

S E 4 9 1

Jack-o-Lantern Tracker Spirits in the Gardens

<http://sddec23-01.sd.ece.iastate.edu>

Client: Nathan Brockman - Director of Entomology

Advisor: Judith Islam - Assistant Teaching Professor

Introductions

Kyle Goben - Team Lead and Client Interaction

Kiara Sta. Maria - Individual Component Design

Phuoc (Johnny) Nguyen - Documentation Lead

Omar Muhammetkulyyev - Testing Lead

What is Spirits in the Gardens?

Halloween!

- Family Friendly
- 1000+ Unique Pumpkins
- Candy
- Costumes
- FUN!!



Event Preparation

Time Consuming

- Lots of Data Entry
- Organizational Nightmare
- 1500+ Stencil Entries



2022.PumpkinSpreadsheet.Count without duplicates-D73P3PD2 - Saved

File Home Insert Draw Page Layout Formulas Data Review View Automate Help

Calibri (Body) 11 B

SLOW WORKBOOK? 91% of your workbook has unused formatting and metadata that can be optimized to improve performance. Check Performance

| | A | B | C | D | E | F | G | H |
|-----|-----------------------------|-------------------------|-----------------|-----|-----|-----|--------|---|
| 160 | 21-136 | Skeleton Hands Heart 03 | Stoneykins | 1 | 1 | 1 | 1 | |
| 161 | 21-137 | Two Face Skull | Stoneykins | 1 | 1 | 1 | 1 | |
| 162 | 21-138 | Cute Pumpkin Face | Stoneykins | 1 | 1 | 1 | 1 | |
| 163 | 21-139 | Hallo Face | Stoneykins | 1 | 1 | 1 | 1 | |
| 164 | 21-140 | Cheerleader Costume | hand created | 1 | | | | |
| 165 | 21-141 | Candy Collection | hand created | 1 | | | | |
| 166 | 21-142 | Vintage Witch Mask | ZP | 1 | 1 | 1 | 1 | |
| 167 | 21-143 | Boone | ZP | | 1 | 1 | 1 | |
| 168 | 21-144 | Gloom and Broom | ZP | | 1 | 2 | 2 | |
| 169 | 21-145 | Vintage Devil Mask | ZP | | 1 | 1 | 1 | |
| 170 | 21-146 | Scarecrow | | | | | | |
| 171 | 21-147 | Ghost BOO! | | | | | | |
| 172 | 21-148 | Smiling Alien | | | | | | |
| 173 | 21-149 | Fiery Ghost | RealSimple.com | | | | | |
| 174 | 21-150 | X Pumpkin Face | Muse Printables | | | | | |
| 175 | 21-151 | Devious Pumpkin | | | | | | |
| 176 | 21-152 | Slobbering Pumpkin | | | | | | |
| 177 | | | | | | | | |
| 178 | | | | | | | | |
| 179 | Insert Rows Above this line | | | | | | | |
| 180 | HOME | | | 155 | 150 | 148 | 146.67 | |
| 181 | | | | | | | | |

ods.Musicians #17-Super Heroes #18-Super Villains #19-Television #20-Tim Burton Movies #21-Traditional P

Problem Statement

Problem

- Keeping track of pumpkins with spreadsheet is exhausting
- Long queue of volunteers waiting line
- Visitors struggle to recognize the shape on pumpkin

Solution

- Web application that both the event organizers and volunteers can use to update their pumpkin statuses and more.
- Train an image recognition model that identifies the stencils from a pumpkin photo



Requirements & Constraints

Requirements:

- Functional Requirements
- Economic Requirements
- UI Requirements

Constraints:

- Accessible online through a browser on mobile and desktop
- Fast response time for searching and showing stencil info from AI



