

VIRA

Virtual Insight into Real Athletics

**Caroline Rankin, Katie Perkins, Nate Irmiter, Bailey Righi,
Willem Paul**

Advisor/Client: Dr. Diane Rover
sdmay20-33.sd.ece.iastate.edu

The image features a dark blue background with several thin, intersecting lines in white and purple. The lines create a dynamic, geometric pattern. The text 'Project Plan' is centered in a bold, white, sans-serif font.

Project Plan

Problem Statement

- **Problem:** Limited resources and learning experiences
- **Solution:** VR application consisting of special tests and quizzes
- **Goals:**
 - Provide experience
 - Provide realistic simulations
 - Easy extension via modular design



Conceptual Sketch



Functional Requirements

The user should be able to do the following:

- Log in and navigate to a module
- Choose between guided and quiz mode
- View the athlete's limb in the module in multiple ways
- Review their progress and performance on modules over a period of time

Other Constraints/Considerations

- Environmental:
 - Real-time, direct interaction with user
 - Space to perform an injury evaluation simulation
 - Recognition of fine hand movements within close proximity
- Economical:
 - Limited by ECpE funds



Potential Risks & Mitigation

- May not be able to acquire AR hardware
 - Switch to VR
- May not function as proposed if we use VR
 - Compromise on implementation decisions
- Must be medically/anatomically accurate
 - Use our athletic trainer resource
- No experience with AR/VR
 - Add extra buffer time
- Animation
 - Attention to detail of graphics



Resources and Costs

Costs:

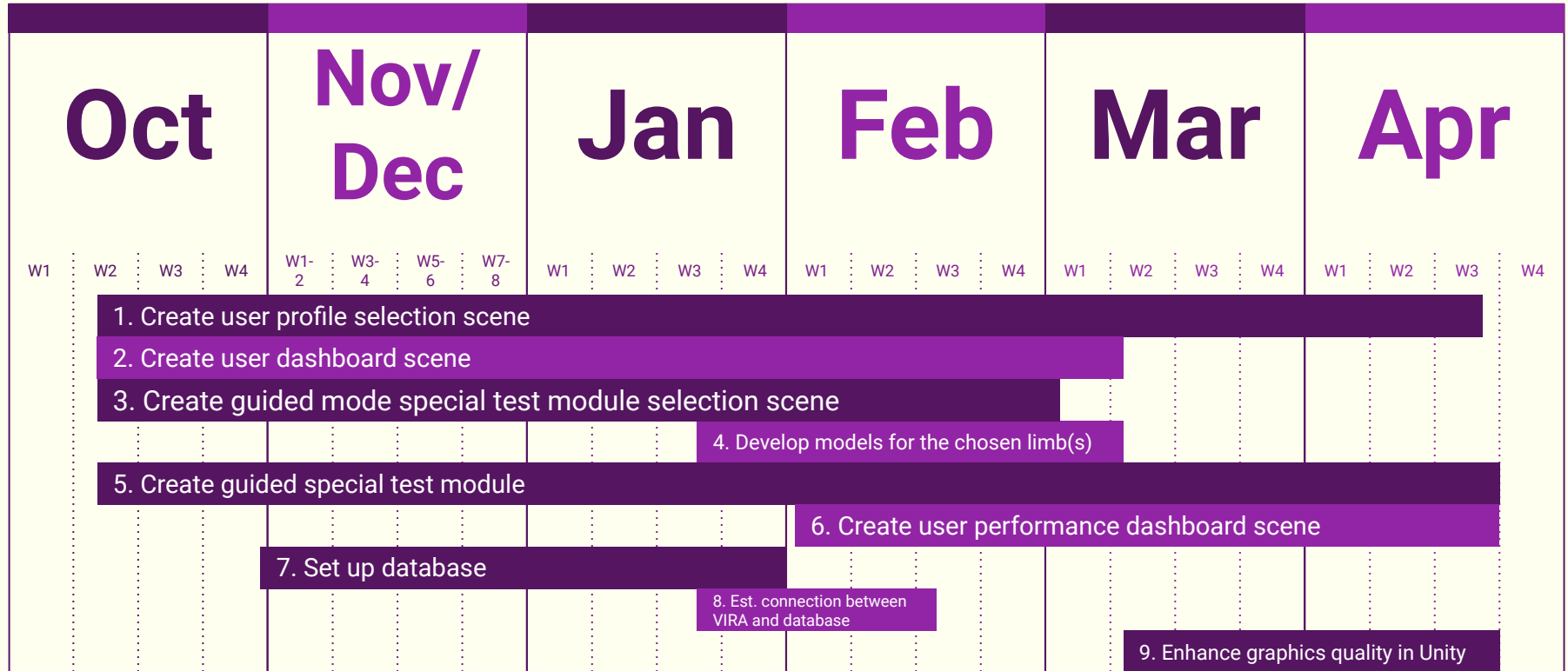
- Oculus Quest cost: 500 USD
- Quest case cost: 40 USD
- **Total resource cost: 540 USD**

