SDMAY19-44 Circuit Drawing Website

Client: Professor Bolstad

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The Problem:

Our client, Dr. Andrew Bolstad, needs a tool to create visually-appealing circuit diagrams for use in his classes. Popular circuit drawing tools tend to be expensive, process intensive, and do not create diagrams that are presentable.

The Solution:

The team must create a circuit drawing tool that addresses the problems existing circuit drawing tools have. Therefore it must be free, easy-to-use, and create visually appealing circuits. This will be accomplished by developing a website through a combination of open-source libraries.
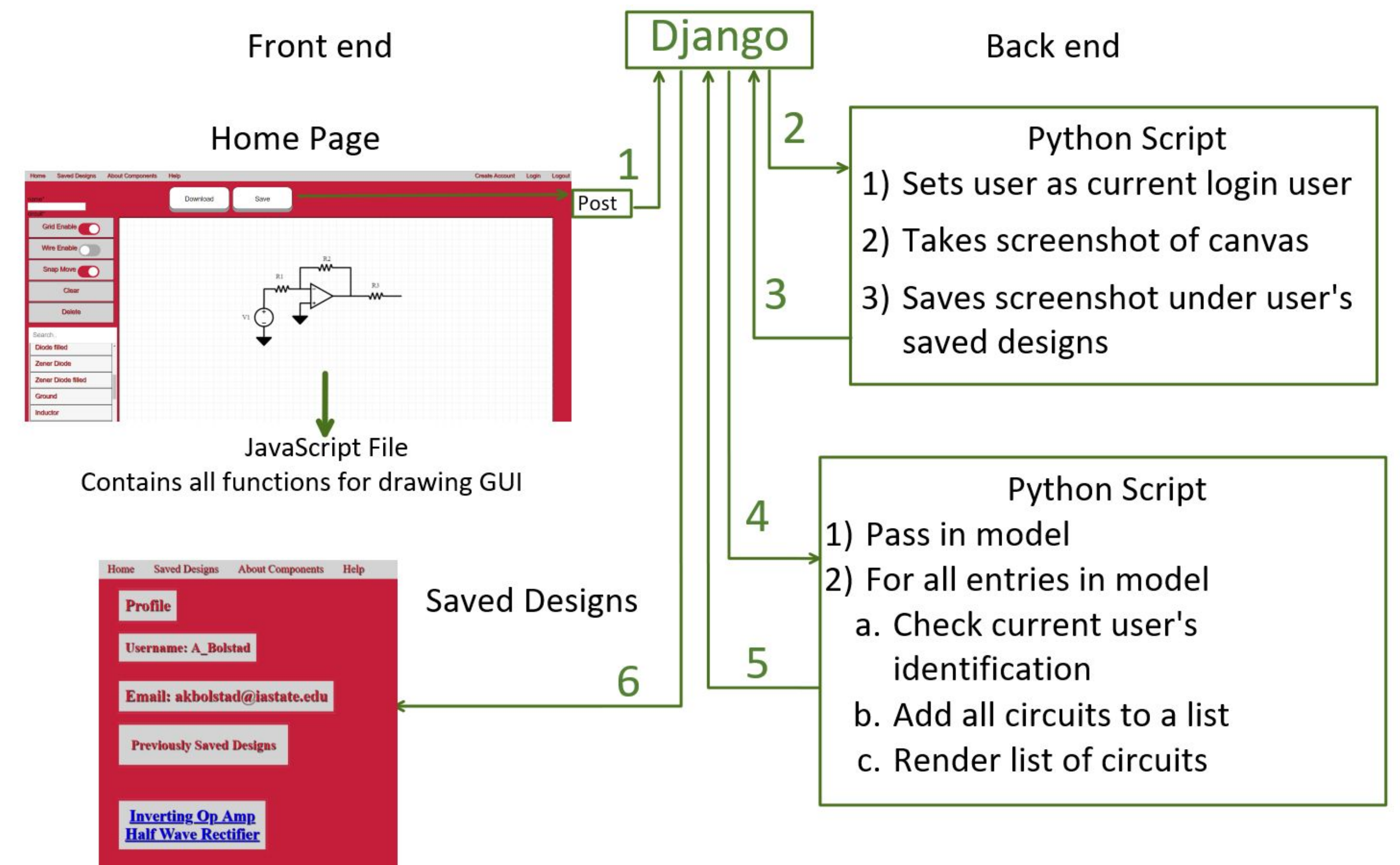
Functional Requirements:

- Allow for users to place components, each with a value and name, into a drawspace and connect components with wires
- Give users the ability to save created circuits for use later, which will require the implementation of user accounts
- Allow user to generate a png file containing an image of the created schematic and have it downloaded to a user's machine for integration with other documents

