Data Foundation Systems

Software Requirement Specification Document

Data Annotation Tool - Moderation + Tool Box

Team DepthFirstSearch

Team Members:

Losetti Mourya (2021101121)

Gowlapalli Rohit (2021101113)

Gnana Prakash Punnavajhala (2021111027)

TA - Smruti Biswal

Overview:

1. Introduction:

The Annotation Toolbox and Annotation Moderation Workflow System is a comprehensive software solution designed to **facilitate the annotation of diverse datasets while also managing the moderation of annotations**. This system is intended to be seamlessly integrated into a larger ecosystem and offers a **versatile annotation toolset** that can accommodate various data types. It caters to both annotators and moderators, streamlining the annotation process and ensuring the quality of annotations.

2. Purpose:

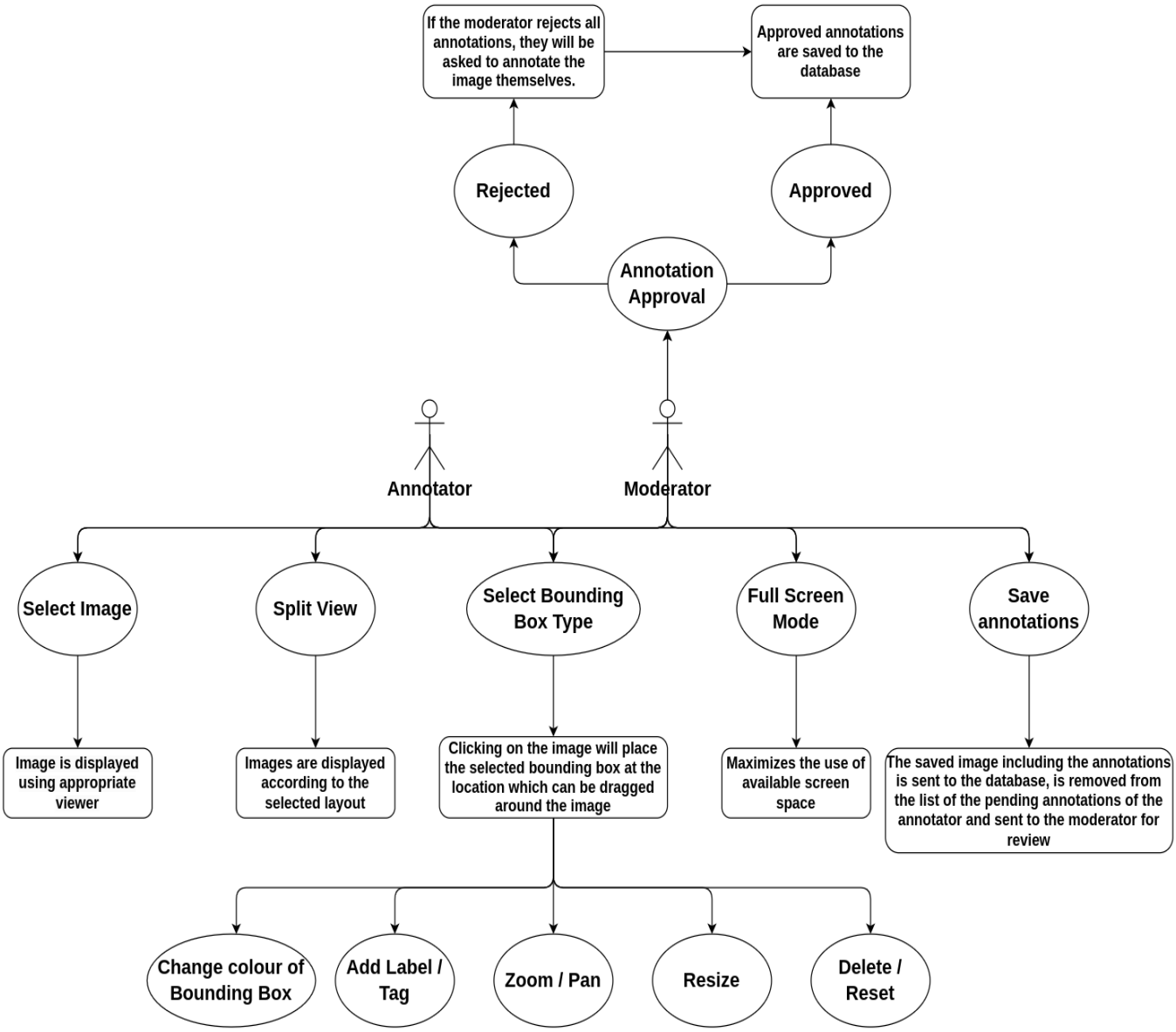
The purpose of this system is to provide a set of annotation tools for creating and managing **bounding boxes, polygons, and other annotation types across different datasets**. It also includes features for annotation moderation to maintain data accuracy and reliability. The system aims to enhance the efficiency of annotation tasks and improve collaboration between annotators and moderators.