Free:

- Unity IDE (with educational Pro licenses)
- MB-Lab
- Blender

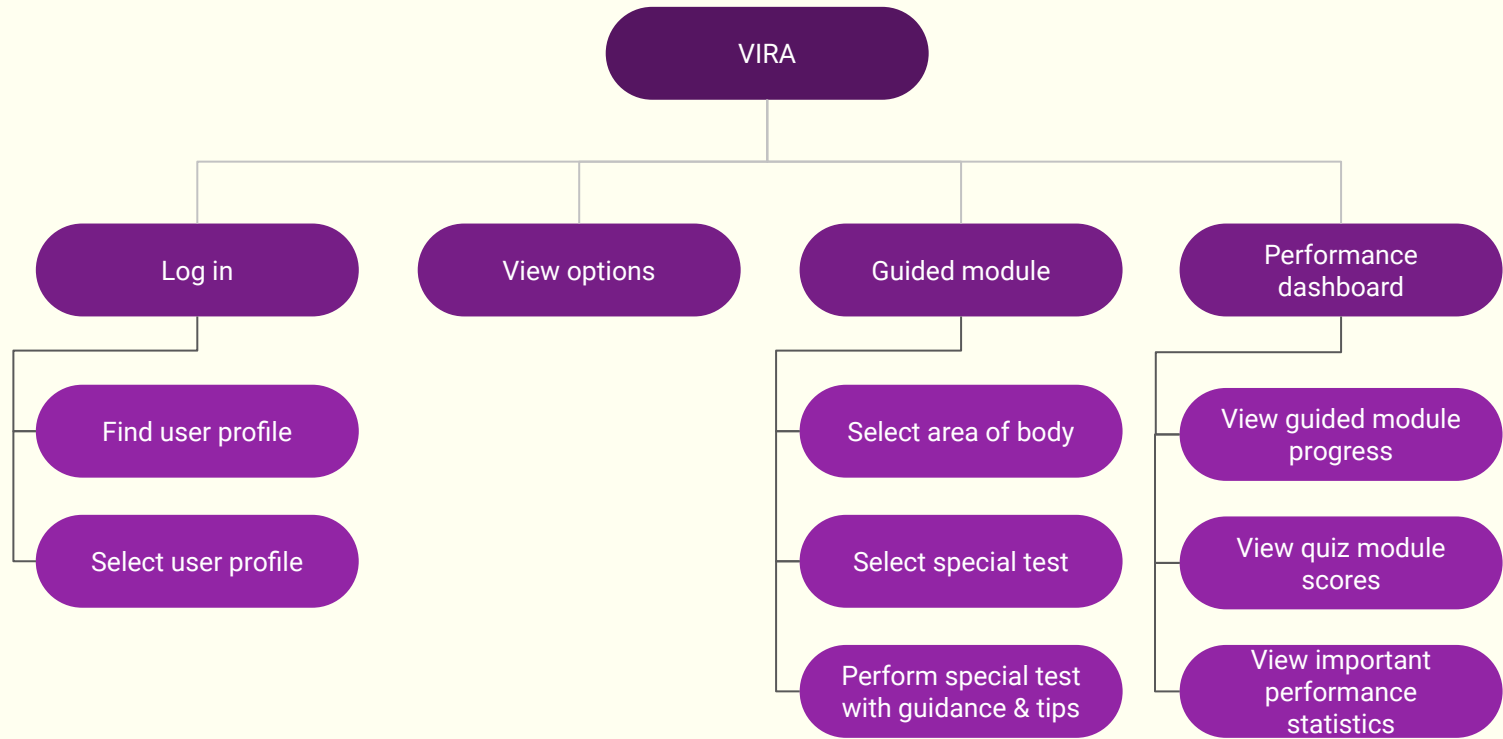


Project Milestones & Schedule



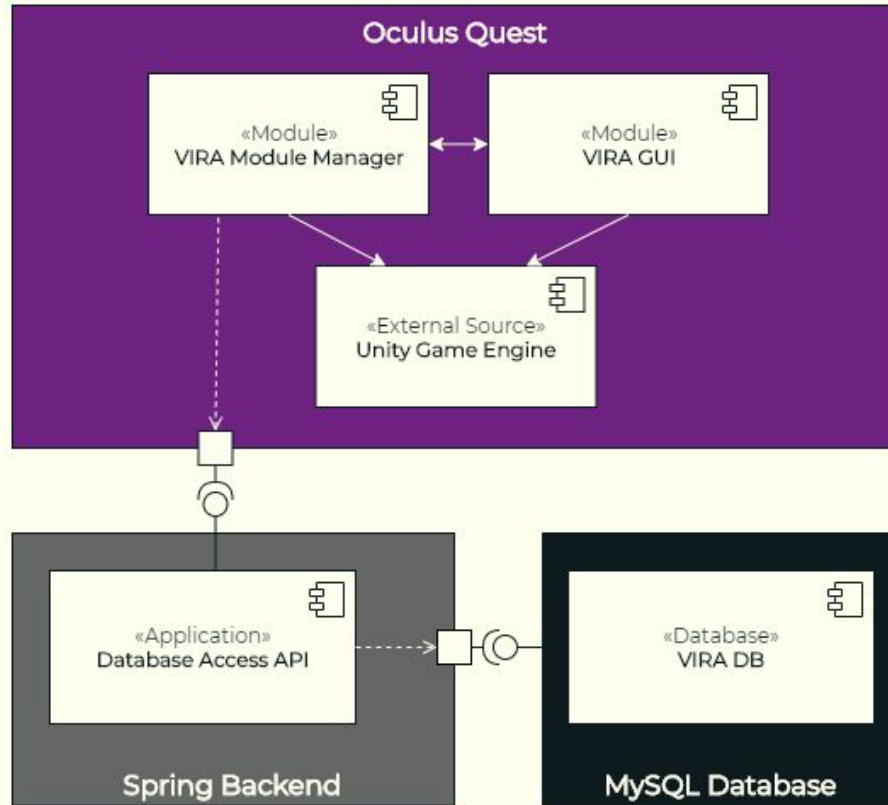