Non-Functional Requirements:

- The website design must be appealing to our client
- The circuits produced must be bold, clear, and meet the expectations of our client
- The website must adhere to standard oauth security protocols, proper networking protocols, and be accessible on the Iowa State Domain
- The website must prevent malicious content from being uploaded

System Interface

Django Framework

- Website Layout - HTML/CSS
- User Authentication & Circuit Saving - Python
- Frontend Drawing GUI - JavaScript

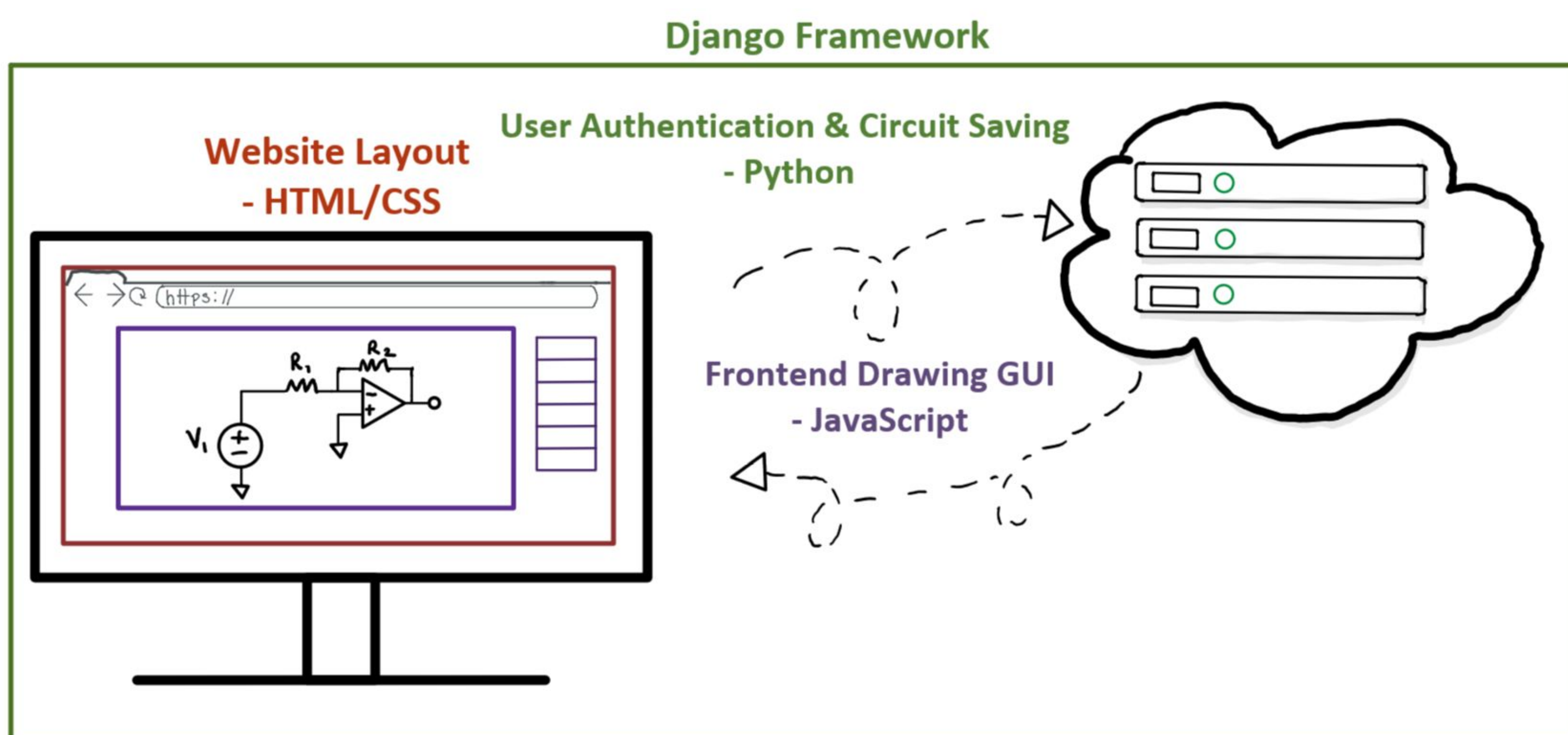## System Implementation & Design:

Backend Management

- User based features managed server side
  - User Authentication with managed sessions implemented to store saved designs
  - Backend manages all url routing and rendering of html
  - Backend controls serving of static files as well as all interactions with the database
- Implemented using the Django Framework
  - Forms and models are used to create database tables in the SQL database
  - Views are used to create backend processing in python
- Third party django module "crispy forms" used to integrate DOM features into django forms

Drawing Tool

- The drawing tool utilizes the fabric.js drawing library
  - Fabric.js is an HTML5 canvas library that allows the use of a canvas element to become an interactive element
- This library allows for the placement of objects into a defined canvas
  - From there these objects can be moved, resized, and rotated within the space
  - The wiring tool uses the built-in line object and places this line depending on the mouse's location on a mouse click. This line will snap to a nearby grid node to help make for cleaner circuits.