Engineering Standards

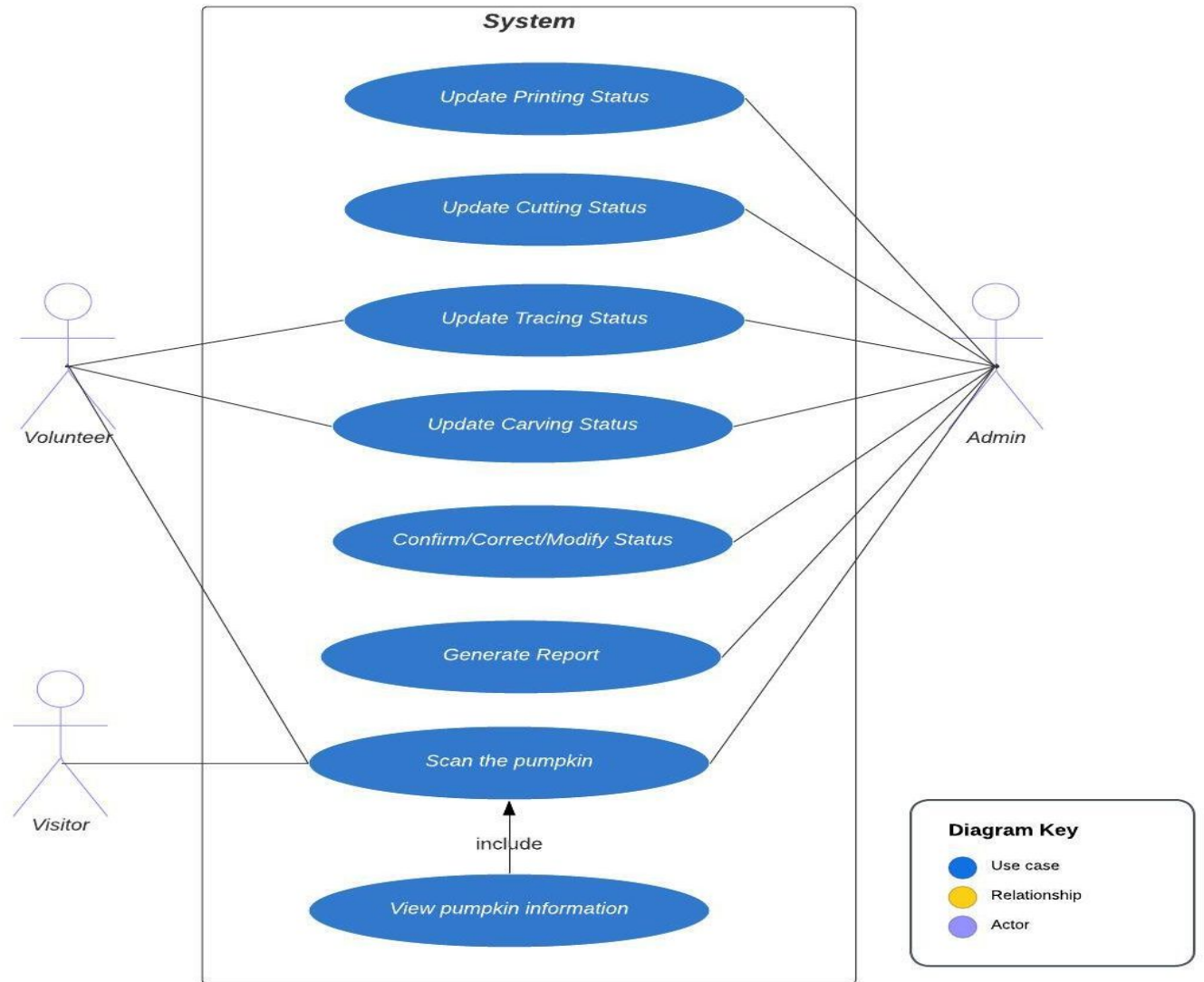
Standards:

- Software life cycle processes (12207-2017 - ISO/IEC/IEEE International Standard) Requirements Gathering
- Test processes (29119-2-2021 - ISO/IEC/IEEE International Standard) Manual and Automated Testing
- Life cycle processes (29148-2018 - ISO/IEC/IEEE International Standard) Requirements engineering
- W3C Standards for web design and application and web architecture Standards Regarding Mobile Web Interfaces

Intended Users and Uses

Users:

- Visitors
- Volunteers
- Volunteer Admins



PROJECT PLAN

Project Management

Task Decomposition

Schedule and Milestones

Risks and Risk Mitigation

Personnel Effort Requirements

Project Management

- Using Agile project management style
- Weekly Sprints
- GitLab to track our progress and tasks on the project



Task Decomposition

Frontend

Three sides of the application:

- Volunteer side - stencil logging
- Admin side - stencil management
- Event visitors - stencil recognition

1. Create screen sketches
2. Implement screens layout and components
3. Attach necessary event handlers and call necessary backend functions
4. Do basic testing of UI functionalities

Task Decomposition

Backend

1. Define database schemas for stencils and event
2. Establish a secure connection to the database
3. Implement endpoints to allow creation and update of stencils and events
 - a. Create controllers to process the CRUD operations of stencils and events
 - b. Set up the request handlers that map to the appropriate controllers
4. Implement the necessary middlewares that are needed to process and store the images

Task Decomposition

Testing

1. Ensure that the volunteer and admin sides of the application are working as expected
2. Based on testing results, add enhancements or edit features as deemed necessary

Schedule and Milestones

Milestones

1. Set up development environments
2. Create detailed screen sketches
3. Create database schemas
4. Set up CI/CD for the application
5. Implement UI for the application using React (volunteers, admins, and visitors)



Schedule and Milestones

Milestones

6. Implement backend API for stencil management
7. Implement backend API for stencil recognition
8. Integrate frontend and backend code
9. Deploy application into the cloud server
10. Test the app during this year's Spirits of the Garden event