System Design

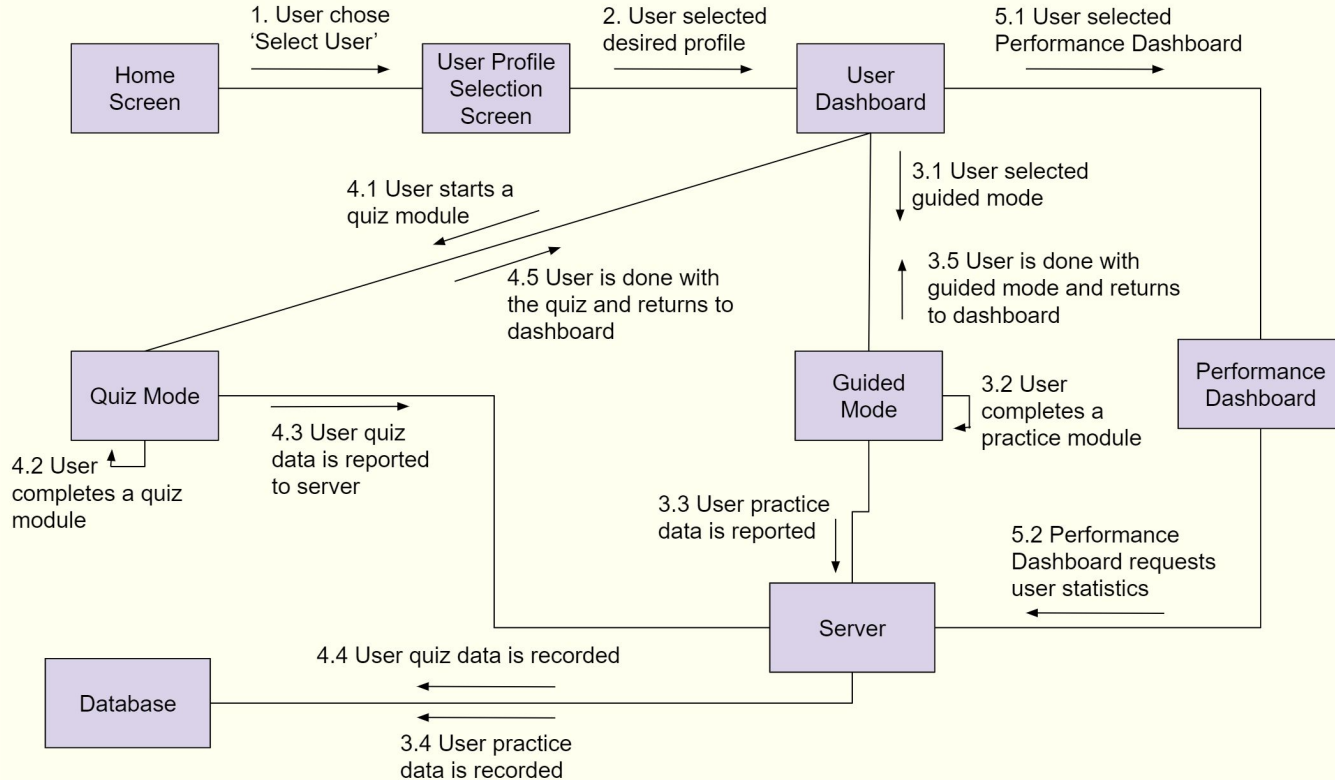


Functional Decomposition

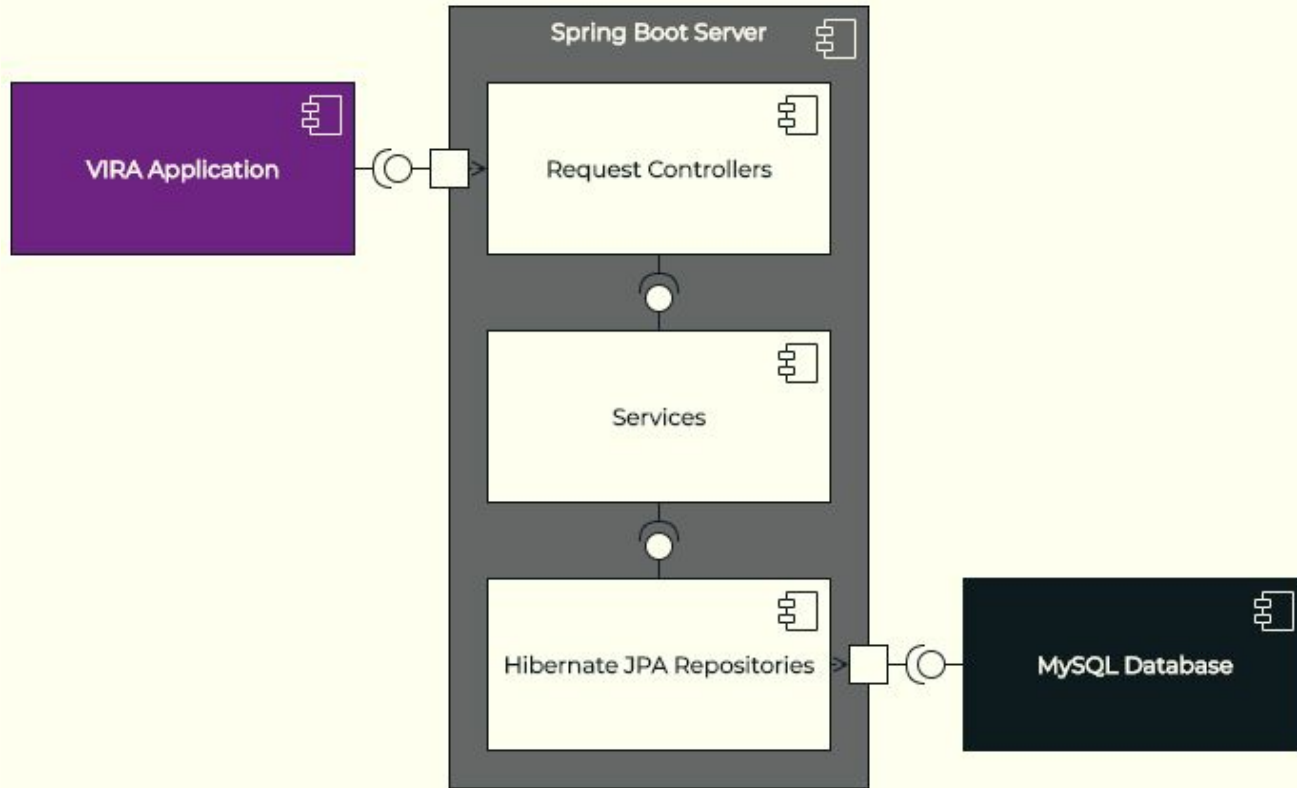
Detailed Design - Component Diagram