3. Scope:

This project encompasses the development of two major components:

- **Annotation Toolbox:** A feature-rich annotation toolset for **creating, modifying, and managing annotations on images**, with support for various annotation types.
- **Annotation Moderation Workflow:** A system for **moderating annotations, enabling moderators to review, accept, or reject annotations** submitted by annotators.

Context Diagram:



Project Description:

Inputs:

- **Image Data:** Raw image files or URLs provided by users or fetched from a designated data source.
- **User Interactions:** User inputs, including mouse & keyboard actions, to control annotation creation, modification, and navigation within the tool.
- **Annotation Metadata:** User-provided information such as object labels, descriptions, or custom attributes associated with annotations.
- **User Preferences:** User-specific settings and preferences, including interface customization choices and annotation display options.
- **Zoom and Pan Controls:** User-initiated actions to zoom in, zoom out, pan, and switch between full-screen and regular modes for image exploration.

Outputs:

- **Annotated Images:** Images with annotations overlaid, depicting objects outlined by bounding boxes, polygons, or other defined shapes.
- **Annotation Data:** Structured data representing annotations, including coordinates, shapes, labels, timestamps, and user IDs. This data is used for storage, retrieval, and analysis.
- **Exported Annotation Files:** Annotation data saved in standard export formats (e.g., JSON) for sharing, archiving, or integration with other systems.

High Level Components:

- **Frontend Interface:** The user-facing component responsible for rendering images, capturing user input, and displaying annotations. It provides an interactive canvas and UI elements for tool control.
- **Export/Import Module:** A module responsible for converting annotation data to and from standard formats to enable import and export operations.
- **Deployment Infrastructure:** Infrastructure components facilitating the deployment and management of the tool.
- **Annotation Engine:** The core module responsible for interpreting user interactions, rendering annotations on images, managing metadata, and ensuring data consistency.
- **Database Management:** The data storage component handling image storage, annotation data, metadata, and version history. It supports efficient data retrieval and retrieval for large datasets.

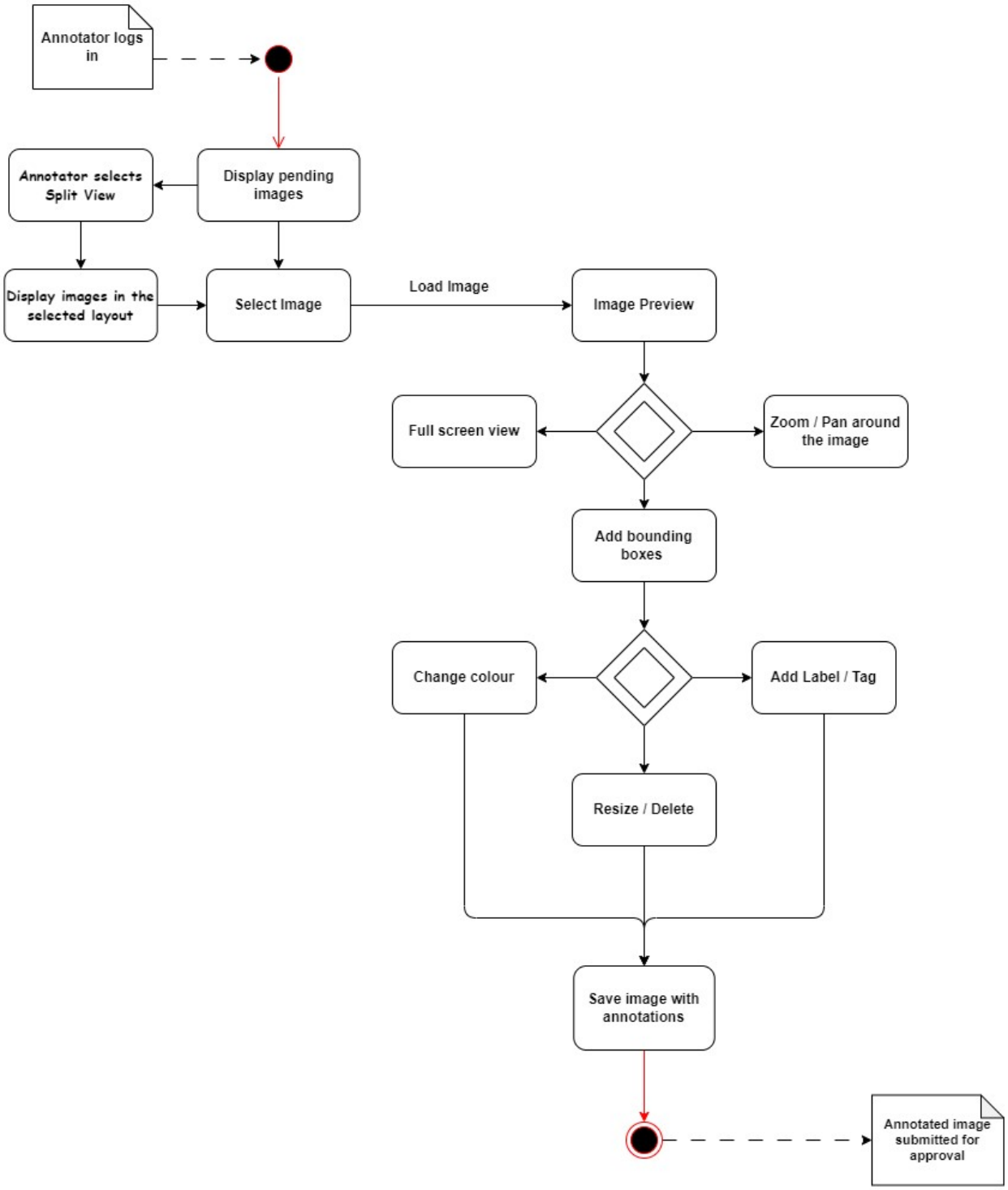
System Requirements:

4. Functional Requirements:

The project involves **Two core Use Cases:**

- **Annotation Toolbox:** Annotators employ the Toolbox to annotate images, applying various annotation methods. Upon completion, annotators send the annotated images for approval to a designated Moderator.
- **Annotation Moderation Workflow:** Moderators have the responsibility of reviewing multiple annotations on an image.They can either accept or reject the annotations based on quality and accuracy, ensuring the final dataset's integrity.

UseCase Activity Diagram - Annotation Toolbox:



Annotation Toolbox:

4.1 Annotation Creation and Editing:

- ❖ The system must provide support for the following annotation types: **Square**, **Rectangle**, **Circle**, **Ellipse**, and **Free-hand curve.**
- ❖ Users should be able to **select an annotation type** and place it accurately on an image by clicking.
- ❖ Bounding boxes should be **movable** and **adjustable**.
- ❖ Annotations must be **interactive**, **resizable**, **modifiable** & **deletable.**
- ❖ Annotators should be able to assign **labels** & **colors** to annotations.

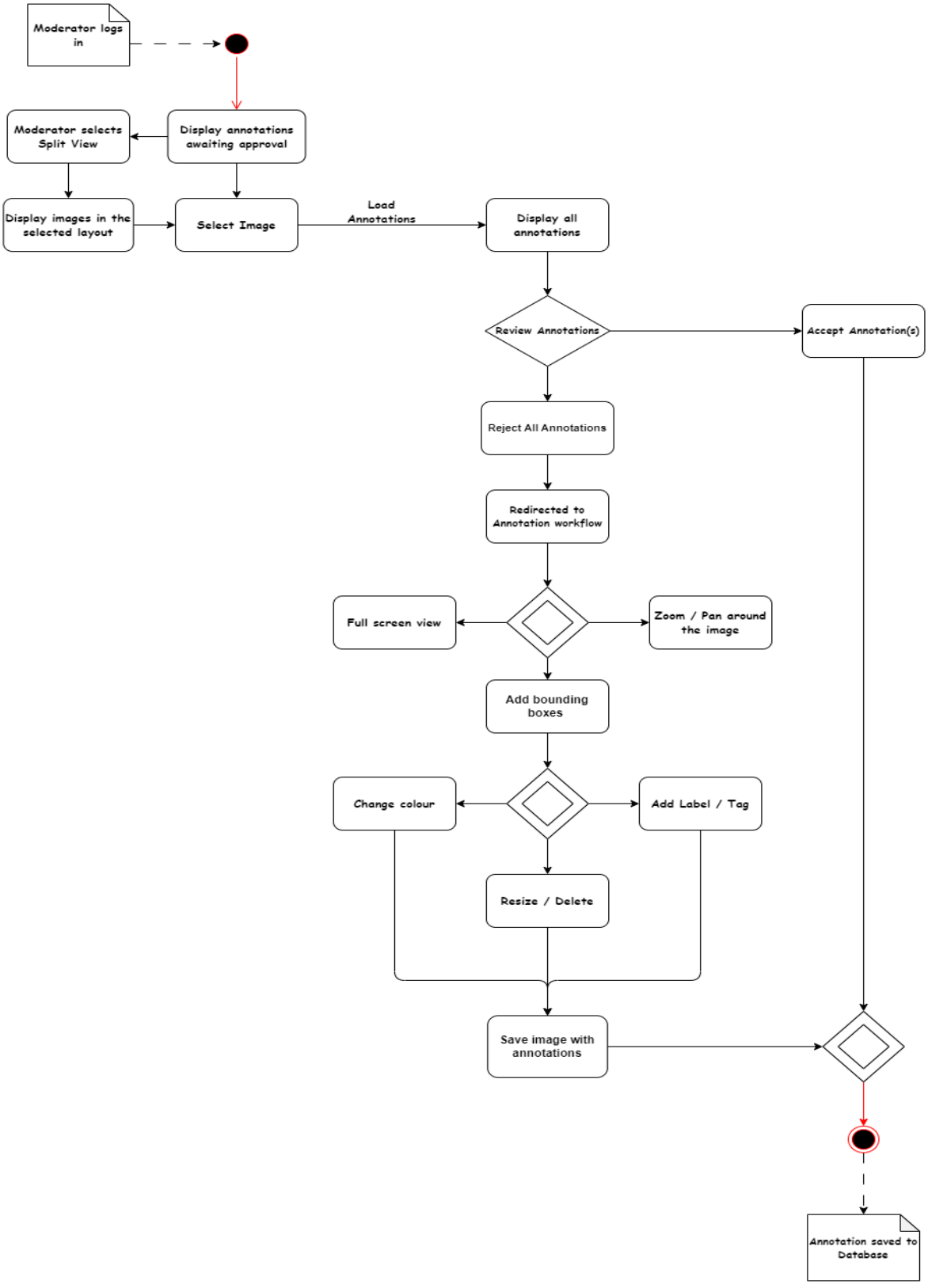
4.2 User Interface:

- ❖ A **collapsible toolbar** on the left side of the screen must allow users to select annotation types.
- ❖ A top toolbar should offer features like **zooming**, **panning**, **split view**, **full screen mode**, **delete**, and **reset**, all of which are collapsible.
- ❖ Zooming should **maintain the relative positions** of annotations and image pixel coordinates.
- ❖ Annotations should work **consistently** at all zoom levels.

4.3 Performance:

- ❖ The system must provide **efficient performance** when working with a large number of annotations or high-resolution images.
- ❖ Annotation creation and modification should be **responsive** and **smooth.**

UseCase Activity Diagram - Annotation Moderation Workflow:



Annotation Moderation Workflow:

4.4 User Type Identification:

- The system must **identify users as annotators or moderators** and direct them to the appropriate workflow.

4.5 Moderator Interface:

- Moderators should have **access to** a **list of images awaiting annotation** and when an image is selected, all annotations performed on that image must be displayed.
- When a moderator selects an image, **all annotations on that image** must be displayed neatly.

4.6 Annotation Review:

- Moderators should have the ability to **accept or reject** annotations.
- If a moderator **rejects all annotations**, they should be **redirected** to perform the annotation themselves.

4.7 Annotator Interface:

- Annotators are presented with a **list of pending annotations**, which are based on the images that have been assigned to them.
- After selecting an image to annotate from this list, the annotator is **directed to the previously described annotation** workflow using the annotation toolbox.

5. Non-Functional Requirements:

5.1 Usability:

- The user interface must be **intuitive**,with a **minimal number of steps** required to perform common tasks like annotation and labeling. The theme & colors shouldn't hinder annotation & labeling. The UI should match other modules' themes & be adaptable to different screen sizes. The **web-application** should function seamlessly across major **web browsers**.

5.2 Performance:

- The system must be **responsive**, even when handling large datasets and complex annotations. Modules should provide fast response times and smooth region updates in response to user actions.

5.3 Security:

- User authentication and data access must be **secure** to prevent unauthorized access and data breaches. The project should ensure that **only** the users assigned as **moderators are allowed** to choose the correct images and flag images as incorrect.

5.4 Compatibility:

- The system must be **compatible** with a variety of datasets and image formats.

5.5 Scalability:

- The system should **scale** gracefully to handle an increasing number of annotations and users.

6. Project Deliverables:

- **Fully Functional Annotation Toolbox:** A software module that provides all the features specified in the system requirements for annotators.
- **Annotation Moderation Workflow:** A module that includes user role identification, image selection, annotation review, and redirection capabilities as outlined in system requirements.
- **Testing:** A suite of test cases to ensure the system meets all functional and non-functional requirements.
- **Integration with Larger System:** Seamless integration of the Annotation Toolbox and Annotation Moderation Workflow into the larger system.
- **Documentation:** Comprehensive documentation that includes:
  - ➔ Installation instructions.
  - ➔ User guides for using the annotation tool.
  - ➔ API documentation for developers.
  - ➔ System architecture and data flow diagrams.