Schedule and Milestones

| Tasks | Pre-492 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|--------------------------------------|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Setup development environments | █ | | | | | | | | | | | | | | | |
| Create detailed screen sketches | █ | | | | | | | | | | | | | | | |
| Create database schemas | █ | | | | | | | | | | | | | | | |
| Setup CI/CD | █ | | | | | | | | | | | | | | | |
| Implement application UI code | | █ | █ | █ | | | | | | | | | | | | |
| Implement backend API code | | | | | █ | █ | █ | | | | | | | | | |
| Implement stencil recognition AI | | | | | | | | █ | █ | █ | | | | | | |
| Integrate frontend and backend code | | | | | | | | | | | █ | █ | █ | | | |
| Deploy application into cloud server | | | | | | | | | | | | | | █ | | |
| Test app | | | | | | | | | | | | | | | █ | █ |

Project Gantt Chart

Risks and Risk Mitigation

| Risks | Risk Probability | Mitigation |
|--|-------------------------|---|
| Not meeting the desired deadlines due to poor allocation of time | 0.2 | Have weekly team meetings and bi-weekly gatherings with our client and advisor to update on our status. |
| Major software or hardware issues or bugs | 0.3 | Working extra hours and thorough testing should reduce the risk. |
| Excessive resource use when training the model | 0.3 | Set limits on the resource usage and monitor the process regularly as well as consult experts. |
| Model is trained incorrectly | 0.4 | Contact subject experts for help. |

Personnel Effort Requirements

| Tasks | Effort (hrs.) |
|---|---------------|
| Set up development environments. | 10 |
| Create detailed screen sketches. | 40 |
| Create database schemas. | 5 |
| Setup CI/CD. | 5 |
| Implement application UI code. | 70 |
| Implement backend API code. | 50 |
| Implement stencil recognition model. | 50 |
| Integrate frontend and backend code. | 20 |
| Deploy application into a cloud server. | 10 |
| Test app. | 35 |

DESIGN

Design Context

Design Exploration

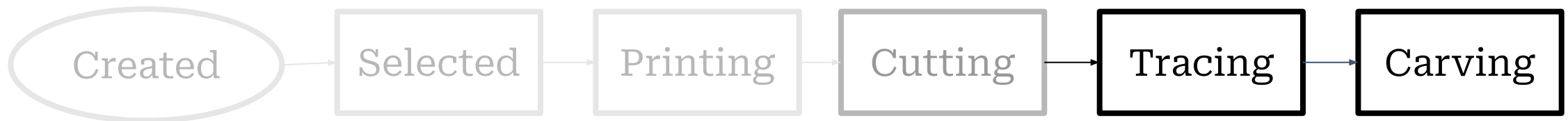
Proposed Design

Design Context - User Needs

Volunteers

- Search stencil by code
- Update stencil status **to Tracing** or **to Carving**
- End Tracing or Carving process

