

Alchem VR- Using Virtual Reality to Measure a Student's Chemistry Lab Proficiency

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What if we could fundamentally transform the lab experience? Rather than using a pencil and paper test to determine lab safety, what would it look like to immerse them into a virtual lab where they must successfully complete the lab before they can participate in the real thing...

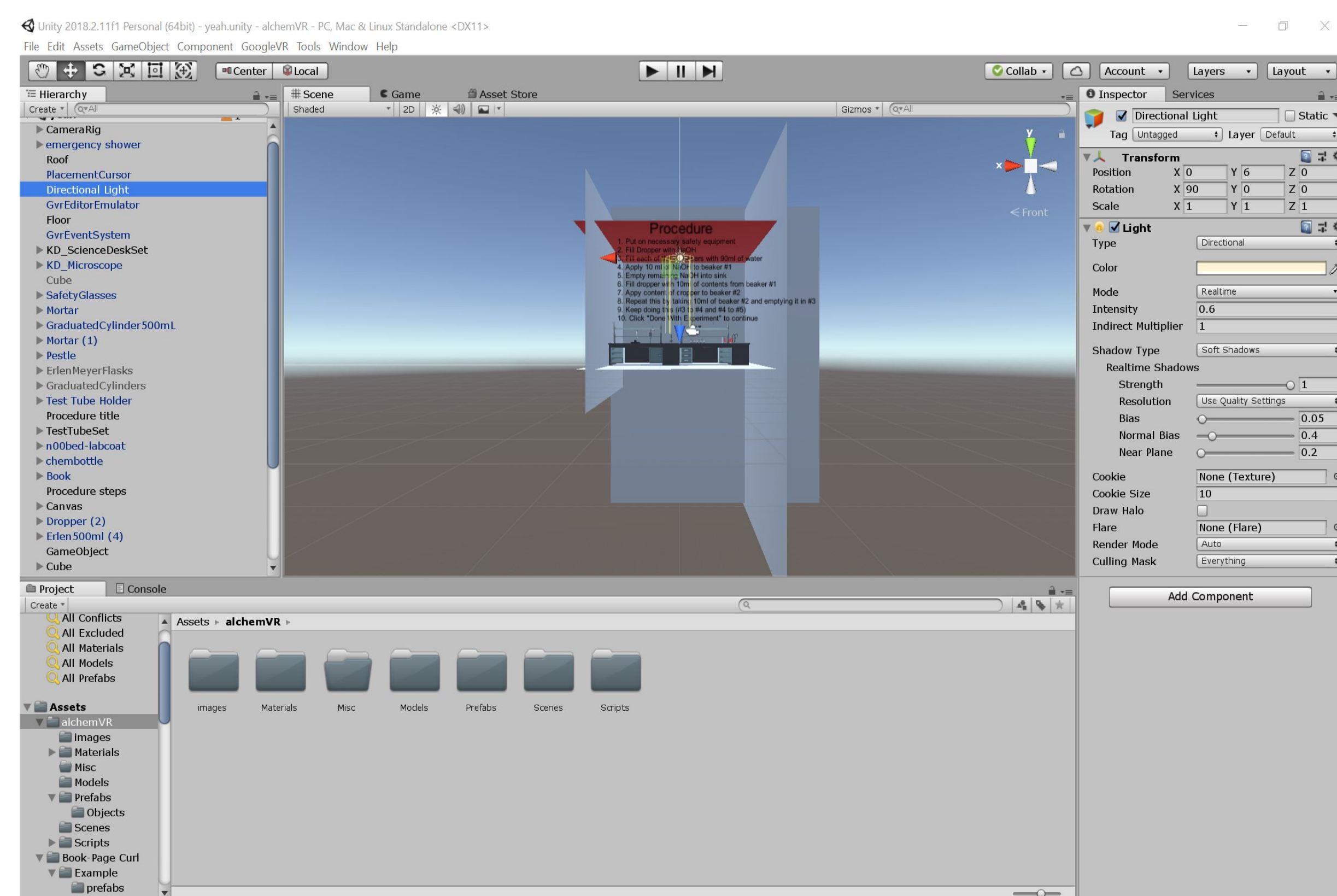


Figure 1. Unity Editor: The following shows our Unity editor, which is our typical work environment for building our simulation. This is essentially where all non-backend work was done, such as scene development, model implementation and other UI elements. This project is divided into four scenes, the main menu, the lab environment, the quiz scene, and the end screen. Most development was done in the lab environment scene.



Figure 2. Unity VR Interaction: The following figure shows the user's perspective when conducting the lab. The user can virtually pick up objects (e.g. beaker) and fill them in the sink to the right. The interactive sliders shows the user how much volume is in the beaker, while following along with a list of instructions.

