AR Chemistry Lab Project Final Report

Title: Augmented Reality Chemistry Lab Application

Introduction: Welcome to the Augmented Reality Chemistry Lab, a groundbreaking application that takes learning chemistry to a whole new level. This dynamic AR-enabled laboratory provides users with an immersive experience, allowing them to study and explore about chemical reactions and visualize molecular structures through the lens of augmented reality. In this final report, we will delve into the design, integration, and user experience of the AR Chemistry Lab app.

Link to AR App Content: Access our Box subfolder containing the AR app promo video, User Guide, APK file, and Unity Project here.

AR Application Design and Integration:

UI/UX Design: The user interface (UI) and user experience (UX) of the AR Chemistry Lab were meticulously crafted to enhance engagement and interactivity. The main menu provides easy navigation to various tools, interfaces, and features. Users can seamlessly explore the application, conduct experiments, and analyze results with an intuitive interface.

The assets used while making the seamless User Interface are downloaded from sketchfab, unity asset store while the other assets are built from scratch using software's like Blendr.

Scripts for AR Interaction: The heart of the AR Chemistry Lab lies in the scripts developed for augmented reality interactions. These scripts enable users to engage with molecular structures, conduct experiments, and observe the outcomes in real-time. The integration of touch interactions, scaling options, and support for both iOS and Android devices ensures a smooth and accessible user experience.

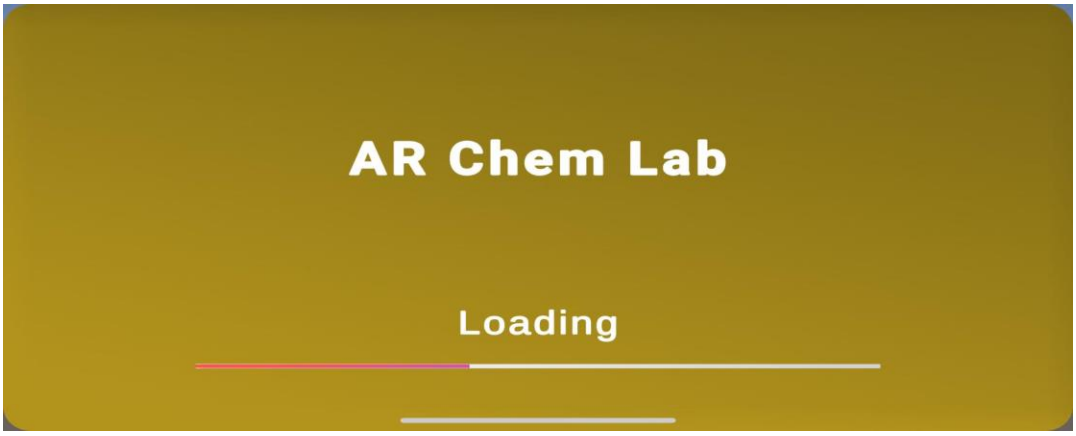
Technical Overview: The AR Chemistry Lab's success hinges on advanced scripts developed for augmented reality (AR) interactions. Leveraging Unity and the AR Foundation framework, these scripts provide users with a dynamic, immersive experience across both iOS and Android devices.

1. *Unity and AR Foundation:* Built on Unity (version 2021.2.16f1) with AR Foundation, ensuring a unified AR experience across platforms.
2. *AR Interaction Logic:* Robust logic for touch interactions, allowing users to manipulate molecular structures intuitively.
3. *3D Object Rendering:* Efficient rendering of 3D molecular structures for optimal performance and visual fidelity.
4. *Experiment Simulation:* Sophisticated simulation system for users to conduct chemical experiments with accurate outcomes.
5. *Cross-Platform Compatibility:* Scripts ensure a consistent and high-quality AR experience on both iOS and Android devices.

