

CS CAPSTONE DESIGN DOCUMENT

MARCH 17, 2020

ONLINE CASE DESIGNER

PREPARED BY

GROUP 35

BOXEUR

YUXIAO HUANG

PENG ZHANG

EVAN HOPPER-MOORE

YU CHUAN TEY

DRAKE EVANS

Abstract

This document describes the various techniques, tools and technologies that we have selected to build the online case designer, Boxeur. The technologies described cover the creation of the web app, front end and back end, and the visualization of the case's 3D model. Because this project is not necessarily large in nature, we have placed value in finding lightweight solutions that still offer robust technology to support the core features of Boxeur.

CONTENTS

1	Overview	2
1.1	Purpose	2
1.2	Scope	2
2	Website	2
2.1	Technology Implemented	2
2.1.1	InVision	2
2.1.2	Sketch	2
2.1.3	LESS	2
2.1.4	React	3
2.2	User Use-Case Chart	4
2.3	Admin Use-Case Chart	5
2.4	Development Gantt Chart	5
3	3D Graphics	6
3.1	Technology implemented	6
3.1.1	WebGL and 3D Model Interaction	6
4	Back End Design	6
4.1	Technology Implemented	6
4.1.1	Node.js	6
4.1.2	MySQL	6
4.1.3	REST API	7

1 OVERVIEW

1.1 Purpose

The purpose of this document is to outline the technologies that will be implemented to achieve the core functionalities of Boxeur.

1.2 Scope

This document covers the technologies behind the front end, back end and 3D visualization of the web app. Each technology choice has an explanation of what it does for our application and how it will be used.

2 WEBSITE

As our project at its core is a design tool, designing a responsive and easy to use interface is crucial for our project. Also because of this, there most likely won't be a large amount of pages on the site, so we prioritized light weight design in selecting the chosen technologies.

2.1 Technology Implemented

2.1.1 *InVision*

Simply put, InVision is a comprehensive UI design software that supports designing user interfaces for mobile applications and other similar interactive products. Prototyping is a key stage in the design process when creating a user interface for a web site. According to the survey, prototyping is the stage where testing can save time, effort and money. The advantage of the InVision tool is that it is very easy to apply to a prototype because uploading still images of the screen is not time-consuming and prototyping with them. Besides, InVision has good navigation and is very friendly to different types of users.

2.1.2 *Sketch*

Sketch is a vector graphics editor most commonly used for designing web user interfaces. Sketch's powerful and vibrant community conditions drive a lot of tracking. As a result, the software is constantly updated, plug-ins are added, and most of the content is free. Most users feel that Sketch has a short learning time. In other words, this software is very easy for users to experience the convenience of using this software. Sketch is designed specifically for UI designers, which simplifies the work of designers, shortens the process and saves valuable time. The symbols and preset templates of this software are very creative, and the design experience brought to users is different from other software. The highlight of this software is its resizing function, which can control the stretching, fixing, changing the size and buoyancy of elements. Plugins, which are updated every day, constantly provide designers with fresh concepts, so that designers can always get different creative ideas.