*Stencil Logging -
Status Update*

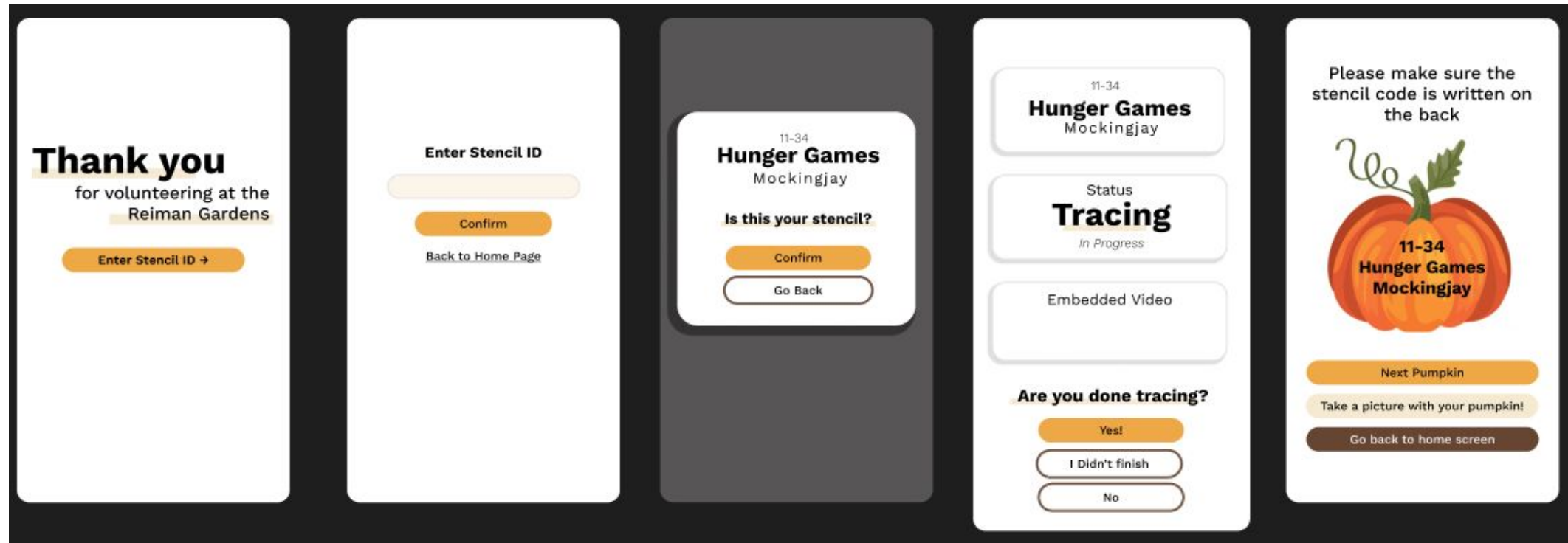


Stencil Stages

Proposed Design

Volunteer-side Pages

Stencil logging



Design Context - User Needs

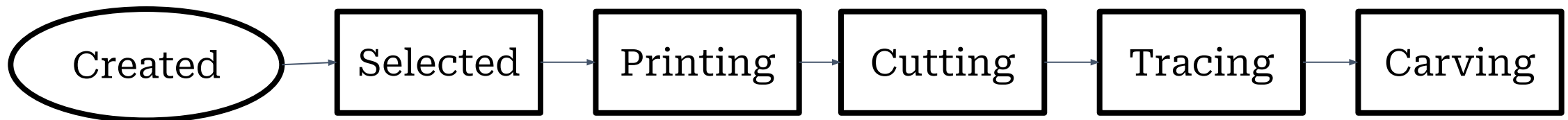
Volunteer Admins

- Create/Edit/Delete/View/Update stencils
- Select stencil for an Event
- Specify which week used
- Sort & Filter stencils - ex. by status or category
- Search stencil by code



