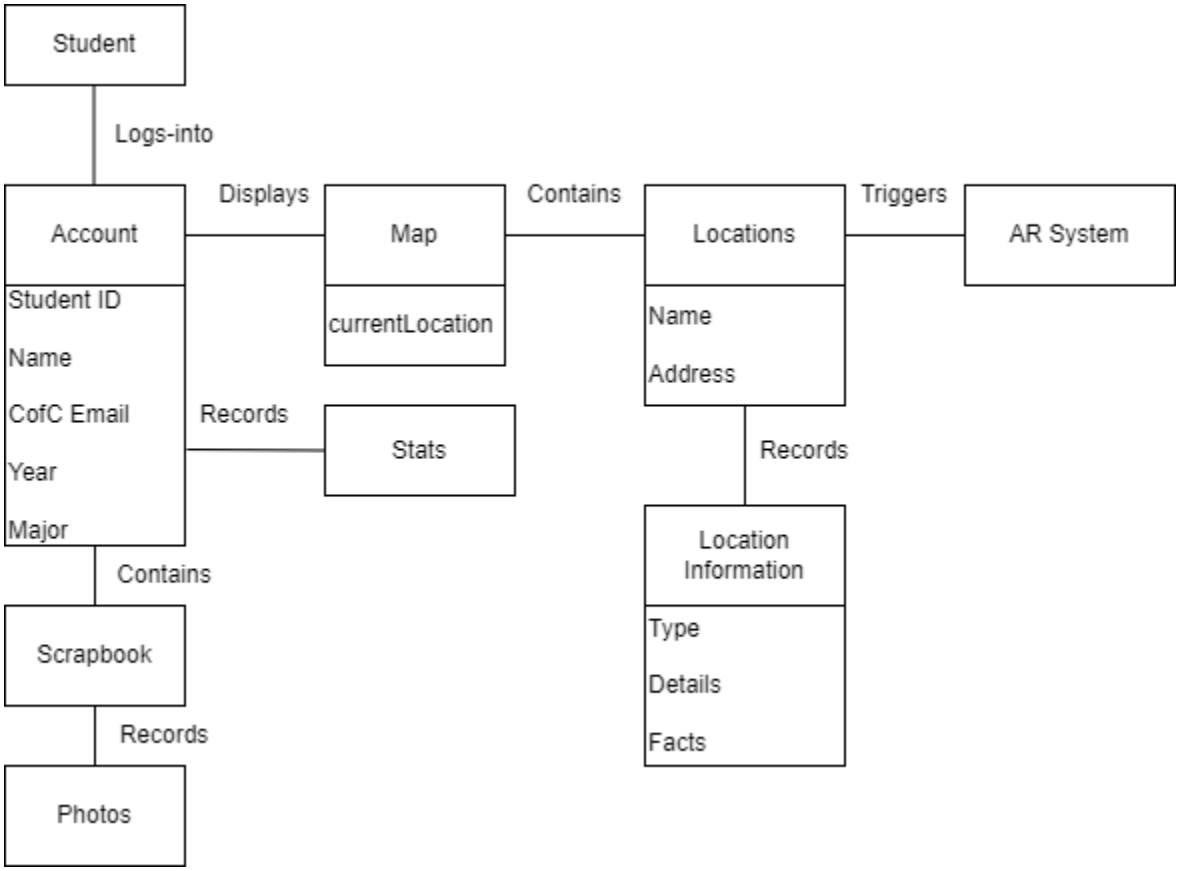
Frequency of Occurrence:

- Once for Every Location event in the game

Open Issues

- This aspect has not yet been coded and is still in the development phase.

Domain Model



Supplementary Specification

- **Performance**
  - The response time of the system must be able to run at a fast enough rate to which can replicate that of real-time feedback.
- **Reliability**
  - The system should be available continuously as an application should be running on individual portable devices with access to internet connection.
  - In the event that the application is under maintenance or restructure, it should maintain all user's collected locations via their CofC credentials to reference to.
- **Security**
  - The system shall use student credential authentication to be able to access the and operate the software on their device.
  - Images that are captured initially by the developers or college for examples, should keep in mind public and private spaces to surrounding locations.
- **Usability**

    - The system’s user interface should be designed for ease of operation and navigation throughout, with users able to perform primary actions with as minimal interactions as possible.
- **Maintainability**
    - The system’s architecture should be modular, with implementation of independent components and connection to others when possible, to facilitate easier maintenance and updates that the project’s progress with potential future and use can be accessed.
    - All components and system designs should have clear, updated documentation for future maintenance efforts and understanding.