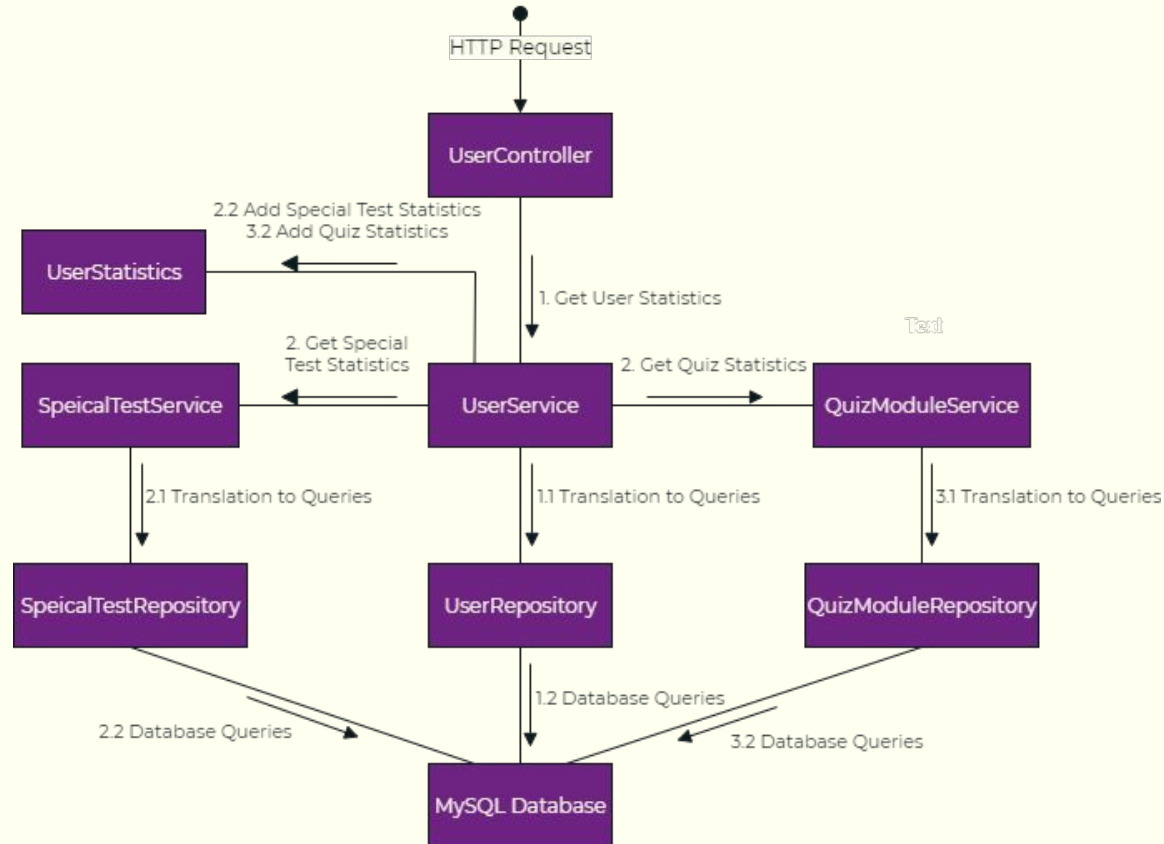
Detailed Design - Communication Diagram



Detailed Design - Server Component Diagram



Detailed Design - Server Communication Diagram