*Stencil
Management*

- Additionally: Update stencil status, Use stencil recognition



Stencil Stages

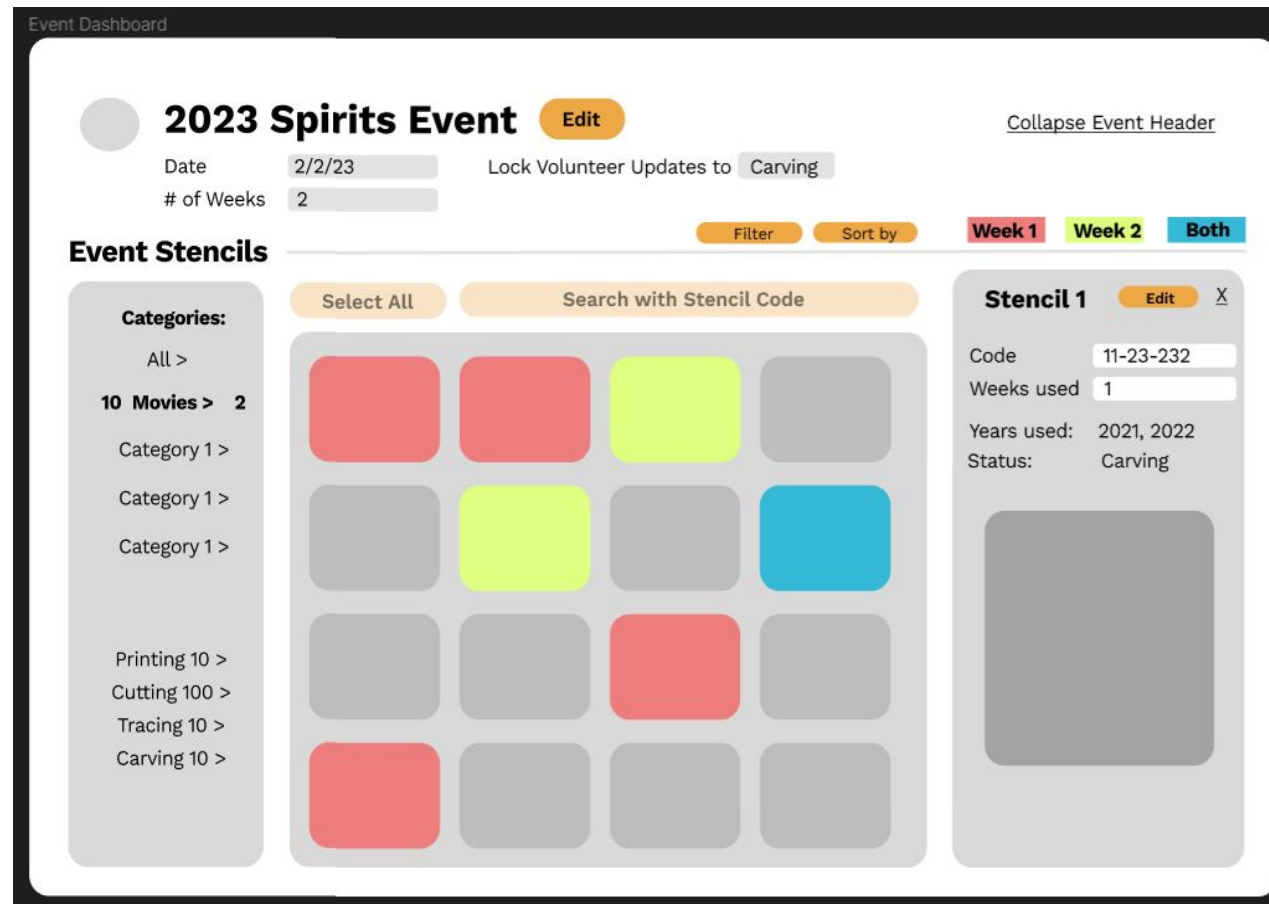
Proposed Design

Event Dashboard

Stencil management

Additionally:

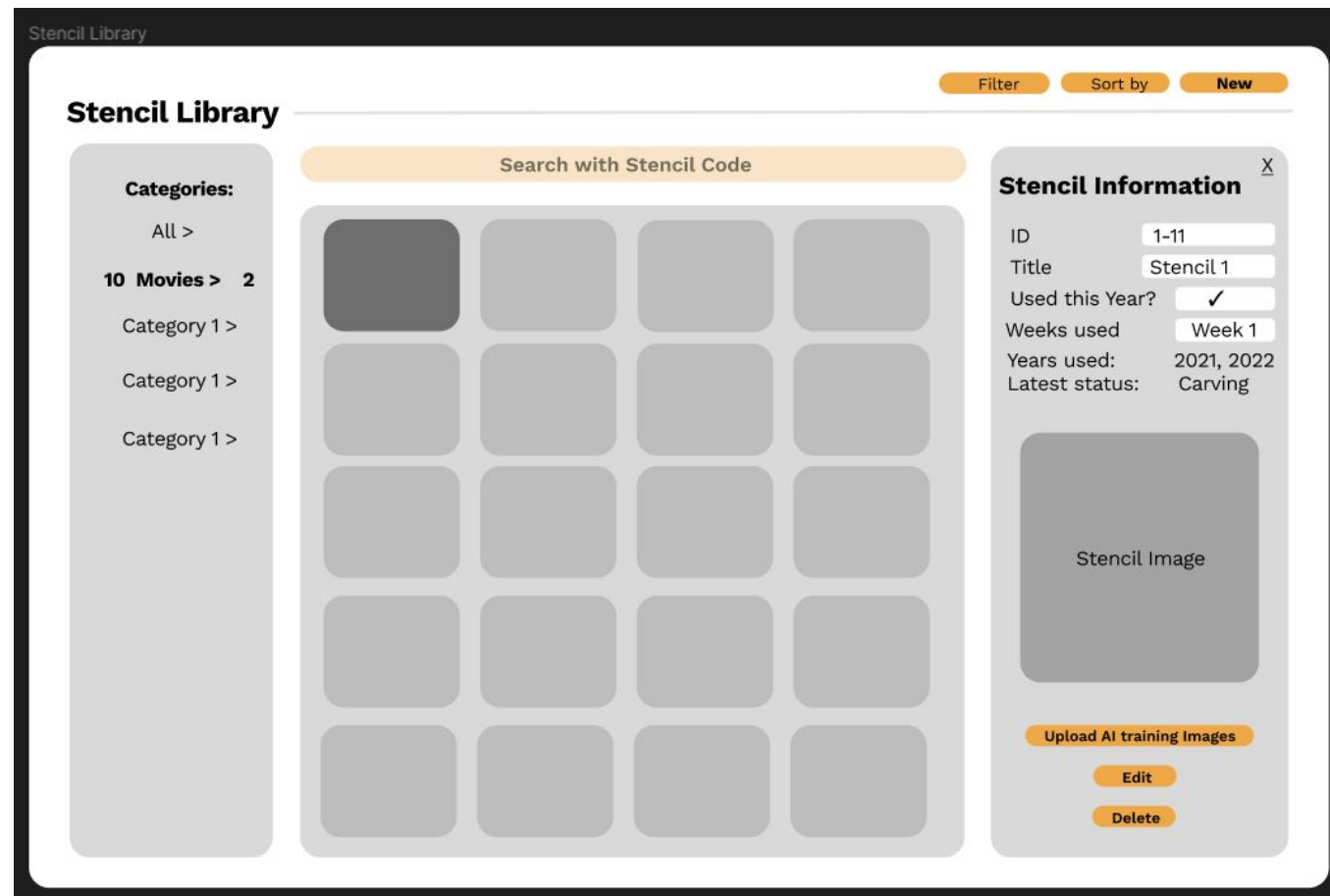
- *Login Page*
- *Navigation Bar to select Event Dashboard or Stencil Library*



