

PROJECT TITLE

Virtual Reality Simulations for High Voltage Line Maintenance

Team Members

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Introduction :

Our project centers around the creation of an immersive VR environment that replicates the conditions and challenges faced by electrical workers in the field.

Through realistic simulations and interactive scenarios, trainees will have the opportunity to experience working on electrical transmission towers, all within a safe and controlled virtual space.

Related Work :

In the study by Galvan et al. (2010 and 2016) [1] , The developed training system is based on non-immersive virtual reality. The training is focused on the maintenance of high power live-lines in a distribution system. It is important for us to identify which procedures would benefit the most from an immersive experience [2]. Their main system name was ALEn3D-AT.

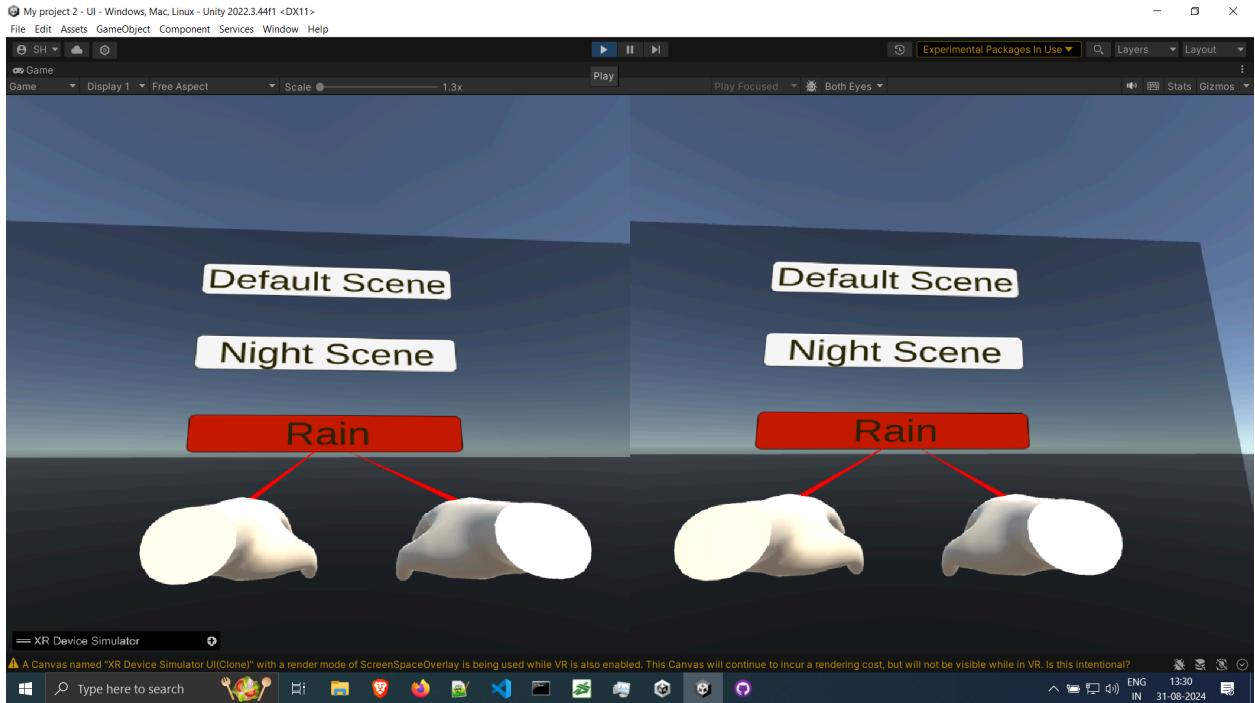
In the study by Knoke et al. (2021) researchers emphasized the importance of organizing the spatial environment for maximum efficiency, creating flexible interactions and environments, prioritizing user comfort, designing around hardware capabilities and limitations, using cues to aid user experience, and ensuring a compelling XR experience with consistent feedback [3].