Hardware and Software/Technology Platforms

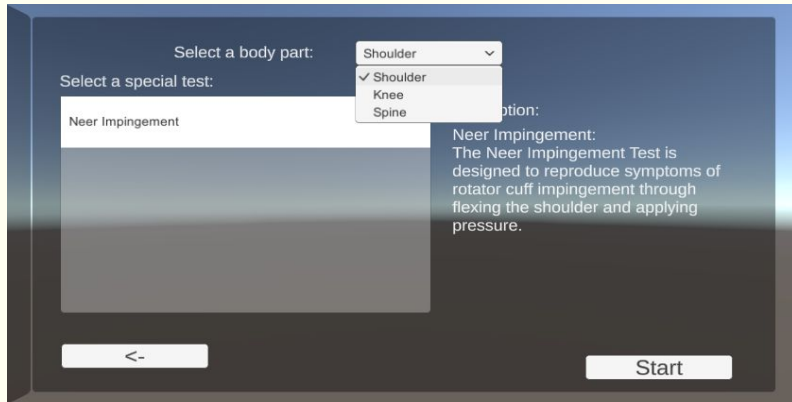
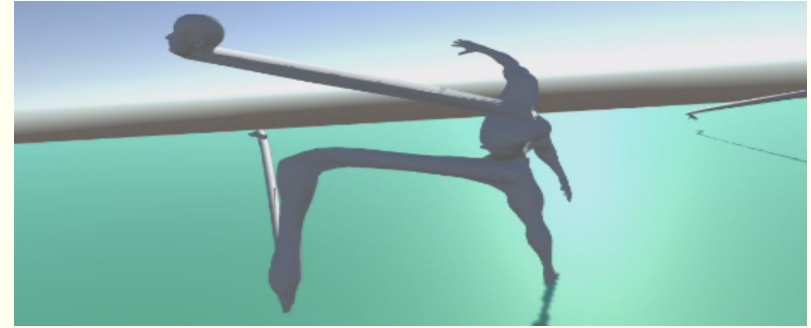
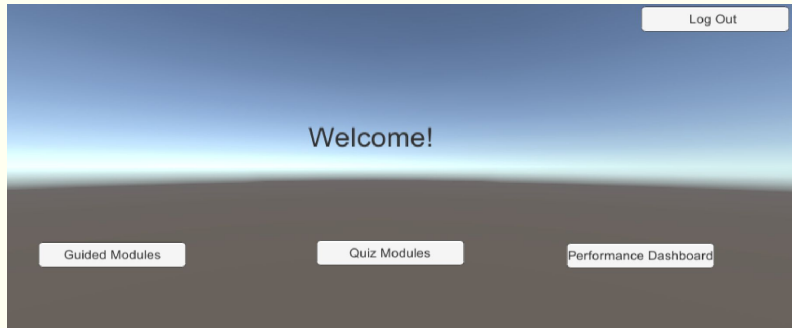
- Hardware
 - Oculus Quest
- Software/Technology Platforms
 - Unity
 - MakeHuman
 - MB - Lab
 - Blender
 - Spring Boot/Hibernate
 - MySQL Database



