VR Lab for Enhanced Learning in Lower-Level Electrical and Computer Engineering (ECE) Courses
(Physical Design)

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Activity Report

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1 AMENDED SOLUTION

Slight modifications have been made since the previously documented design document. The most significant change was the addition of a back-end spice model that would communicate with our virtual electrical components allowing the ability to add more functionality to our design.

2 PHYSICAL DESIGN

2.1 System Architecture

A workflow block diagram for visualization is shown in Figure 1.

2.2 System Components or Subsystems

All components and subsystems are listed out and given a brief description.

2.2.1 VR Headset

Meta Quest 2 - Budget friendly hardware option. Used to test and run the VR environment.

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2.2.2 Development Environment

Unreal Engine 5 - Powerful and well documented game development engine. Used to develop and construct the development environment.

2.2.3 Software Development

C++ - Primary coding language for the Unreal Engine 5. Used to design classes, functions, and variables for electrical components. Also used to connect to a spice model for more functionality in the environment.

2.2.4 Component Design

Autodesk Fusion 360 - Powerful CAD software. Used to mainly design the electrical components.

2.3 Engineering Standards

The main engineering standards we will implement into our design will follow Epic C++ Coding Standards.

2.3.1 Class Organization

Classes should be organized with the reader in mind rather than the writer. Since most readers will be using the public interface of the class, that should be declared first, followed by the class's private implementation.
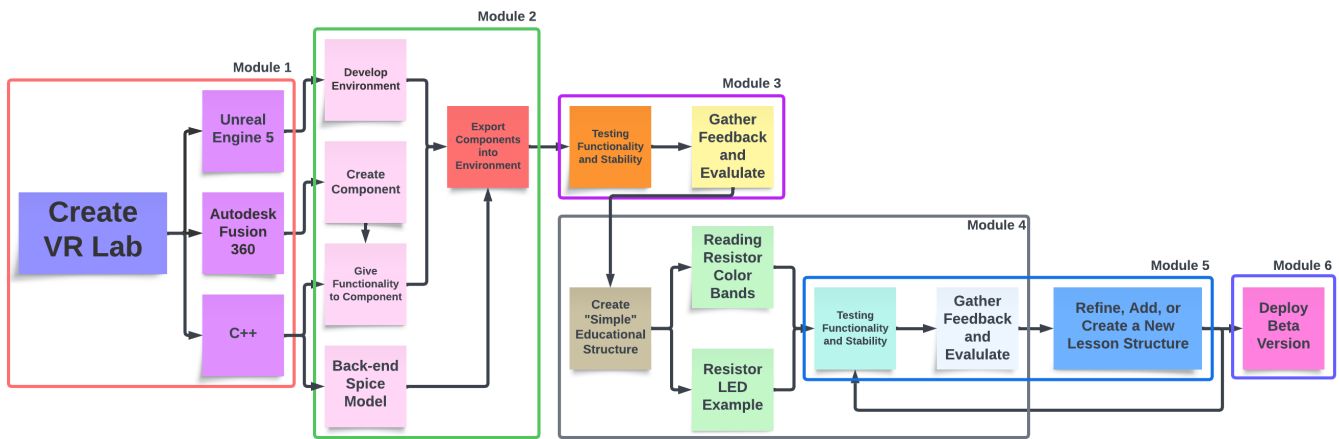
Figure 1. Workflow block diagram

2.3.2 Copyright Notice

Any source file (.h, .cpp, .xaml, etc.) provided by Epic for distribution must contain a copyright notice as the first line in the file. The format of the notice must exactly match that shown below: // Copyright Epic Games, Inc. All Rights Reserved. If this line is missing or not formatted properly, CIS will generate an error and fail.

2.3.3 Naming Conventions

All code and comments should use U.S. English spelling and grammar. The first letter of each word in a name (such as type name or variable name) is capitalized, and there is usually no underscore between words. Variable, method, and class names should be clear, unambiguous, and descriptive. The greater the scope of the name, the greater the importance of a good, descriptive name. Avoid over-abbreviation.

2.3.4 Inclusive Word Choice

When you work in the Unreal Engine codebase, strive at all times to be respectful, inclusive, and professional in your use of language.

2.3.5 Use of standard libraries

When there is a choice between a standard library feature instead of [Epic's], prefer the option which gives superior results, but bear in mind that consistency is also valued highly.

2.3.6 Comments

Comments are communication and communication is vital. Follow standard comments guideline that are generally acceptable.

2.3.7 Formatting

Epic uses a system based on JavaDoc to automatically extract comments from the code and build documentation, so there are some specific comment formatting rules that need to be followed. Provide comments for classes, methods, and variables. Remember that comments should augment the code. The code documents the implementation, and the comments document the intent. Make sure to update comments when you change the intent of a piece of code.

3 BUDGET

Figure 2 lists the main hardware and software recommended to replicate our project so far. The Meta Quest 2 is an affordable and widely supported hardware. The link cable is recommended but there may be other options to connect the VR headset with the development environment. The Autodesk Fusion 360 application is recommended as a free education plan is offered to students. The Unreal Engine 5 application is recommended as it provides an abundance of tools for VR development and is well documented.

Items	Price (MSRP)	Date	Description	Links
Meta Quest 2 (128GB)	299.99	11/8/2023	XR Device	https://www.meta.com/quest/products/quest-2/
Link Cable	79.99	11/8/2023	Connects to PC	https://www.meta.com/quest/accessories/link-cable/
Autodesk Fusion 360		11/8/2023	Create Models	https://www.autodesk.com/products/fusion-360/personal
Unreal Engine 5		11/8/2023	Dev Environment	https://www.unrealengine.com/en-US/unreal-engine-5

Figure 2. Bill of Materials