Risk List & Risk Management Plan

Business risk

- If this is implemented in the schools orientation program, it will be a direct reflection of the school, and set the tone for all incoming students' perceptions of the education career. A poor experience may lead to students transferring to other institutions.
    - Students being given wrong information about school buildings will lead to greater problems down the line for them and staff.
    - **Ideas of mitigation:** Every scrapbook entry comes with an exact address of the respective buildings, as well as the title, and the contact information for any respective staff

Technical risk

- The MapBox API could fail to load location data correctly or efficiently, leading to student confusion or incorrect information of school buildings being given.
- The students personal device may not have the ability to connect to wifi or data.
    - **Ideas of Mitigation:** The app will have a copy of the schools map for emergencies to help prevent students from getting lost.

Resource risk

- Lack of knowledge for desired platform to produce AR environment and objects
    - With the team's knowledge, there may be a lack of knowledge of how to implement AR objects and items that are desired or planned to be implemented to the project.
    - **Ideas of mitigation:** provide open-sources and tools to all teams, and divide tasks amongst members to outreach knowledge to certain members to be more knowledgeable on certain items to assist and guide other members to understanding or handling certain criteria.

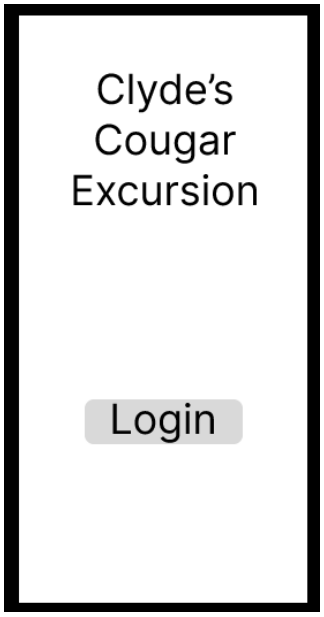
Schedule Risk

- Conflicting schedules amongst members

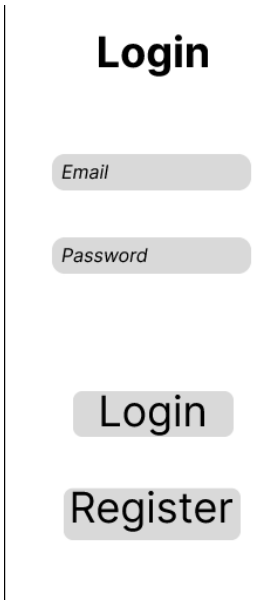
    - All team members are currently in school as well as employed in outside organizations, this makes team meetings and development schedules tight and crucial.
    - **Ideas of mitigation:** team holds meetings within the beginning of each phase to plan the team's approach to a phase, alongside holding daily meet-ups to provide updates for each team member to know of any concerns or issues that may arise to be conflicting to the development of the project.
- Resource unavailability
    - As team members are current college attendees, there may arise limits to available sources that can be provided to the team to fulfill certain goals and tasks.
    - **Ideas of mitigation:** if such issues arise, the team plans to divide the team to outsource and look into additional resources and/or libraries to be a substitute to complete tasks or extend knowledge.
- Scope measure
    - With the team still developing understanding practices of iterative development, the possibility of over-tasking a phase may lead to tasks to be overlooked and/or undermined.
    - **Ideas of mitigation:** In order to keep a concise and understanding of the team's work-ability, the team can provide for tasks to be divided amongst members and have continuous member communication to keep members updated and measure of the work that is completed within phase(s) and recognize the work mentality of the team in the beginning of the project's development.

Prototype and proof-of-concepts

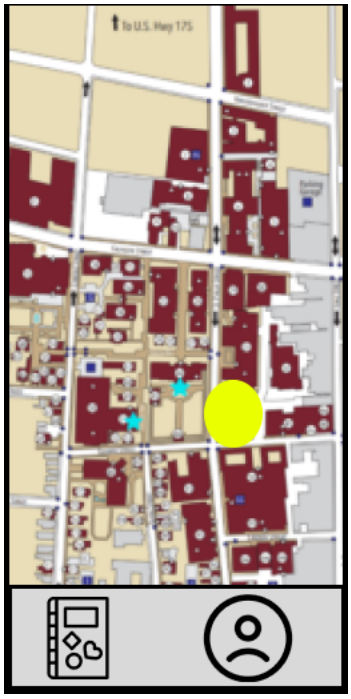
https://www.figma.com/design/YF77ChGpPLY6PL9KV2Utue/Cofc-Scavenger-Hunt?node-id=0-1&node-type=canvas&t=Y3ee4VBiRI9SeMUG-0



This is the introductory screen that the user will be presented once opening the application.