2.1.3 *LESS*

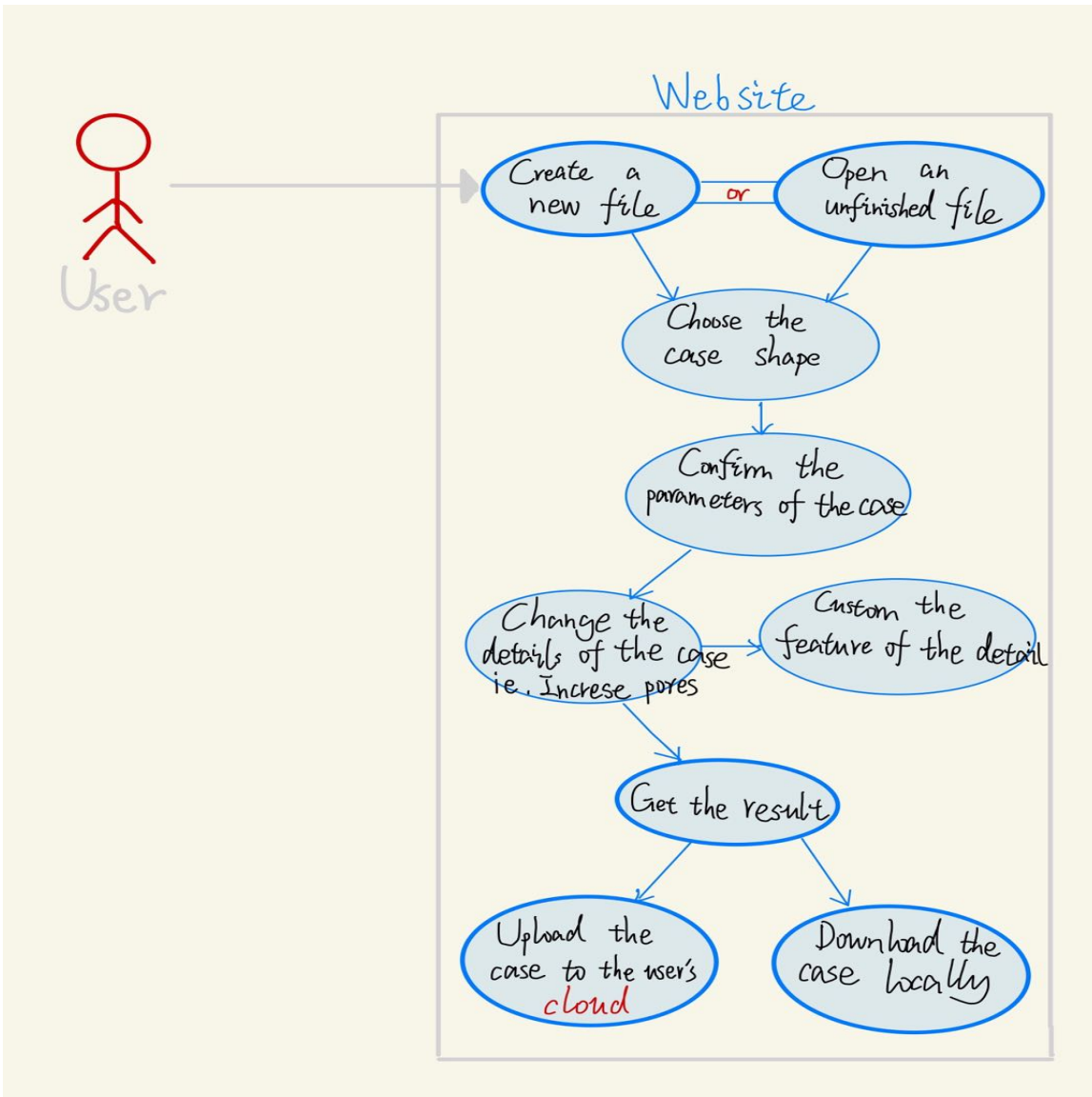
Leaner Style Sheets (LESS) is a backwards compatible language extension for CSS. LESS improves on CSS mainly by adding the capability for nesting. Nesting leads to cleaner and easy to read code as the more standard curly-brace blocks are made possible. LESS also adds the capability for variables, functions, mixins and importing other `.less` files. Variables make it easier to maintain a website, for example a color used for buttons across the site could be changed in

one line without having to search and replace in multiple files. Mixins provide similar functionality but with chunks of code, making it faster to write code that instead would have to be copied in multiple places. Mixins could be especially useful with browser specific properties (ie `-moz-*` and `-webkit-*`). LESS files are compiled into CSS either at run time on the browser using JavaScript or using a Node.js command line tool.

