

ONLINE AUCTION SYSTEM

A PROJECT REPORT

Submitted by

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ABSTRACT

The Online Auction System is a web-based platform designed to facilitate real-time bidding, enabling users to participate in buying and selling goods through competitive bidding. This system provides a secure, user-friendly interface for buyers and sellers, featuring functionalities for user registration, auction creation, bid placement. It leverages a centralized database to store auction data, bid histories, and user information securely, ensuring data integrity and seamless transaction flow. This system's design support timed auctions, enhancing flexibility for users. By utilizing robust authentication protocols and secure payment gateways, the Online Auction System aims to create a safe and transparent bidding environment, catering to a broad range of goods and services. This platform presents a scalable solution to traditional auction limitations, providing greater accessibility, improved engagement, and wider market reach.

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LIST OF ABBREVIATIONS

ACRONYM	EXPANSION
JS	JavaScript
DB	Database
XML	Extensible Markup Language
VS	Visual Studio
API	Application Programming Interface
HTTP	Hypertext Transfer Protocol

1. INTRODUCTION

Online auctions have revolutionized the buying and selling landscape by providing a flexible, accessible platform for conducting auctions in a virtual environment. With growing digitalization and increased internet accessibility, there is a rising demand for efficient online auction systems that can manage the complexities of real-time bidding, multiple participants, and secure transactions. This project proposes an Online Auction System designed to address these needs by providing a secure, user-friendly platform for buying and selling items through competitive bidding.

1.1 Problem Statement

Traditional auction systems often require physical presence and can be limited by geographical constraints, reducing accessibility for both buyers and sellers. Furthermore, existing online auction platforms may lack essential functionalities, face issues with user verification, or offer limited control over auction management, leading to user dissatisfaction and security risks. There is a need for an online auction system that provides a comprehensive, secure solution to these issues while ensuring an intuitive user experience and reliable bidding process.

1.2 Motivation

The motivation for developing an online auction system stems from the demand for a platform that simplifies auction processes, expands access, and increases convenience for users. As online shopping and e-commerce continue to grow, auction systems represent an innovative alternative for individuals seeking unique or competitively priced goods. Creating a reliable and engaging online auction platform can enhance user trust, expand market reach, and encourage more active participation in the online marketplace.

1.3 Objective

The objective of this project is to develop a comprehensive Online Auction System that enables users to register, login, browse available auctions, and participate in real-

time bidding. The system should provide a range of functionalities that support both sellers and buyers, ensuring that auctions are managed securely, and that participants have access to a transparent and efficient bidding environment.

1.3.1 Proposed System

The proposed Online Auction System includes the following key components:

- **Registration Page:** Allows new users to create an account and provides authentication features.
- **Login Page:** Enables registered users to securely access their account.
- **Home Page:** Displays general information and recent auction highlights to engage users upon login.
- **Auction List Page:** Lists all active and upcoming auctions, allowing users to view and select items for bidding.
- **Create Auction Page:** Allows sellers to list items, set starting bids, define auction durations, and other auction details.
- **Edit Auction:** Provides sellers with the ability to modify auction details if necessary before bidding starts.
- **Delete Auction:** Allows sellers to remove auctions before bidding begins, ensuring control over listings.

1.3.2 Advantages of the Proposed System

The proposed Online Auction System offers several advantages:

- **User-Friendly Interface:** Designed for ease of use, with simple navigation across pages such as the registration, login, and auction pages.
- **Enhanced Accessibility:** Enables users to participate in auctions from any location with internet access, reducing geographical limitations.
- **Secure Transactions:** Incorporates security protocols to protect user data, ensuring safe bidding and account access.
- **Efficient Auction Management:** Provides sellers with tools to manage their auctions flexibly, including the ability to create, edit, and delete auctions as needed.

- **Real-Time Bidding:** Offers a dynamic and engaging bidding experience for buyers, with real-time updates on current bids and auction status.

2. TECHNOLOGIES LEARNT

In developing the Online Auction System, the MERN (MongoDB, Express, React, Node.js) full-stack framework was utilized. This technology stack provided a robust, scalable foundation for building and deploying a fully functional, responsive web application. The following is a breakdown of the core technologies learned and applied in this project:

- **MongoDB:** Used as the database for storing user data, auction details, and bid histories. MongoDB's NoSQL structure allowed for flexible data modeling and efficient handling of large datasets in a scalable manner.
- **Express.js:** Acted as the server framework, providing essential middleware and routing capabilities to manage HTTP requests and server responses. Express simplified API development, enabling secure, efficient communication between the frontend and backend.
- **React.js:** Utilized for building the client-side interface, providing an interactive, dynamic user experience. React's component-based architecture allowed for modular development, making the interface more manageable and scalable.
- **Node.js:** Served as the runtime environment for the backend, enabling asynchronous operations and improving the efficiency of handling multiple user requests simultaneously. Node.js's non-blocking architecture facilitated the real-time bidding functionality required for an auction platform.