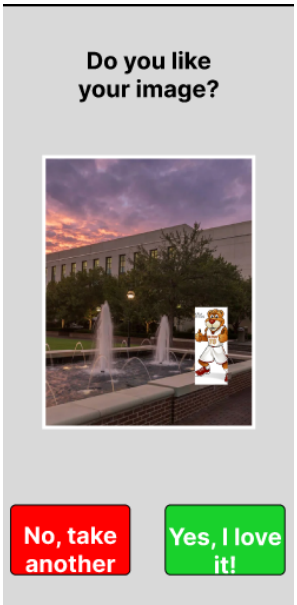


After interaction with the system's opening screen, the user will be presented with a need for their College of Charleston credentials with indicators if their email and account will allow for them to continue with the use of the application furthermore.

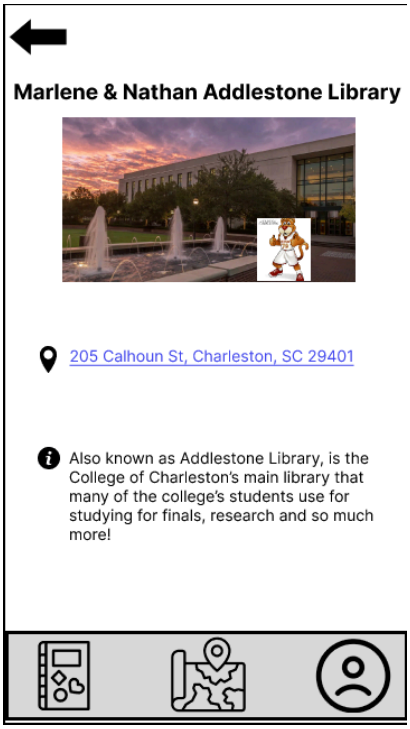


Upon successful login, the user will be introduced to the opening screen for the application of a digital map that tracks the user and their location throughout the Charleston area and the campus of the college. Once they are near a location an indicator on their screen will show they are near an area.

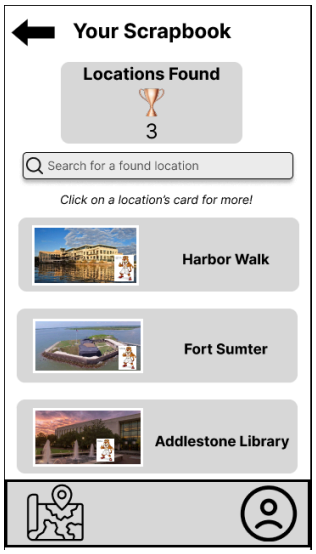
After getting near the location, the user will be able to switch to their camera and they will be greeted with an AR object Clyde to capture the image near the intended location.



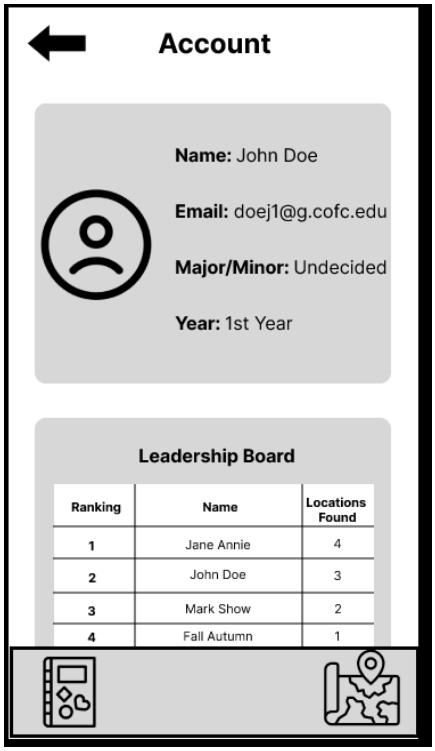
Once the image is captured the user will be presented with a confirmation screen to accept their new location's image or to retake the image to their fitting.



After successfully capturing the image of a location, the user will be presented with their captured image of the location they have found, the address alongside a description of the importance and additional information in regards to the location, this will be presented once the image was accepted by the user and can be reviewed again when interacting with the card for the place within the scrapbook..