Test Plan

- Software and Hardware:
 - **Unity environment**
 - **Postman**
- Functional:
 - **System and acceptance testing:** Team
- Non-Functional:
 - **Usability testing:** Analyze how first-time users navigate VIRA

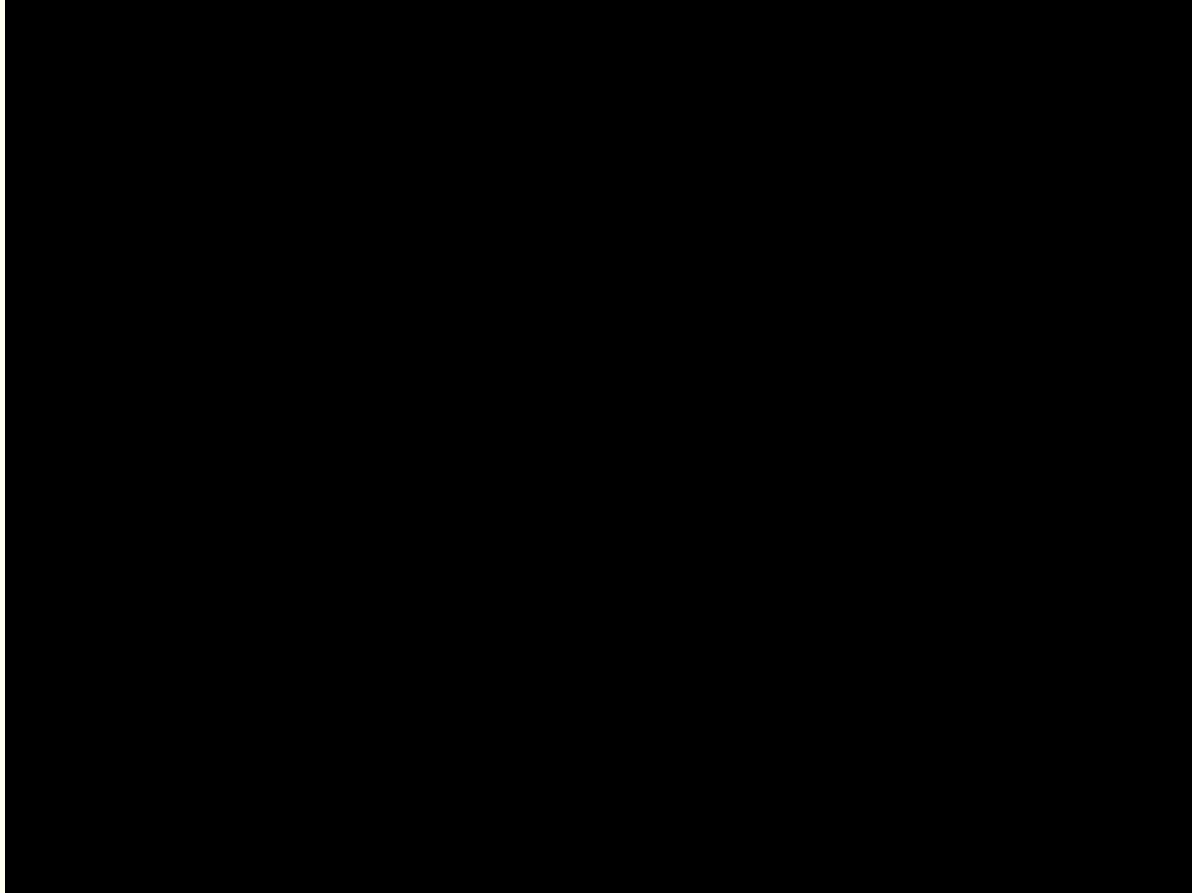
Prototype Implementations



Final Implementation - UI Screens



Final Implementation - Guided Module



Final Implementation - Models



Final Implementation - Performance Dashboard



Final Implementation - Performance Dashboard

Look around you for more statistics and to go back.

Guided Modules Completed: No data

Quiz Modules Completed: No data

Engineering Standards and Design Practices

- IEEE Standards
 - P2048.5 – Standard for Virtual Reality and Augmented Reality: Environmental Safety
 - P2048.6 – Standard for Virtual Reality and Augmented Reality: Immersive User Interface
- Design Practices
 - Be kind to the user's eyes:
 - Reduce eye strain due to bright colors, flashing lights, and fast movements