2.1.4 React

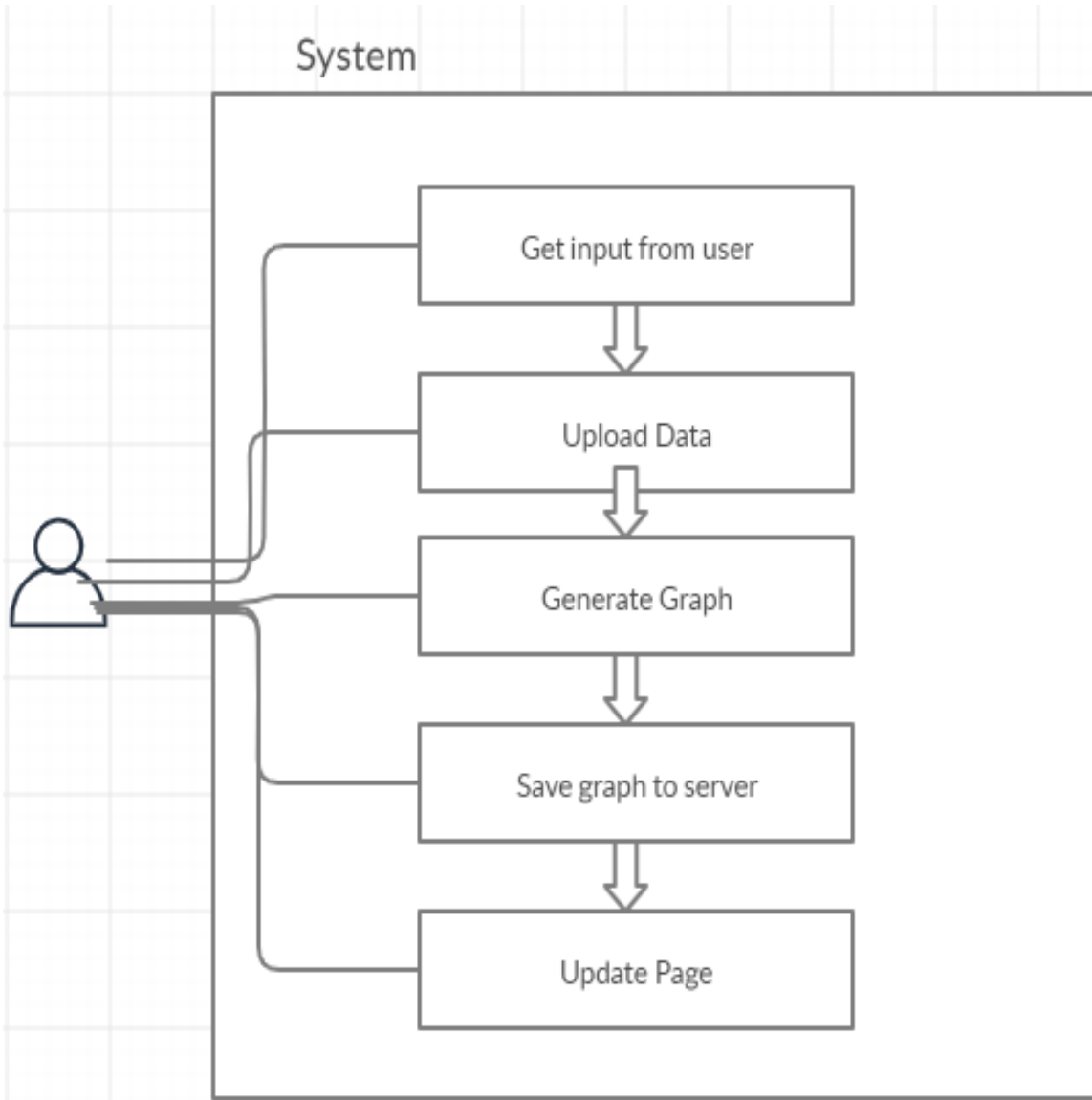
React is a very popular open source front-end framework, which is mainly used for web application development and provides developers with a very simple and fast solution. The basic syntax for React is JSX, which allows developers to mix JavaScript and HTML code in React code. Finally, React will convert JSX to JavaScript to run the code and display on the page. In addition, React improves the overall development efficiency by introducing Virtual DOM to solve complex DOM operations. For the development of WEB applications, React is a very good choice, which will bring more benefits to our development team.