The MERN stack's synergy provided the project with a high-performance, cross-functional framework, allowing for seamless integration between frontend and backend components while maintaining a streamlined development process.

3. SYSTEM DESIGN

This section provides an overview of the Online Auction System's architecture, module breakdown, system specifications, and detailed design elements, including diagrams to visualize the system's functionality and data flow.

3.1 System Architecture

The Online Auction System follows a three-tier architecture, consisting of the client-side, server-side, and database layers. This architecture enables modular development and maintains a clear separation of concerns:

- **Client-Side (Frontend):** Built with React.js, the client side is responsible for displaying information and capturing user input through an intuitive user interface. It communicates with the backend via API requests.
- **Server-Side (Backend):** Developed using Node.js and Express.js, this layer handles business logic, manages HTTP requests, processes bid data, and ensures security. The server authenticates users and facilitates real-time communication for dynamic bidding.
- **Database Layer:** MongoDB serves as the database, where user data, auction listings, and bid records are stored. It enables flexible data structures and ensures the persistence of all essential information.

3.2 Module Description

The system consists of several modules, each focusing on specific functionalities to ensure a cohesive user experience:

- **User Management:** Includes registration and login functionalities, handling user authentication and managing user profiles.
- **Auction Management:** Allows users to create, edit, and delete auctions, with secure access control for authorized users.
- **Bidding System:** Manages bid placements and updates in real time, ensuring accurate and competitive bidding.
- **Notification System:** Provides users with notifications for new bids, auction status changes, and other updates.

3.3 System Specification

3.3.1 Software Requirements

- **Frontend:** React.js, HTML5, CSS3, JavaScript
- **Backend:** Node.js, Express.js
- **Database:** MongoDB
- **Development Tools:** VS Code, MongoDB Compass, Postman (for API testing)
- **Other Dependencies:** Mongoose (for MongoDB object modeling), JWT for authentication

3.3.2 Hardware Requirements

- **Processor:** Intel i5 or higher
- **RAM:** 8 GB or higher
- **Storage:** Minimum 256 GB SSD
- **Network:** Reliable internet connection for development and testing.