In Application Control/User Guide:

The following guide is for the user to understand how to use/navigate through the application**.**

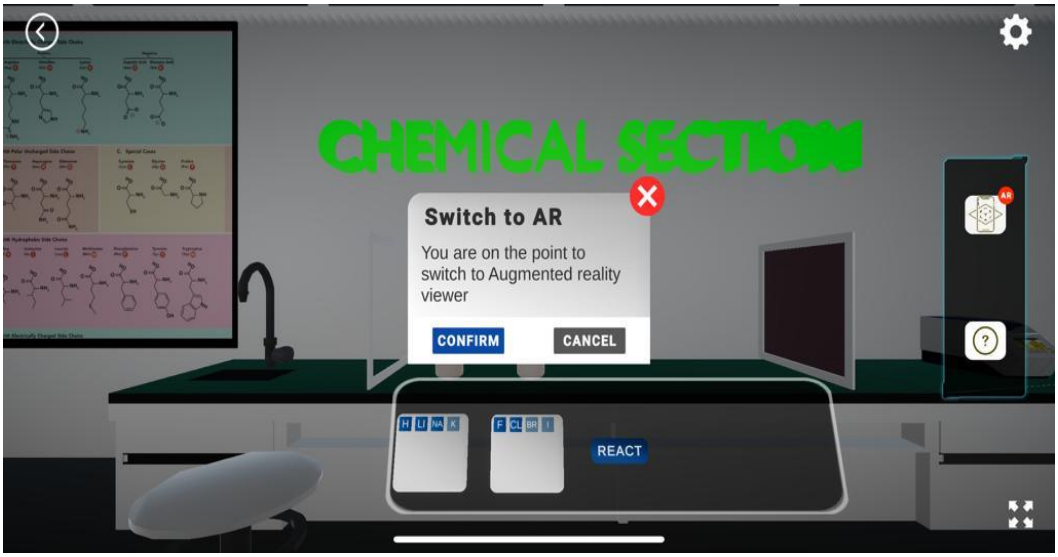
- Once the application is downloaded on the desired device, launch the application on your device. The user can view the loading screen on its launch.



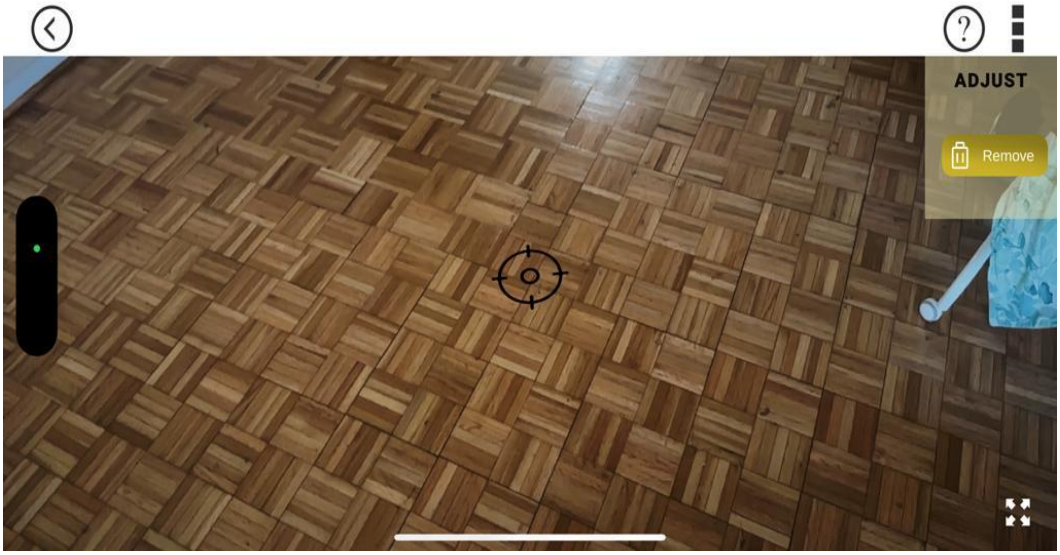
- After the application is launched, the user can see the main interface. On tapping the required button, it leads the user to explore various features after they acknowledge to explore more about it.

