

# Review of existing lighting laboratories for education in virtual environment. Could a lighting virtual laboratory develop?

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## Abstract

In the situation of a global pandemic, it turns out that distance virtual learning is the only way out for continuing education of students. In this regard, the application of virtual resources to perform exercises related to lighting technology is a very important task.

The report presents review of existing virtual lighting laboratories for education.

The purpose of the research is to acquaint the audience with the learning opportunities with the so-called virtual laboratories, which will be more than necessary given the latest world trends.

An extensive search for information has been made, which is the result of several months of work. The study provides an overview of various options for the implementation of the required product, including both ready-made systems and proprietary/copyright applications.

There are made appropriate conclusions from the study.

**Index Terms:** lighting virtual laboratory, e-learning, education, system engineering software.

## 1 Introduction

Nowadays it is very fashionable to conduct trainings remotely. The use of modern technologies and approaches is extremely important for the handling and elimination of a specific doubt or problem. The most popular thing in recent days is e-learning.



The purpose of the work is to find a suitable product or application that can simulate the activity of a lighting laboratory under an online environment. Possibilities for creating own system with one of the ready-made tools for electrical measurements or a fully implemented product written for example in JavaScript or HTML5 will also be considered.

## 2 Exposition

For the purposes of the present study, a comprehensive search was conducted in the online space for a suitable product or application to conduct training related to lighting technology in the so-called virtual environment.

### 2.1 Existing virtual lighting laboratories

From the few and as limited as possibilities existing virtual lighting laboratories, we can focus on the following products:

#### 2.1.1 Virtual Light Lab from West Side Systems

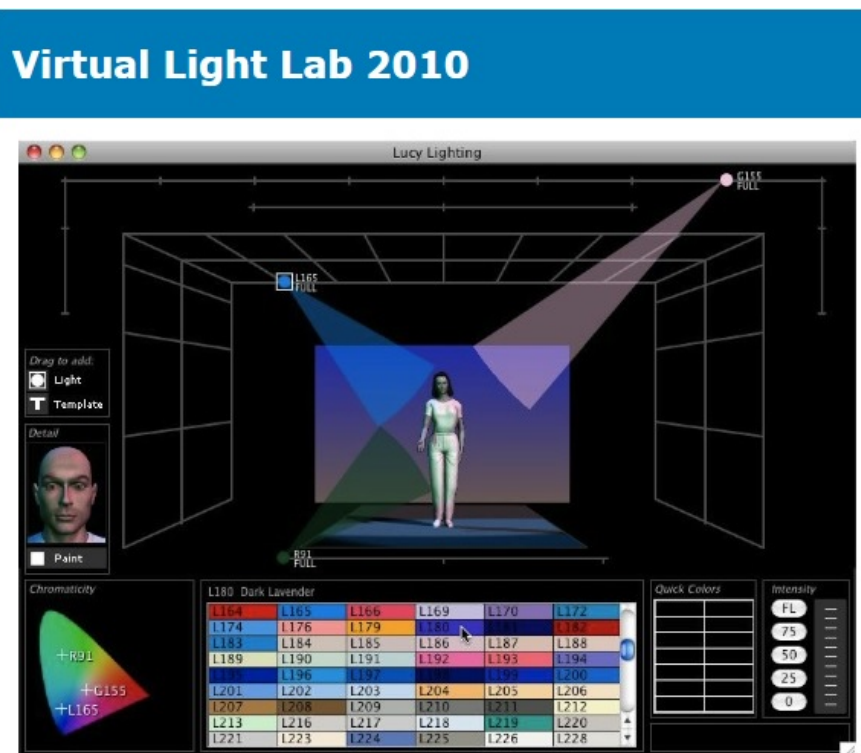


Figure 1. Virtual Light Lab 2010

This software that developed by West Side Systems allows lighting teachers/students to experiments with light, shadow, color composition, and cue timing in a simulated lighting studio [1].