Proposed Design

Stencil Library

Stencil management

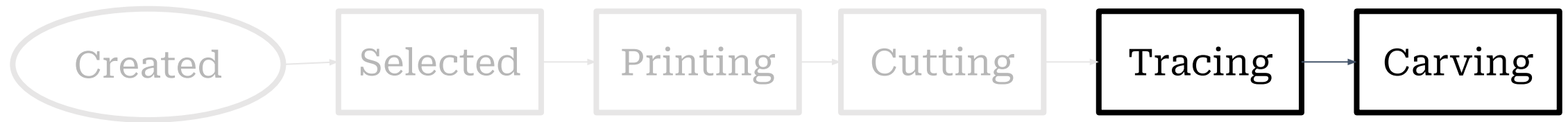


Design Context - User Needs

Visitors

- Use camera to take picture of **carved pumpkin** to identify what stencil
- Verify accuracy

Stencil Recognition



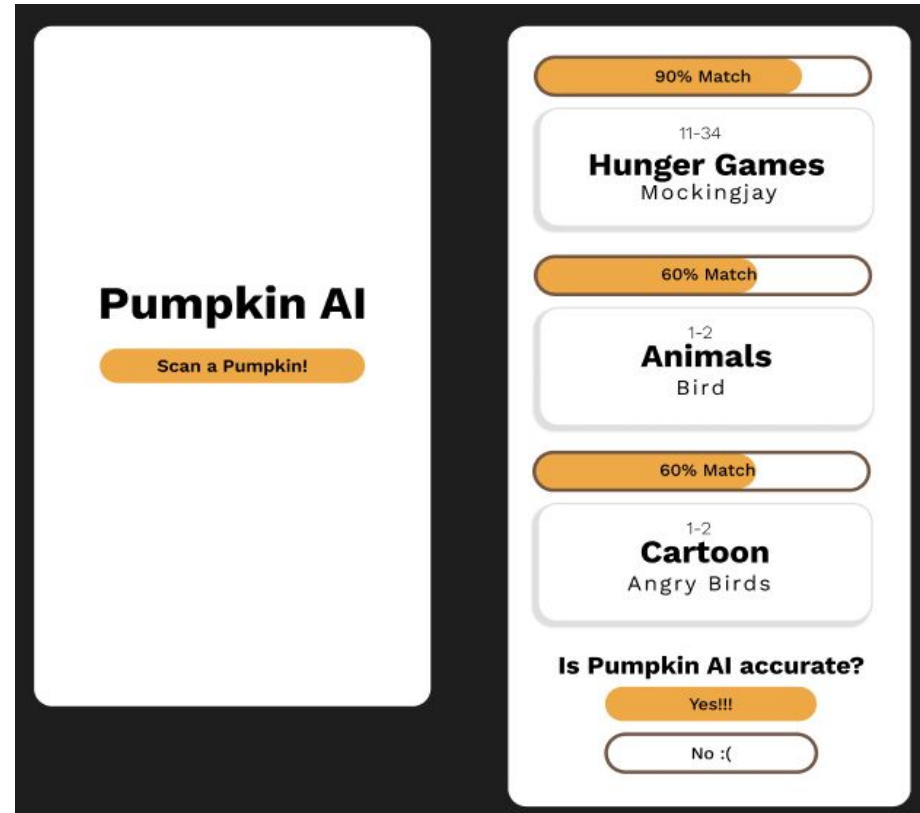
Stencil Stages

*Note: **Only admins** can utilize Stencil Recognition in Tracing and Carving steps*