3.4 Detailed Design

3.4.1 Use Case Diagram

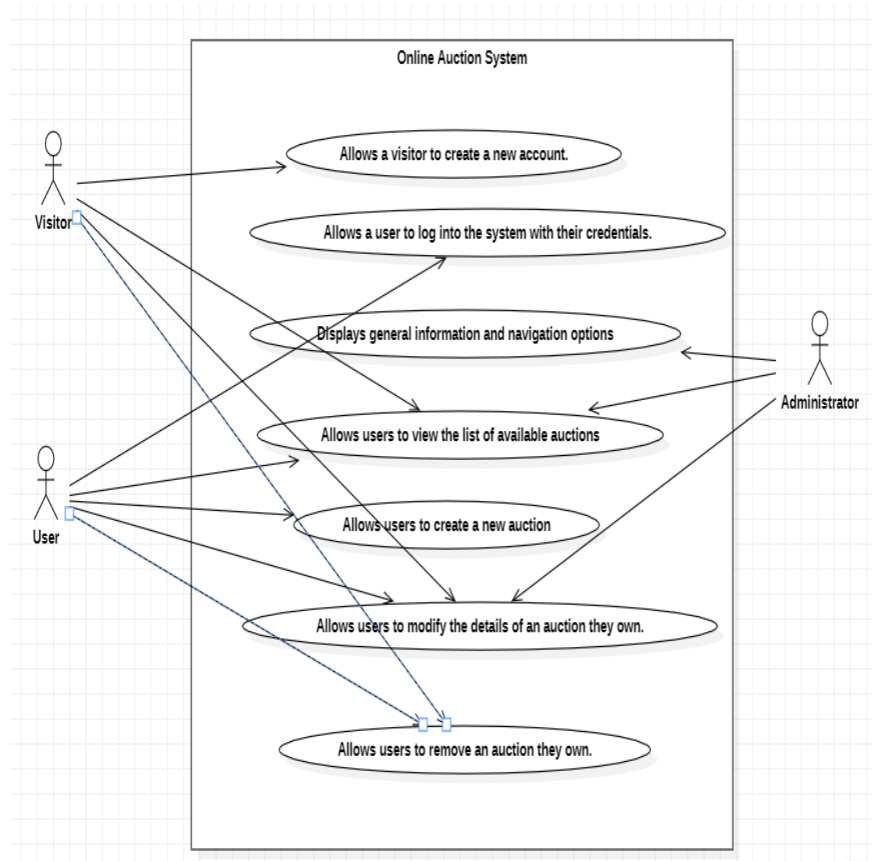


Figure.1.1: Use Case Diagram

3.4.2 Sequence Diagram

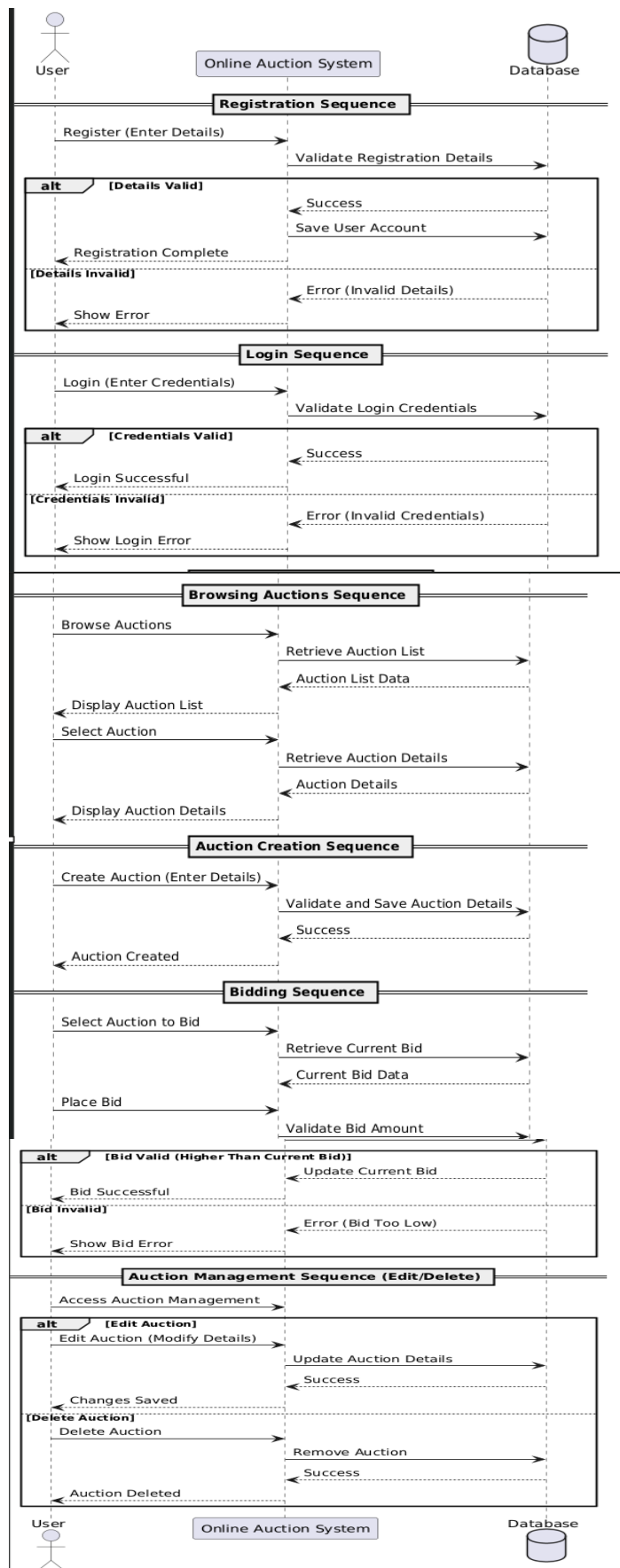


Figure.1.2: Sequence Diagram

3.4.3 Class Diagram

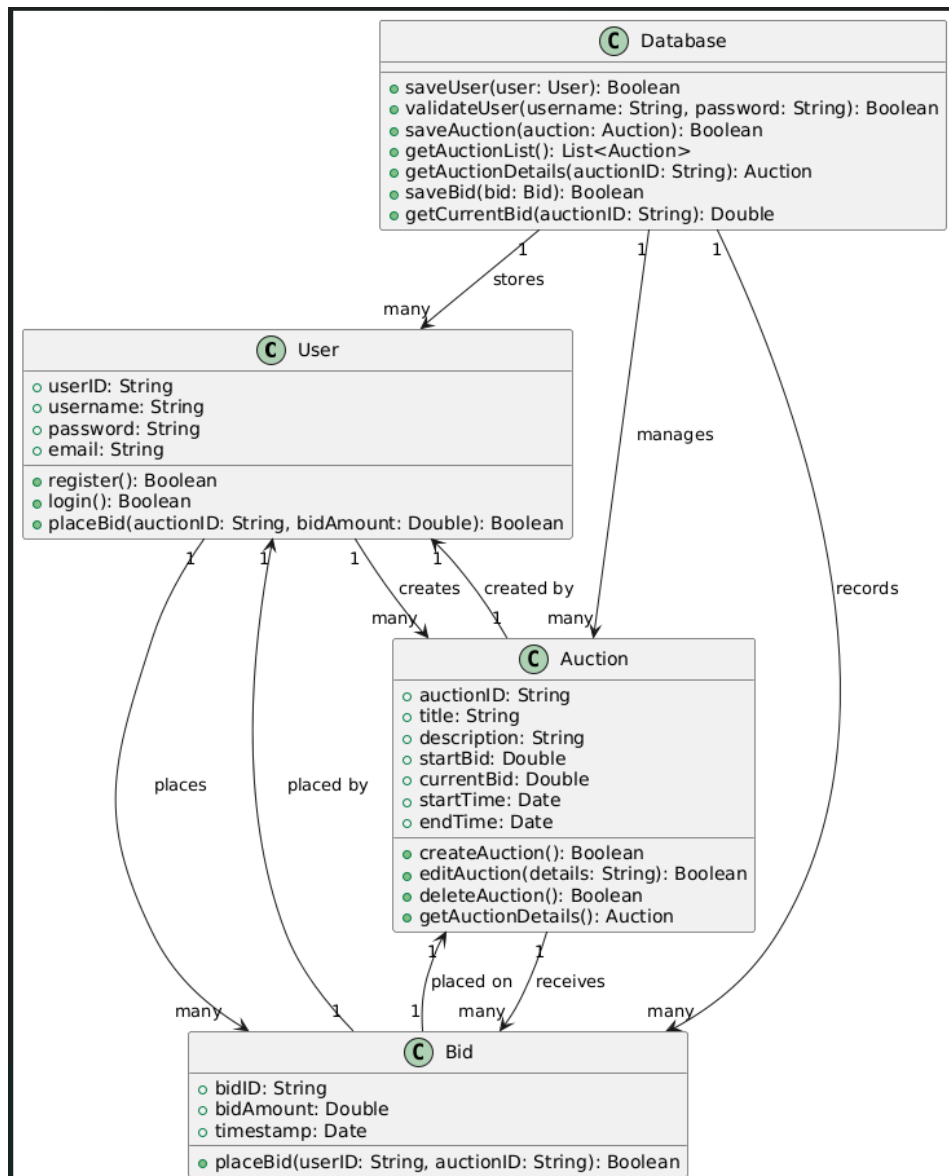


Figure.1.3: Class Diagram

3.4.4 Dataflow Diagram (DFD)

Level 0

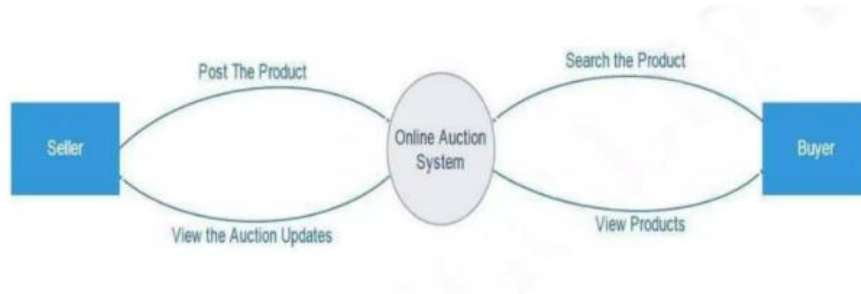


Figure.1.4.1: DFD Level 0

Level 1

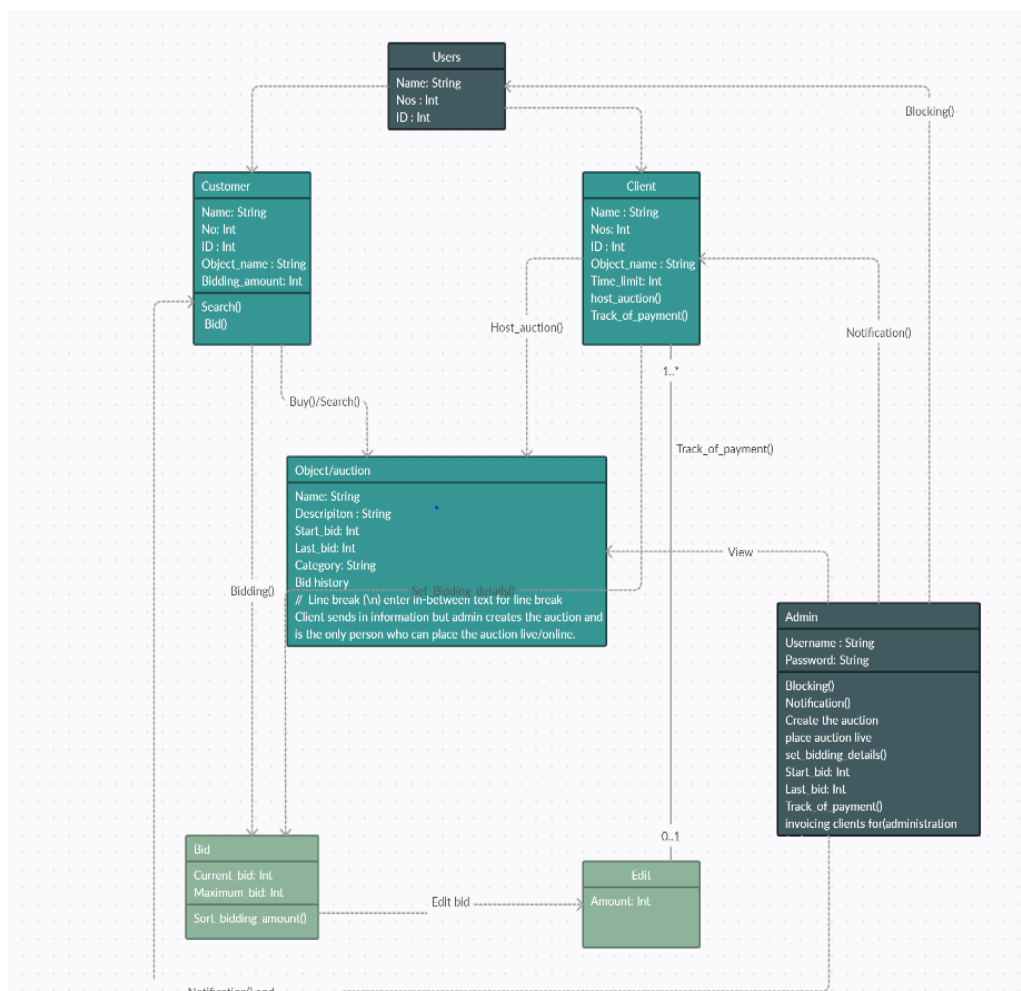


Figure.1.4.2: DFD Level 1

3.4.5 Activity Diagram

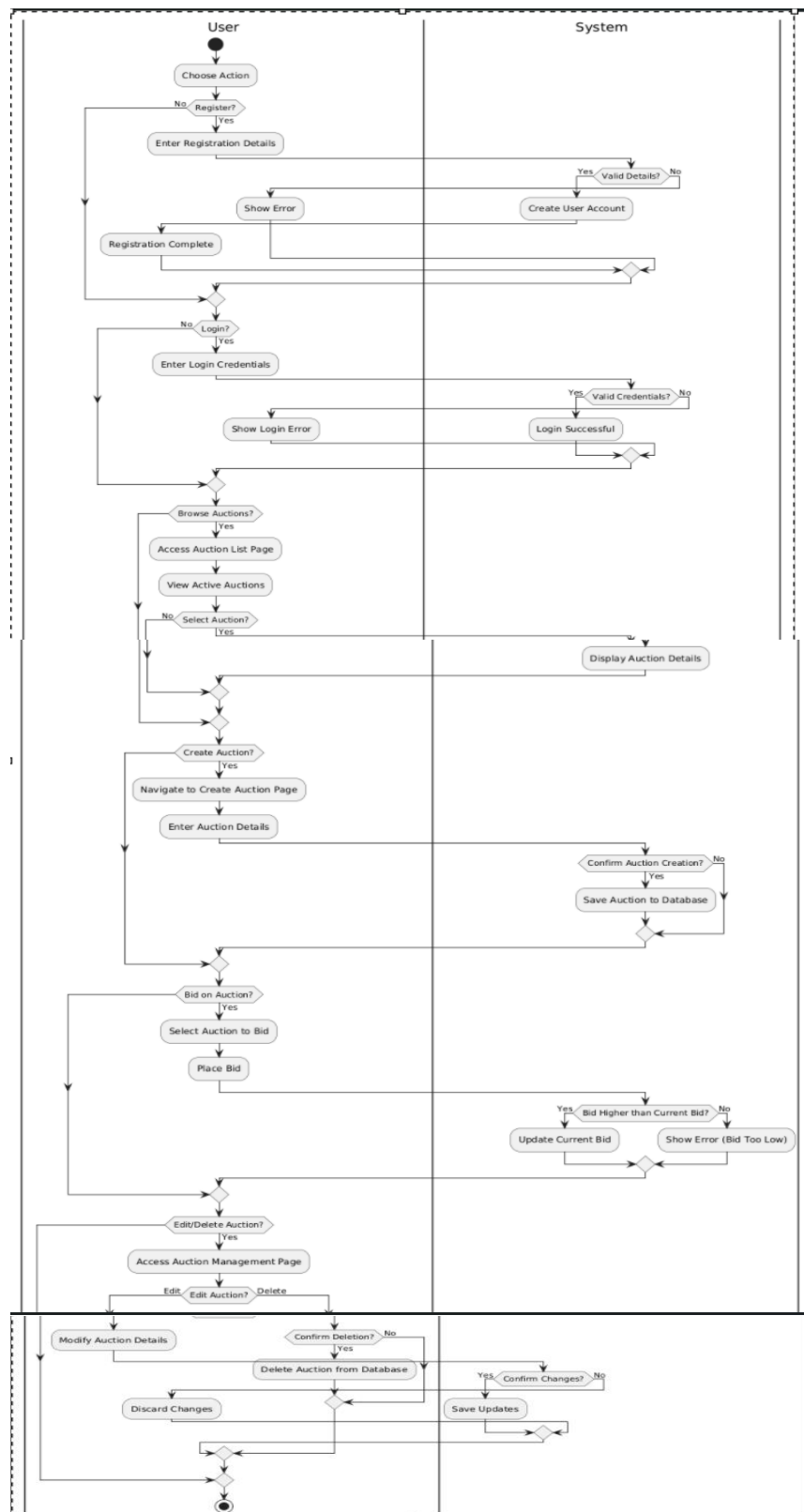


Figure.1.5: Activity Diagram

4.IMPLEMENTATION

This chapter describes the development of the Online Auction System, covering stages of implementation, experimentation, optimization, and