 - Modular Design
 - One script applied to multiple GameObjects
 - Use prefabs for base GameObjects that can be modified
 - Dynamic population of nested components can be optimized using a prefab
 - UI continuity



Conclusion

Challenges

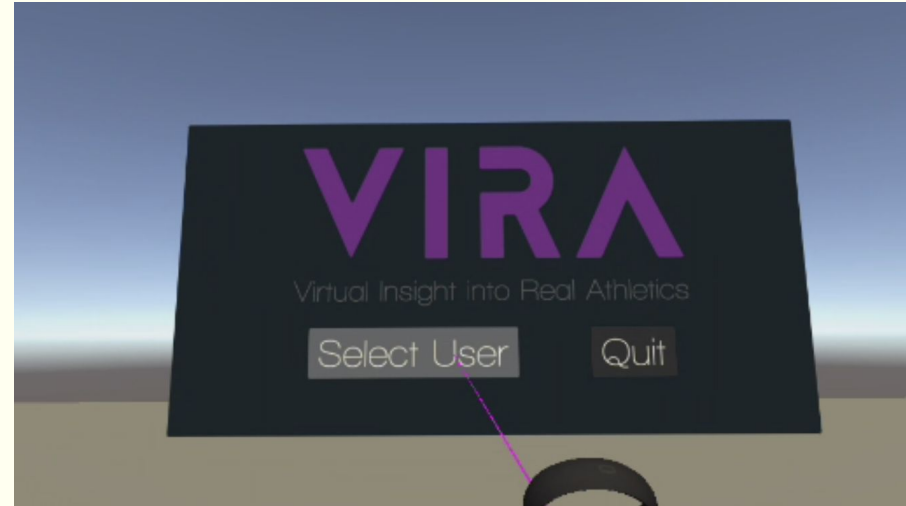
- COVID-19
- Issues with acquiring hardware
- Lack of initial background knowledge
- Abnormal animation for VR
- Software availability & resource paywalls

Team Member Contributions and Task Responsibilities

	Katie	Nate	Bailey	Willem	Caroline
Scheduling/Planning	X		X		X
Communications		X	X		
C# Scripting	X		X		X
Modeling/Animation	X	X			
UI Design				X	X
Server/Database	X	X		X	
Documentation	X	X	X	X	X

The Future of this Project

- Experimental, student-proposed project
- Would be possible for future senior design teams to expand with more guided special test modules and quiz modules
- Could possibly be adapted to AR technology in the future





Questions?



Thank You!