Proposed Design

Visitor-side pages

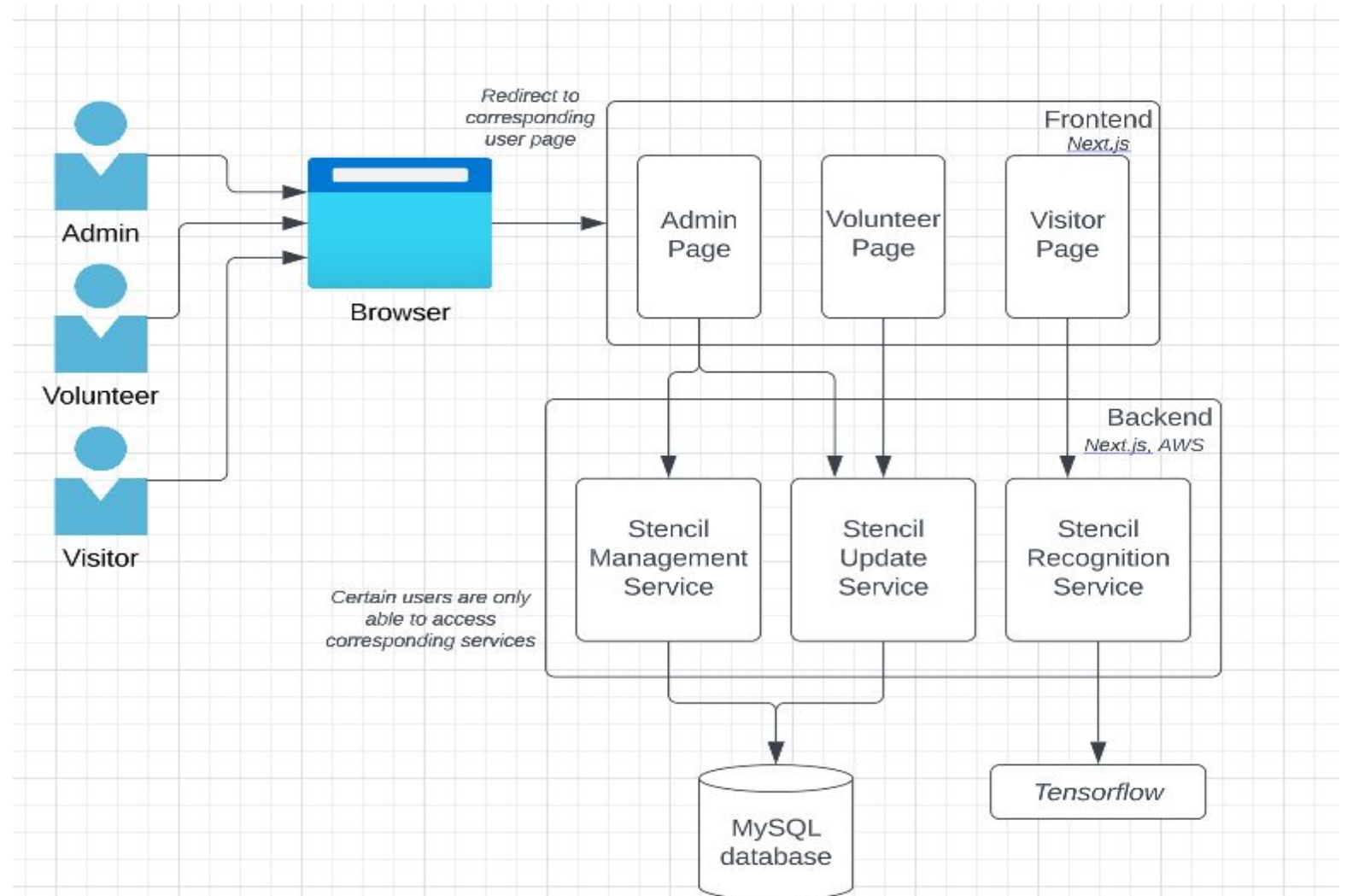
Stencil recognition



Design Exploration & Block Diagram

Design Decisions

- Development framework - React with Next.js
- UI Component Library - React Bootstrap
- Database Management - MySQL
- AI - Tensorflow
- Web application - accessed through desktop and/or mobile browser



TESTING

Unit Testing

Interface Testing

Integration Testing

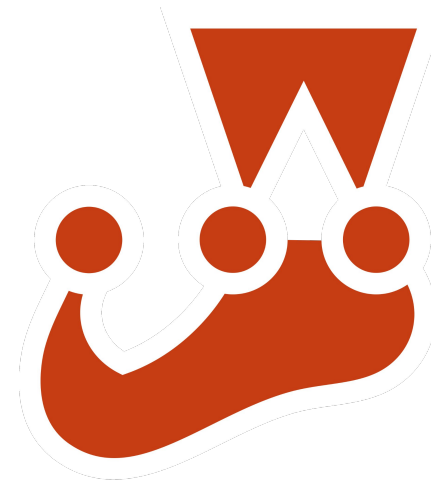
System Testing

Regression Testing

Acceptance Testing

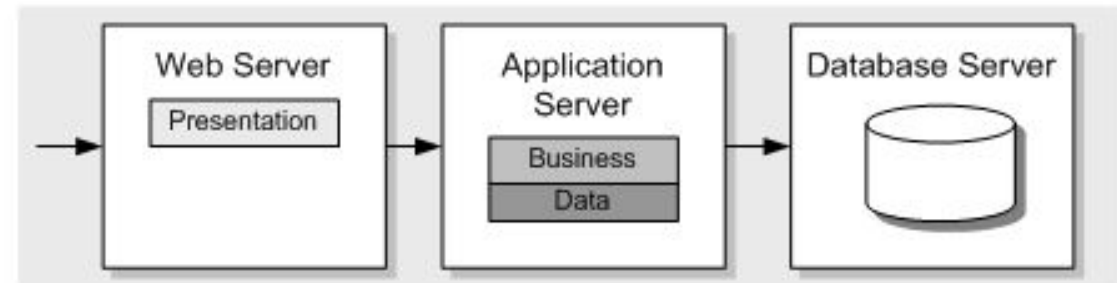
Unit & Integration Testing

- Unit Testing
 - Individual modules testing
 - Image classification accuracy
- Integration testing
 - Data between main components are consistent
 - Classification model interaction with the application
- Tools: Selenium, Jest, TensorFlow.js.