evaluation. It details the tools and techniques employed, alongside descriptions of the system's core modules that facilitate user registration, auction management, and real-time bidding. This section documents the development journey, from initial setup to final optimization, with supporting screenshots, pseudocode, and flowcharts to illustrate each feature's workflow and the overall system architecture. Clear explanations of experimentation methods and validation techniques are provided to ensure a comprehensive understanding of the project's practical elements.

4.1 Implementation details

The Online Auction System was implemented through a series of structured phases, each concentrating on various aspects of the application, including user authentication, auction management, and bid handling.

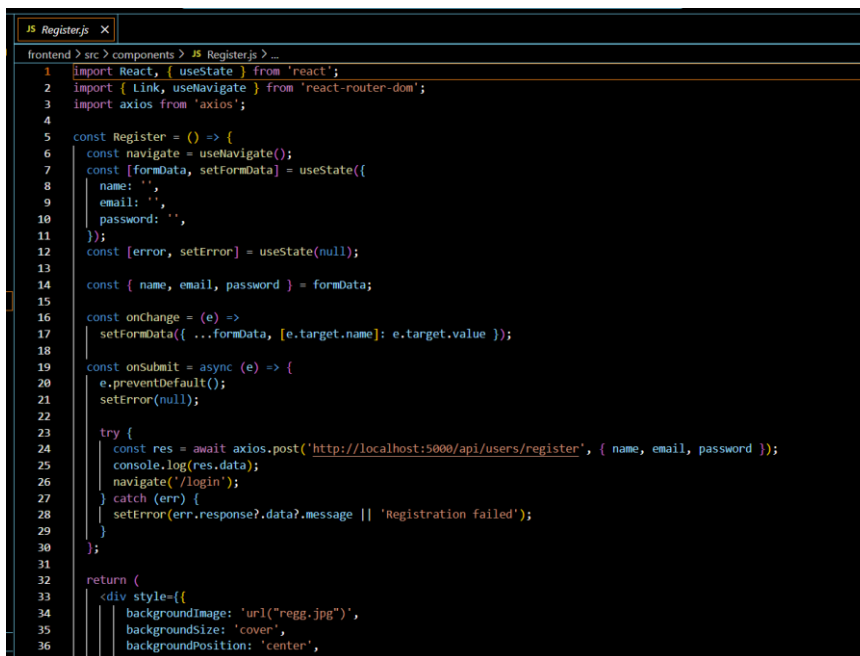
4.1.1 Development Tools and Justification:

- **Frontend:**
 - **React.js** was chosen for the frontend to provide a responsive, interactive user interface. React's component-based architecture enables modular, reusable code, making it efficient to build user-centric features such as auction lists, bidding interfaces, and profile management.
- **Backend:**
 - **Node.js and Express.js** were selected for the backend to create a scalable, high-performance environment for managing API requests, business logic, and security. Node.js's non-blocking, event-driven nature allows handling of multiple user actions in real-time, critical for managing live bidding interactions.

- **Database:**
 - **MongoDB** was chosen for the database, providing flexible and scalable storage for user information, auction listings, and bid data. MongoDB's document-oriented structure suits the application's need for managing complex, nested auction data and simplifies operations for tracking multiple bids and real-time updates.
- **Development Environment:**
 - **Visual Studio Code (VS Code)** was used as the primary code editor due to its robust support for JavaScript and Node.js development. VS Code's extensive plugin ecosystem facilitates efficient debugging, real-time collaboration, version control, and seamless code management, streamlining the development workflow for the project.