Proposal :

We propose a VR training system for high voltage line maintenance that leverages the Unity engine offers a transformative approach to training, combining interactive elements and tools, dynamic physics simulation, realistic weather conditions, and effective training experience.

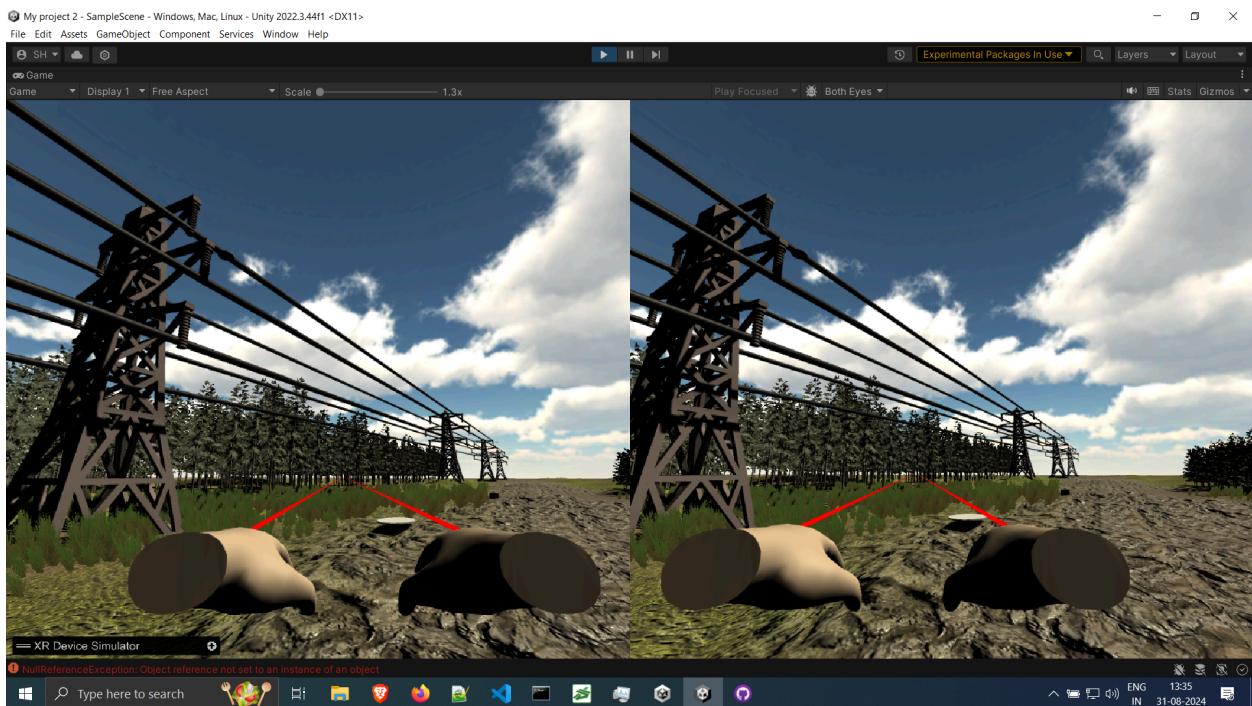
The System Model :

As we run the project we into a menu where we can choose three realistic weather conditions.