### 2.1.2 LightLab



Figure 2. LightLab

An online training site designed primarily for theatre and theatre education. Here we have options for change a cyclorama, sidelight, toplight, footlight and etc. [2].

### 2.1.3 Bending light

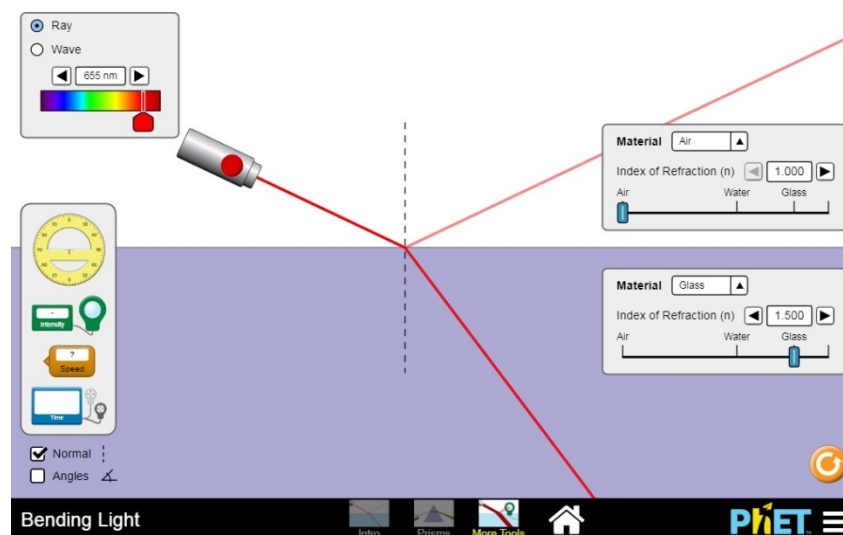


Figure 3. Bending Light

Bending light product is developed by University of Colorado Boulder. The application is created in HTML5 and JavaScript in order to train and explain how light bends at the interface between two media and what determines the angle and how a prism creates a rainbow [3], [5].

## 2.2 Creating a virtual lighting laboratories

To create a virtual laboratory we need a special tool/product or we need to create one using one of the existing programming languages with which we can perform the necessary measurements.

### 2.2.1 Virtual lighting laboratory with existing ready-made tools

National Instruments represent to us Laboratory Virtual Instrument Engineering Workbench (LabVIEW). LabVIEW is a system-design platform and development environment for a visual programming language [4].

LabVIEW is systems engineering software for applications that require test, measurement, and control with rapid access to hardware and data insights.

### 2.2.2 Proprietary/copyright virtual lighting laboratory application

Given the changing circumstances on a global scale in a pandemic environment, a system created in HTML5 and / or JavaScript would be very useful for explanation and training in an online environment.

HTML5 is a markup language used for structuring and presenting content on the World Wide Web.

JavaScript is high-level, often just-in-time compiled, and multi-paradigm [5].

After a thorough search, we can observe the following:

- The created platforms for e-learning in the field of lighting are not many and are strictly specialized for solving a specific case.
- Some of the programs need to be installed, others are not designed for all existing platforms and therefore can not be started.
- The existence of such virtual laboratories for online learning would lead to much larger research. This is because we can avoid problems such as product dimensions, speed when changing a variable in the type of measurement.

### 3 Conclusion

1. Ready-mades tools, programs or applications make it easier for us by giving us the opportunity to build a model on the basis of which the measurements will be performed.
2. LabVIEW is a comercial development. For this reason it is mainly used by scientific institutions.
3. The use of any of the programming languages such as HTML5 and / or JavaScript gives us the freedom with which we can create the product we need.
4. Given the geopolitical state of the earth, science and humanity urgently need to create products such as virtual laboratories to train future generations. For this purpose, it would be enough for them to have a computer, laptop, tablet, phone, etc. and internet connection

### 4 References

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- [3] University of Colorado Boulder, <https://www.colorado.edu/>
- [4] <https://www.ni.com/>
- [5] <https://en.wikipedia.org/>