4.2 Module Implementation

4.2.1 Registration and Login Module



```

1  import React, { useState } from 'react';
2  import { Link, useNavigate } from 'react-router-dom';
3  import axios from 'axios';
4
5  const Register = () => {
6    const navigate = useNavigate();
7    const [formData, setFormData] = useState({
8      name: '',
9      email: '',
10     password: '',
11   });
12   const [error, setError] = useState(null);
13
14   const { name, email, password } = formData;
15
16   const onChange = (e) => {
17     setFormData({ ...formData, [e.target.name]: e.target.value });
18   };
19
20   const onSubmit = async (e) => {
21     e.preventDefault();
22     setError(null);
23
24     try {
25       const res = await axios.post('http://localhost:5000/api/users/register', { name, email, password });
26       console.log(res.data);
27       navigate('/login');
28     } catch (err) {
29       setError(err.response?.data?.message || 'Registration failed');
30     }
31   };
32
33   return (
34     <div style={{
35       backgroundImage: 'url("regg.jpg")',
36       backgroundSize: 'cover',
37       backgroundPosition: 'center',
38     }}
39   );

```

Figure.2.1.1: Registration Syntax Module

```

JS Loginjs x
frontend > src > components > JS Loginjs > ...
1 // src/components/Login.js
2
3 import React, { useState } from 'react';
4 import { Link, useNavigate } from 'react-router-dom';
5 import axios from 'axios';
6
7 const Login = ({ setUser }) => {
8   const navigate = useNavigate();
9   const [formData, setFormData] = useState({
10     email: '',
11     password: '',
12   });
13   const [error, setError] = useState(null);
14
15   const { email, password } = formData;
16
17   const onChange = (e) => {
18     setFormData({ ...formData, [e.target.name]: e.target.value });
19   }
20   const onSubmit = async (e) => {
21     e.preventDefault();
22     setError(null);
23
24     try {
25       const res = await axios.post('http://localhost:5000/api/users/login', { email, password });
26       setUser(res.data.user); // Set the user data in App component
27       navigate('/home');
28     } catch (err) {
29       setError(err.response?.data?.message || 'Login failed');
30     }
31   };
32
33   return (
34     <div style={{
35       backgroundImage: 'url("reg.jpg")',
36       backgroundSize: 'cover',
37       backgroundPosition: 'center',

```

Figure.2.1.2: Login Syntax Module

4.2.2 Home Page

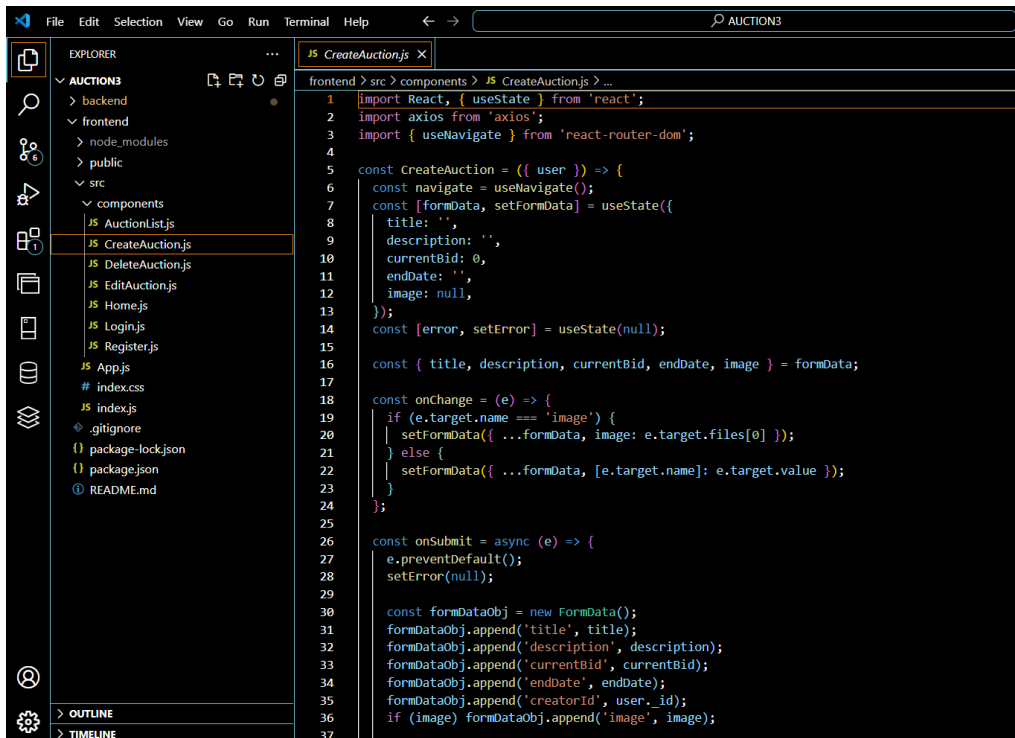
```

File Edit Selection View Go Run Terminal Help
AUCTION3
EXPLORER
  AUCTION3
    backend
    frontend
      node_modules
      public
      src
        components
          JS AuctionListjs
          JS CreateAuctionjs
          JS DeleteAuctionjs
          JS EditAuctionjs
          JS Homejs
          JS Loginjs
          JS Registerjs
          JS Appjs
          # index.css
          JS index.js
          .gitignore
          package-lock.json
          package.json
          README.md
      OUTLINE
      TIMELINE
JS Homejs x
frontend > src > components > JS Homejs > ...
1 import React from 'react';
2 import { Link, useNavigate } from 'react-router-dom';
3
4 const Home = ({ user }) => {
5   const navigate = useNavigate();
6
7   const handleLogout = () => {
8     navigate('/');
9   };
10
11   return (
12     <div style={{
13       backgroundImage: 'url("ho1.jpg")',
14       backgroundSize: 'cover',
15       backgroundPosition: 'center',
16       minHeight: '100vh',
17       display: 'flex',
18       flexDirection: 'column',
19       justifyContent: 'center',
20       alignItems: 'center',
21       color: 'fff',
22       textAlign: 'center'
23     }}>
24       <h1 style={{
25         fontSize: '4rem',
26         fontWeight: 'bold',
27         color: 'red',
28         marginBottom: '20px'
29       }}>AUCTION!</h1>
30       <h2 style={{
31         fontSize: '2.5rem',
32         fontWeight: 'bold',
33         marginBottom: '40px'
34       }}>Welcome to Auction, {user ? user.name : 'Guest'}</h2>
35       <nav style={{
36         display: 'flex',
37         flexDirection: 'column',