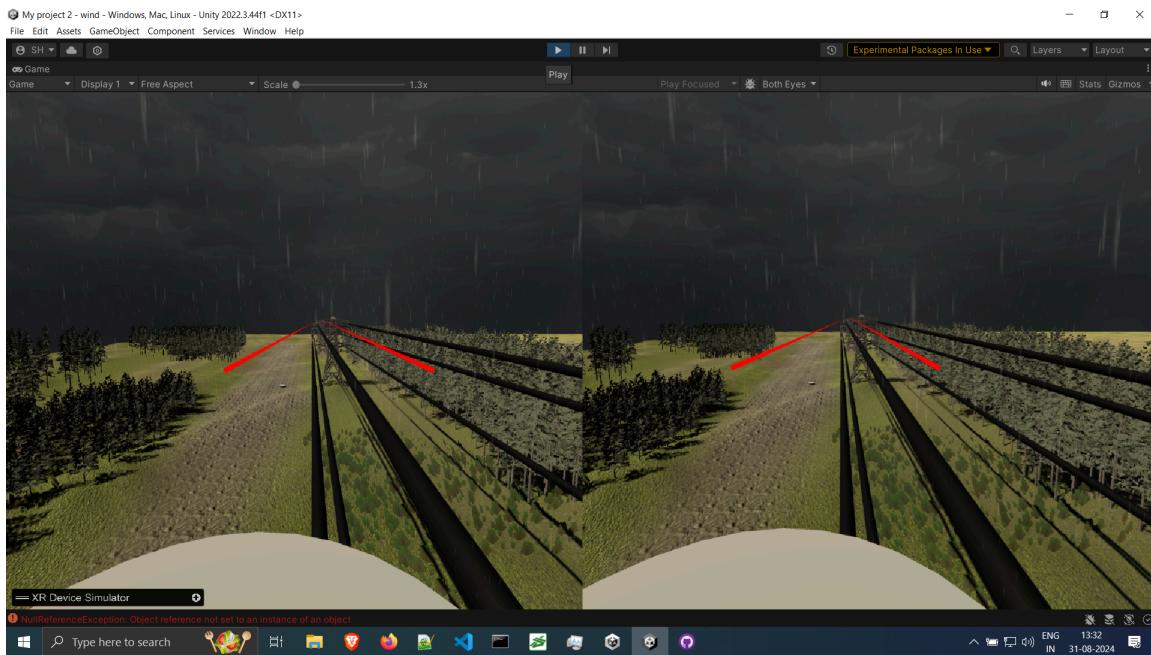
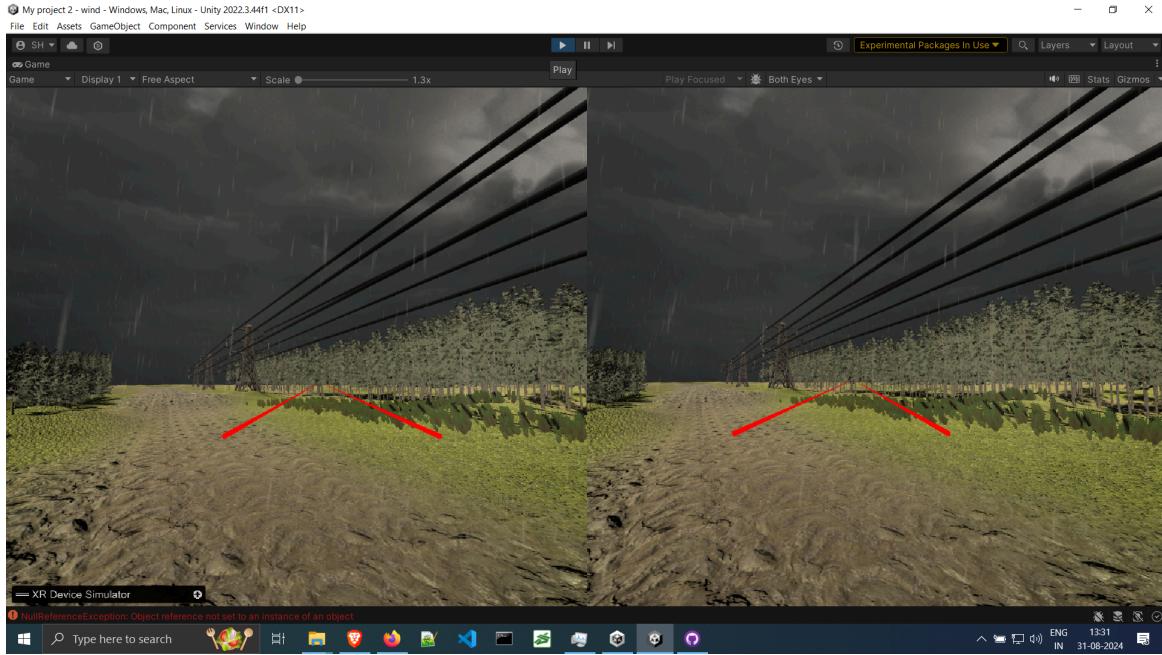


First we can go the Default scene where depiction of sunny sky has been tried to be reflected.