Applicable Standards & Best Practices:

- IEEE Recommended Practice for Software Requirements Specifications
  - Used to help accurately describe clients needs and wants and means to obtaining those
- W3C Web and Applications Design Standards (HTML,CSS)
  - Used to help recognize basic website application standards and practical uses in the design process

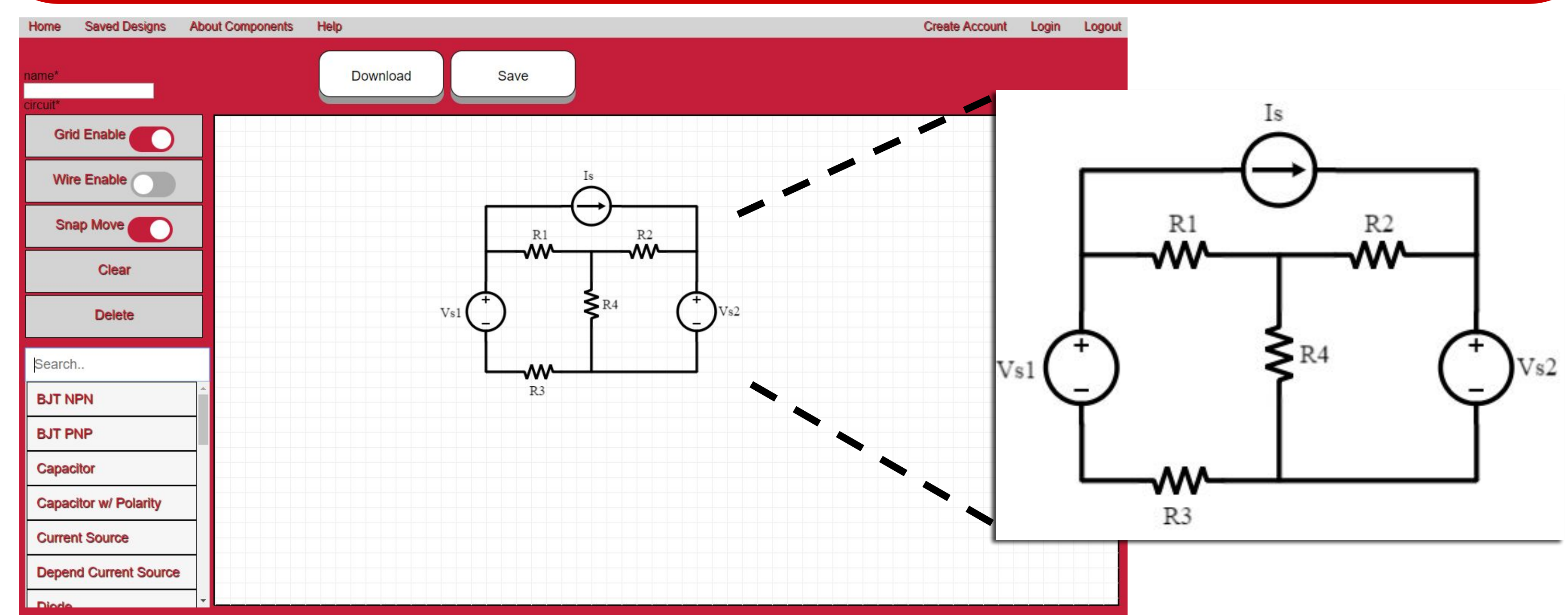## Testing & Evaluation:

Drawing Space:

- Select any component within the component list, rotate the component, change the name of the component, and delete the component
- Draw wires that connect to the components within the drawing space
- Download an image of a circuit drawn on the drawing space without creating the account

User Accounts:

- Create a user account, login to a user account, and logout from a user account
- Save an image of a circuit drawn on the drawing space to a user's account

Visual Graphics:

- The website should be organized and appealing for easy use

Moving Forward:

We have accomplished a lot as a group. Several challenges were overcome such as learning many new coding languages and website design for the first time for some of us. Overall, we believe this project to be a success for us. For the next steps of this project, many things could be added on top of what we have already created. A few of those things could be: hotkeys, more educational value, simulation, etc. Simulation of the circuit drawing website could take this project to the next level of use for the faculty and students here at Iowa State.