- On the extreme top right side of the screen there is a setting “⚙”icon, which on tapping enables the user to analyze information about other buttons which are present on screen. The user can tap on the red cross “×” icon twice to get back to the main screen.

- After learning and exploring the User Interface and various Icons present on the screen, the user can switch to AR platform by tapping the AR icon present at the right side.
  The user can use the scale option to fix the resolution and appearance on their screen as it varies based on the device user is using and many other properties.

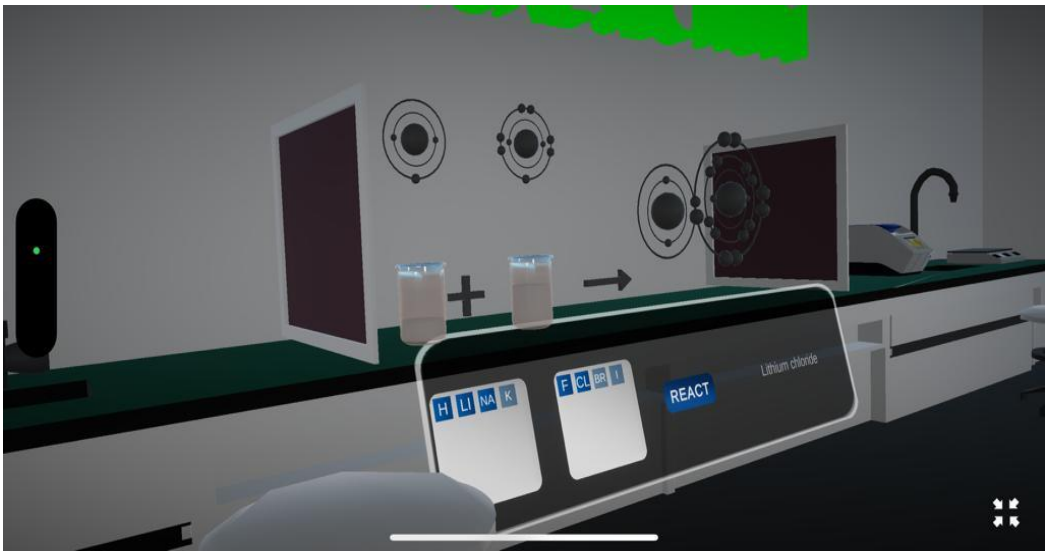


- The user can configure the lab by situating and tapping on the target icon on the floor, which confirms the application that the plane has been selected and it is ready to be displayed.
  The user can position the black target icon on a plane surface to detect and deploy the application. If there is any occlusion, The user can reconfigure the plane surface by tapping on the “remove” button present towards the left side of the screen.