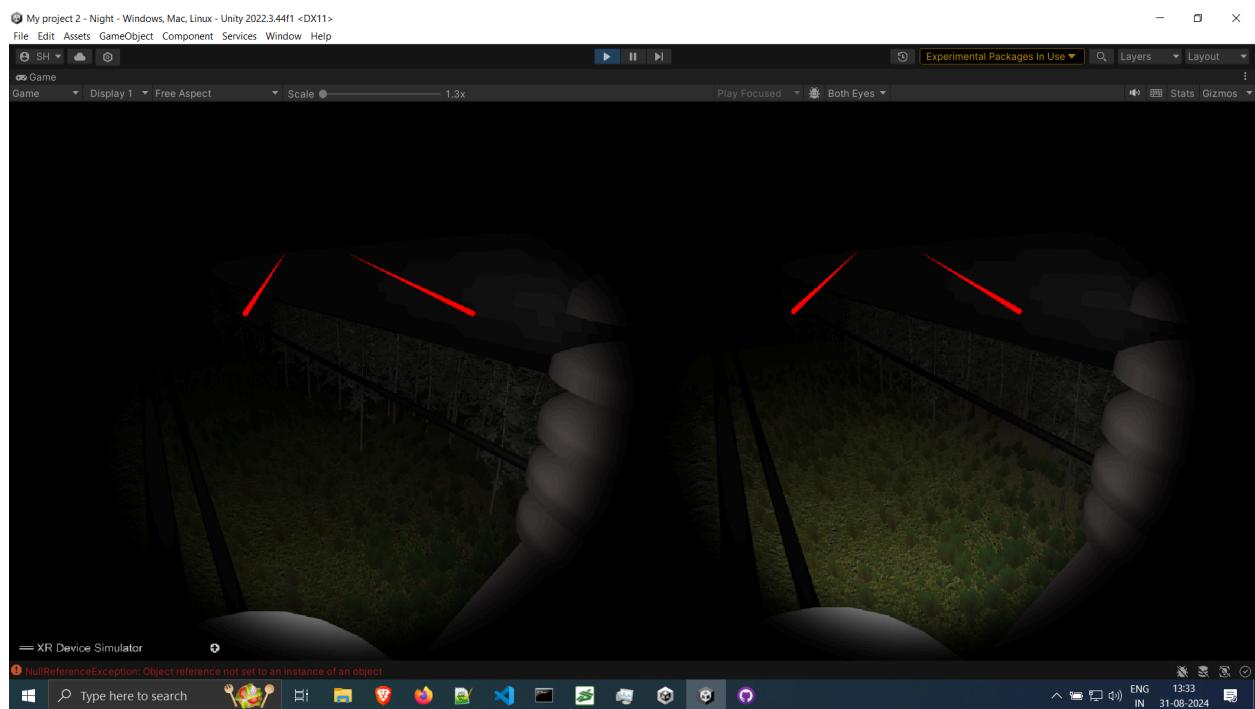
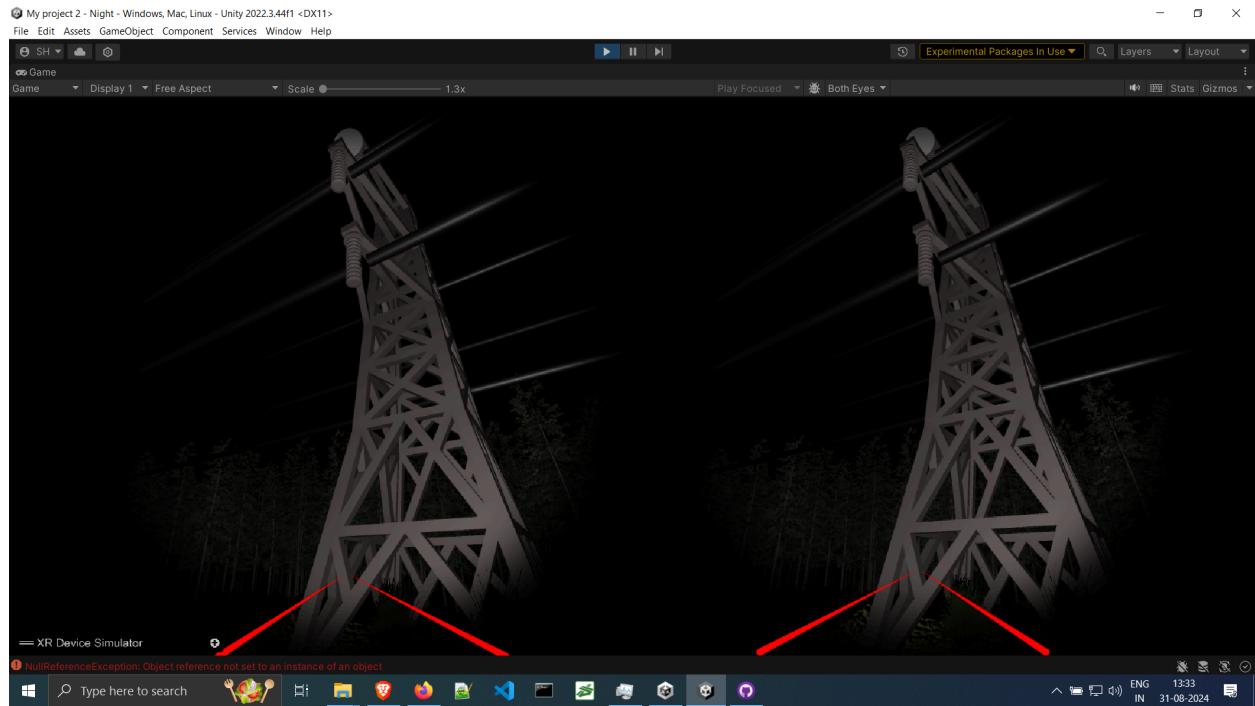
Sunny Sky