2.2 User Use-Case Chart



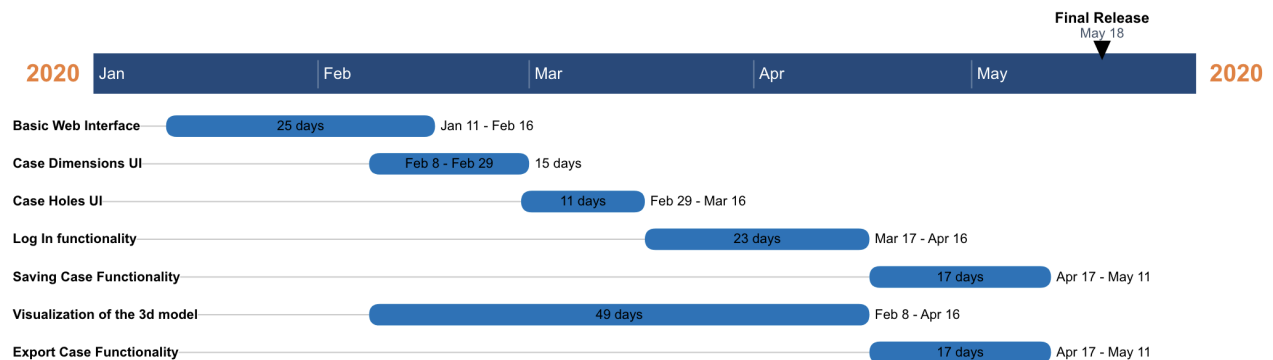
User use case chart. This shows that the operation that users can do. Users can create a enclosures by using this tool.

2.3 Admin Use-Case Chart



Admin use case chart. This shows that the process that the system does.

2.4 Development Gantt Chart



3 3D GRAPHICS

One of the core functionalities of the Boxeur app is presenting the three dimensional model of the case, updating as the user changes the specifications. The technology chosen must be able to be changed at run time and preferably will interface well with web languages.

3.1 Technology implemented

3.1.1 WebGL and 3D Model Interaction

The method that we will use to implement an interactive 3D model into the webpage will be WebGL, a javascript implementation of OpenGL. With the toolkit provided by WebGL, we will be able to implement an interactive model that the user will be able to change according to the specifications they give on the first page of the application. The next page of the document will be more interactive, allowing the user to choose a shape for a hole to add the case and the size of the hole. They will then get to choose where on the case the hole will go by interacting with the model itself. As the user moves the mouse around the model, ruler lines will follow the mouse. To move the model, the user will right-click the model and drag the mouse. Clicking will place the hole where the user currently has the mouse. The shape for the hole will have the mouse at its center. The user will also have the option to turn on or off snap measurements, where the shape will snap to specific common measurements (center, edge, or other simple lines of measurements) or to the measurements of previously placed shapes on the case. Once the user has placed a shape, they will have the option to place more. Holes may overlap if the user chooses to get more complex shapes than the ones provided. If templates are implemented, then the user will also be able to choose saved templates and pre-made templates.

4 BACK END DESIGN

The web application must have the functionality to restore previous sessions which will be implemented through a system of logins and storing user data. We will design the architecture for the database in our back end language, Node.js. These technologies will help us design this architecture well and implement it easily.

4.1 Technology Implemented

4.1.1 Node.js

Node.js is a JavaScript runtime for building scalable network applications. Node.js functions similar to a web server and lets developers define exactly how files are served, making it as lightweight as we define it to be. Node.js uses an event-driven model and focuses on controlling processes through callbacks in JavaScript. To handle connections, Node uses events to spawn new processes for connections and follows the defined instructions for serving files, making a simple one-file server possible.

4.1.2 MySQL

The data can be stored and processed using Oregon State University's server storage, and using Mysql in conjunction with HTML, JavaScript to read and call data. Files can be stored and called in CSV format and allow users to manipulate and use the les. For example, users can upload data, download data, and delete data on the website. These operations need to call Mysql, get from the database, and store the data. We will connect the HTML to Mysql so that the user can directly retrieve the target le. In addition, this allows each user to sign up as a member and view recently available les for easier and faster design.

4.1.3 *REST API*

The Representational State Transfer (REST) API is an architectural style that defines how data is sent and the interaction between the server-side and the client-side. A RESTful design for an API is based on using Uniform Resource Identifiers (URI) and the JSON data type to efficiently transfer data. JSON is a highly browser compatible data type which can be interpreted easily by JavaScript. REST APIs focus on simplicity by using the standard HTTP protocols and keeping the interaction stateless, meaning all of the information required to get or send data is included in the request. REST API defines other principles such as having cacheable data and a hierarchical structure which can increase speed and security, respectively. Using REST API as a guideline to designing our architecture in Node.js will lead to a clean and scalable application.