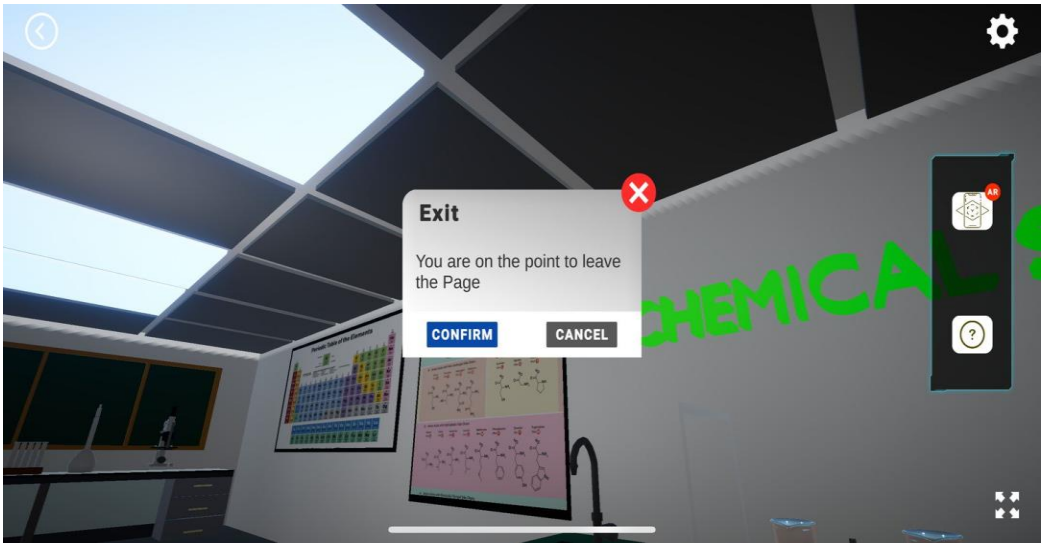


- As the lab is displayed, the user is free to move inside the lab experiencing the augmented reality. The main objective of developing the application can be fulfilled by performing the molecular experiment.

- The user can tap on the desired chemical element displayed on the screen to visualize the hybrid orbitals of that element, after pressing the “REACT” button, the user can now observe the desired molecular structure of two elements thus formed.
  User can consider experimenting with various elements to yield a different output at each turn, such a way the user can learn about other molecules.



- After performing the experiment, the user can click on the “back” icon located on top left side to quit the application by acknowledging and tapping the “CONFIRM” button on screen.



Lessons Learned:

The journey throughout this AR Chemistry Lab project has been enlightening. Developing an augmented reality application involves a combination of creativity, technical expertise, and user-centered design. The lessons learned include the importance of iterative testing, user feedback, and adapting to evolving technologies. Searching about various sources to understand and reduce errors has been critical aspect of working on this project which significantly explains the use of “learning while doing” technique.

AR Chemistry Lab User Guide:

Refer to the following link from my box folder to have full access to the User Guide.

Getting Started: This section guides users through the process of downloading, installing, and launching the Chemistry Lab AR application.

Exploring the Interface: Users are introduced to the main menu, where they can explore various tools, interfaces, and features, ensuring a smooth and enjoyable navigation experience.

Conducting Experiments: Detailed instructions on exploring a range of experiments, studying augmented reality features, and analyzing results within the application are provided.

Updates and Support: Users are advised to carefully study the user guide for proper installation and to ensure that they have the latest versions to avoid any errors during application launch.

Installation on iOS and Android: Step-by-step instructions for installing the application on iOS and Android devices, including necessary downloads and configurations, are outlined.

Interface and Guide of the Application: Detailed steps for navigating the application interface, entering AR mode, configuring the lab, and conducting experiments are provided to facilitate a seamless user experience.

Controls: The user guide highlights the simple touch interactions for navigation and scaling options, ensuring users can fully engage with the AR Chemistry Lab.

Future Enhancements and Summary:

As I conclude this report, I look towards the future of the AR Chemistry Lab. Future enhancements may include additional experiments, improved device compatibility, and collaborative features to promote group learning experiences.

In summary, the AR Chemistry Lab project has successfully brought the world of chemistry to life through augmented reality. The journey has been filled with challenges, achievements, and valuable lessons. Altogether, I shall continue to improve and expand the application remaining committed to providing users with an innovative and enjoyable platform for experiencing chemical experiments in a fun learning way.

Conclusion:

Achievements and Successes: The AR Chemistry Lab project successfully achieved its initial design goals of making chemistry learning engaging and interactive. Users can explore various chemical reactions, visualize molecular structures, and conduct experiments in a virtual laboratory setting. The application effectively combines education and entertainment, making the learning process enjoyable.

Areas for Improvement: While the overall project was a success, there are areas that could be enhanced for an even better user experience. Improvements in the responsiveness of touch interactions (optimizing for better refresh rate on touch), additional features for other experiments (more complex reactions) and expanded device compatibility could be considered in future updates.

Challenges Faced: Certain aspects of the initial design faced challenges during development. Overcoming technical limitations, optimizing performance to ensure dynamic user response and ensuring a smooth yet interactive AR experience across different devices required careful consideration and problem-solving.