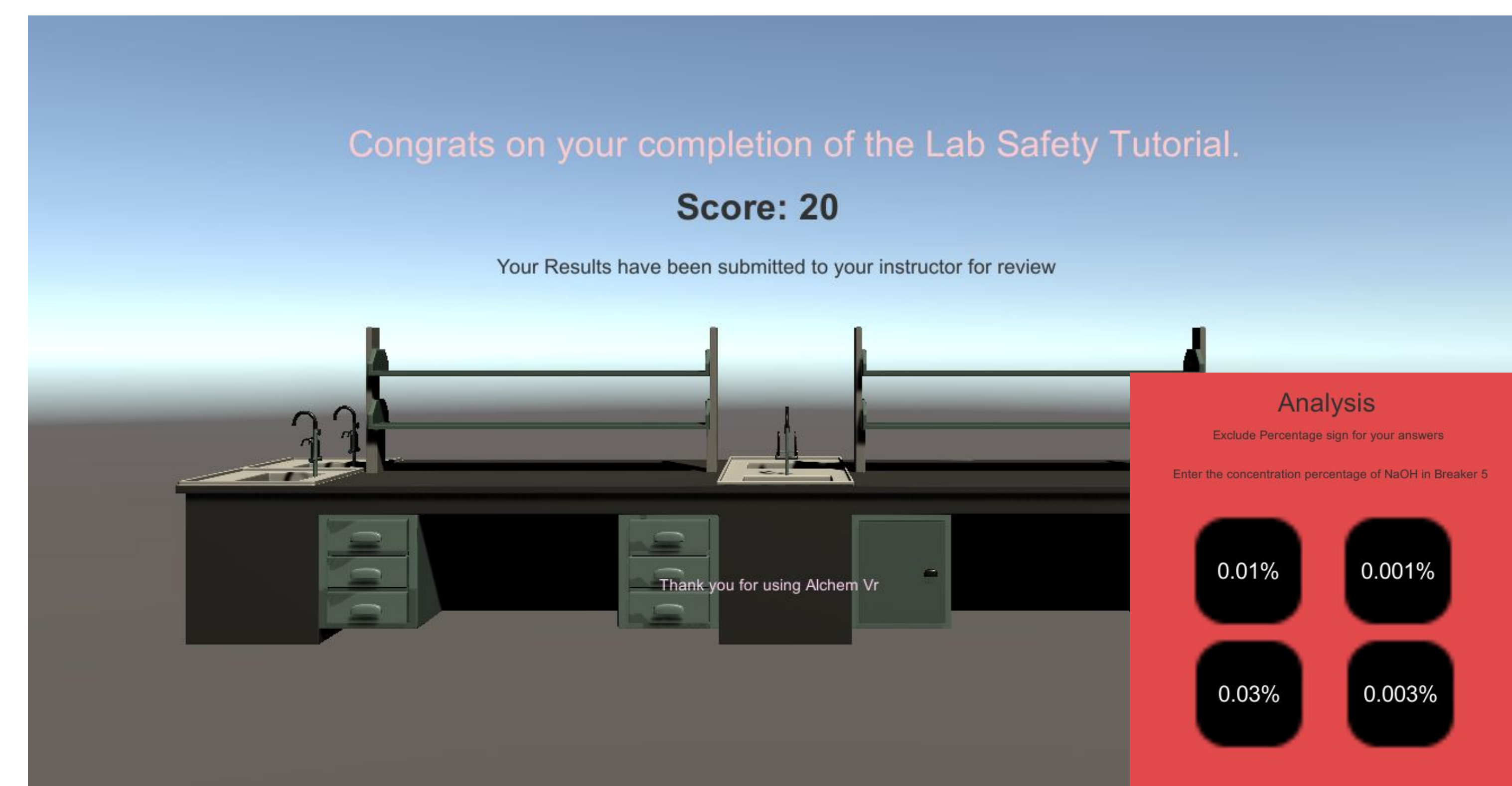


Figure 3. Results: At the end of the simulation and lab experience, users are prompted with an analysis question to help dictate their scoring and understanding of the lab. Scores are provided at the end based on performance in lab safety, lab execution and the analysis question. This scoring system can help teachers gain an understanding of a students ability to safely and effectively conduct a lab.

Why

- According to various studies, students are multi-modal learners, meaning that they like to learn using more than one learning style (Jurenka et al., 2018).
- AlChem VR allows students to learn with a visual and kinesthetic style, while the instructor can provide the auditory style, while a pen and paper test would only have the auditory style.
- An actual lab is a more real world test that can more accurately asses students than a pen and paper test

Target Audience

- Developed for Android to be used in Google Cardboard because of the low cost compared to that off most other Virtual Reality Headsets.
- Our target demographic is high school chemistry students; chemistry labs and lab safety are in the general standards across the United States.

Technology & Resources

- We gathered objects from a variety of different free asset websites as well as purchase a couple as well.
- We implemented these objects by using C# in Visual Studio.
- We utilized Blender to make some of our own 3D models as well.

What We Learned

- Unity: Unity collab, 3d environments, 3d modeling
- Other technical skills, such as a better understanding of C#, Blender modeling software
- A greater understanding of how to develop software as a team, setting timely and reachable goals for each member
- One of the challenging parts of this project was to make liquid physics functional.

Future Directions

- Unity project including scripts is available at this [github repository](#). Feel free to make a pull request and further advance AlChem-VR
- AlChem VR will be available to download on your android device from the GooglePlay store.

Citation

Jurenka R, Starecek A, Vranakova N, Caganova D. The Learning Styles of the Generation Group Z and Their Influence on Learning Results in the Learning Process. 2018 16th International Conference on Emerging eLearning Technologies and Applications (ICETA). 2018.
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