Interface Testing

- Testing each API endpoint for their existence and intended responses to input.
- Web server and application server interface
- Application server and database server interface
- Tools: Jest.



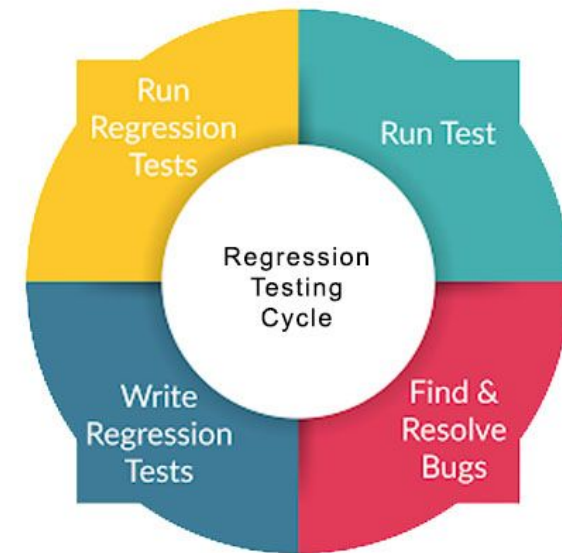
System Testing

- Testing requirements:
 - Updating and maintenance of the stencils by the admins.
 - Preparation for the upcoming events.
 - Searching for and changing the pumpkin status.
 - Viewing the update submission logs and approving the status.
- Tools: React Testing Library, Jest, and Selenium.



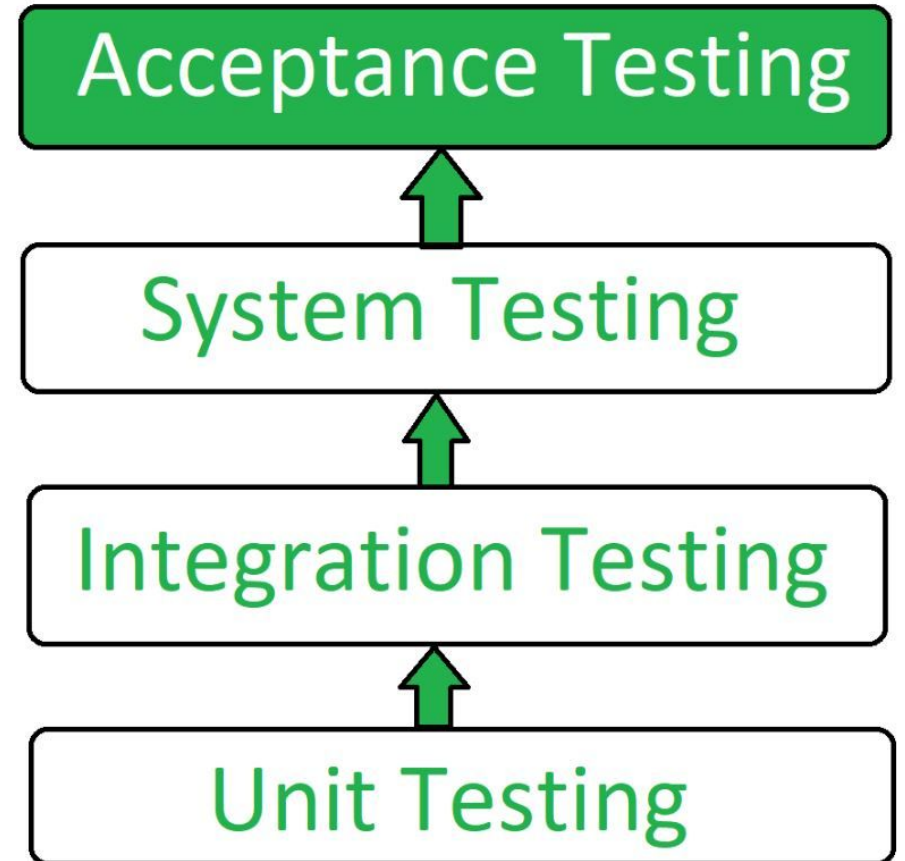
Regression Testing

- Re-execute the test cases.
- Add any additional cases to cover the new functionalities.
- Automated through CI/CD pipeline on Gitlab.
- Tools: Gitlab actions, Jest.



Acceptance Testing

- Bi-weekly meetings with our client.
- A trial run of the event in October
- Gitlab issues, Jira for tracking user needs and requirements.



Next Semester

- Admin Interfaces
- Visitor Interfaces
- Image Classification Training





Questions?

Frightful and Delightful,

*it's a
big*

thank you!