Rainy Weather



Night Sky



In our AR/VR safety training project, we've incorporated the **XR Interaction Toolkit** to enable key interactions.

The **XR Grab Interactable** script was attached to objects to make them grabbable. This allows users to interact with virtual tools and equipment by grabbing and manipulating them in the VR environment.

Teleport Anchors were implemented to allow users to move seamlessly within the VR environment. By interacting with designated teleport points, such as near or on the transmission tower, users can instantly travel to those locations. This functionality simulates tasks like ascending the tower without needing to physically climb, providing an efficient and realistic experience in the training environment.

In the project, a **particle system** was used to simulate rain in the "Rainy" weather scenario. This feature adds to the realism of the training environment by creating dynamic weather effects.

References :

[1]Israel Galvan, Andres Ayala, Javier Muñoz, Marco Salgado, Eric Rodríguez, Miguel Pérez. (2010). "Virtual Reality System For Training Of Operators Of Power Live Lines."

[2]Andre´s Ayala Garcia , Israel Galvan Bobadilla , Gustavo Arroyo Figueroa , Miguel Perez Ramrez , Javier Mun~oz Roma"Virtual reality training system for maintenance and operation of high-voltage overhead power lines.

[3]Benjamin Knoke, Moritz Quandt, Michael Freitag, Klaus-Dieter Thoben (2021)"Virtual Reality Training Applications in Industry - Towards User-friendly Design"

[4]<https://www.linkedin.com/pulse/safetizen-pioneering-electric-live-line-maintenance-power-feeder-6nfnc/>

[5]https://www.gegridsolutions.com/press/gepress/vr_for_hv_equipment_technical_training.html

[6]<https://teslasuit.io/use-cases/high-voltage-electrical-safety-training/>