Upon interaction of the notebook icon on the navigation bar, the user will be presented to the scrapbook screen which will display all locations that the user has visited and captured an image of and have access to interactive cards in regard to each location.



When a user interacts with the profile icon on the navigation they will be presented with their information in regards to the college alongside a leadership board to their placement in comparison to other users of the application and of which places they have found. The formula for rankings will be $(\frac{places\ found}{elapsed\ time})\ *\ bias$, where the bias will be a normalizing variable

Iteration Plan

- **Goals:**
    - Establish core architecture of the system
    - Identification of high-level priorities to implement prior
    - Identify and mitigate major risks
    - Being implementation of more standard design
    - Design architecture to plan approach to implement program's code and game's flow
- **Key Deliverables**
    - Have design of architecture of a high-level diagram and description for the system
    - Have functionality of simple introductory items such as: login, digital map,
- **Features to be implemented**:
    - Login Functionality:
        - Implement of basic login feature, with inclusion of user authentication with required CofC credentials
        - Support of error handling for incorrect login credentials
    - User Registration:
        - Development of registration page and user data validation with college's required email
    - Integration of Geo Map
        - Have interactive digital map to register user's movement throughout city for additional required navigation features
    - Collection of Example Images:
        - Harbor Walk
        - Cougar Mall
        - Financial Aid Office

Phase Plan & Software Development Plan

- **Duration:** ~2 weeks

- **Effort:**
    - By the end of the elaboration phase, the team aims to have successfully implemented all required goals and necessary documentation for such items. Alongside measuring the team's velocity to measure out the team's plan to complete as many high-level goals that the team can afford to do with consideration of the project's deadline and stakeholder's feedback.

- **Tools:**
    - The team has decided to revolve the project around the use of Unity for code development and implementation in creation of the project's user interface. With

additional tools being GitHub for team collaboration and code and documentation implementation.

- **People:**
    - College of Charleston
        - Stakeholder of project which the team holds to maintain continuous feedback and consideration of organization's business cases and rules, alongside allowance for future project hand-off to be further modified to the organization's needs.
    - Incoming Students
        - Project's main users for the software and consideration for cases and creation of features and implementations to consider when developing the software's user interface.

- **Education:**
    - With our team's dedication to use an interactive AR platform via portable devices, the team requires an understanding of how to implement AR and consider additional training for creating items that are necessary for the operation of the application such as interactive digital map movements with user movements, creation of AR objects into real-time environments, image capturing within application.

- **Additional resources:**
    - The Mapbox Free API for Unity, it allows for updating map data and player location in real time.

Development Case

Discipline	Practice	Artifact	Inception	Elaboration	Construction	Transition
		Iteration →	I1	E1…En	C1..Cn	T1…T2
Business Modeling	Agile modeling requirements workshop	Domain Model	start	refine		
Requirements	Requirements workshop: scope of project and vision	Use-Case model	start	refine		

		Vision	start	refine		
		Supplementary Specification	start	refine		
		Glossary	start	refine		
Design	Agile modeling test-driven development	Design Model		start	refine	
		Software Architecture		start		
		Data Model		start	refine	
Implementation	Test-driven development with programming continuous integration coding standards	Login		start		
		Registration				
		Image collection of buildings		start		
		Testing decided working environment for project		start		

Glossary

Term	Definition	Format	Aliases
AR	This is a term short for Augmented Reality.	A function of the game where animated or digital objects are displayed on top of a camera's output.	Augmented Reality
Clyde	The College of Charleston's Mascot, a Bipedal Cougar that wears the school's basketball uniform.	In the scope of this project, Clyde will be a 3D model.	Cougar Clyde
Game	This refers to the App and project as a whole.	A mobile app that will allow for AR.	App, Clyde's Cougar Excursion
Location	Buildings, historical alongside buildings related to the college campus. These are hidden until discovered by the student, these are the main activity progression throughout the application.	In the scope of this project, these locations are divided between college and general college buildings.	
MapBox API	A free to use API that will update map data and generate images based on a user's location.	API that will be integrated into the core unity project	MapBox
Scrapbook	A comprehensive list in the game that will show a user's previously visited locations, the photos that have been taken, and each corresponding location's information.	In the scope of this project, the scrapbook will be a special UI menu in the game.	

Unity	A free to use IDE that will be used to program the project. It will use the language C# and has built in support for both AR and mobile development.	IDE	