```

Figure.2.2: Home Page Syntax Module

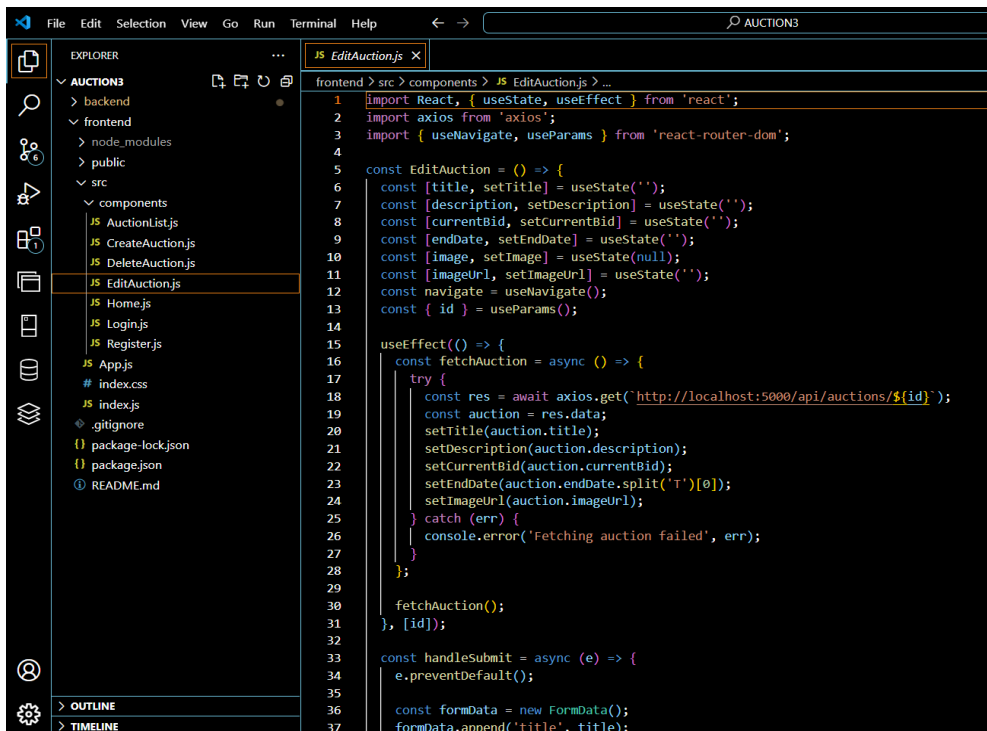
4.2.3 Create Auction Module



```
1 import React, { useState } from 'react';
2 import axios from 'axios';
3 import { useNavigate } from 'react-router-dom';
4
5 const CreateAuction = ({ user }) => {
6   const navigate = useNavigate();
7   const [formData, setFormData] = useState({
8     title: '',
9     description: '',
10    currentBid: 0,
11    endDate: '',
12    image: null,
13  });
14  const [error, setError] = useState(null);
15
16  const { title, description, currentBid, endDate, image } = formData;
17
18  const onChange = (e) => {
19    if (e.target.name === 'image') {
20      setFormData({ ...formData, image: e.target.files[0] });
21    } else {
22      setFormData({ ...formData, [e.target.name]: e.target.value });
23    }
24  };
25
26  const onSubmit = async (e) => {
27    e.preventDefault();
28    setError(null);
29
30    const formDataObj = new FormData();
31    formDataObj.append('title', title);
32    formDataObj.append('description', description);
33    formDataObj.append('currentBid', currentBid);
34    formDataObj.append('endDate', endDate);
35    formDataObj.append('creatorId', user._id);
36    if (image) formDataObj.append('image', image);
37  }
```

Figure.2.3: Create Auction Syntax Module

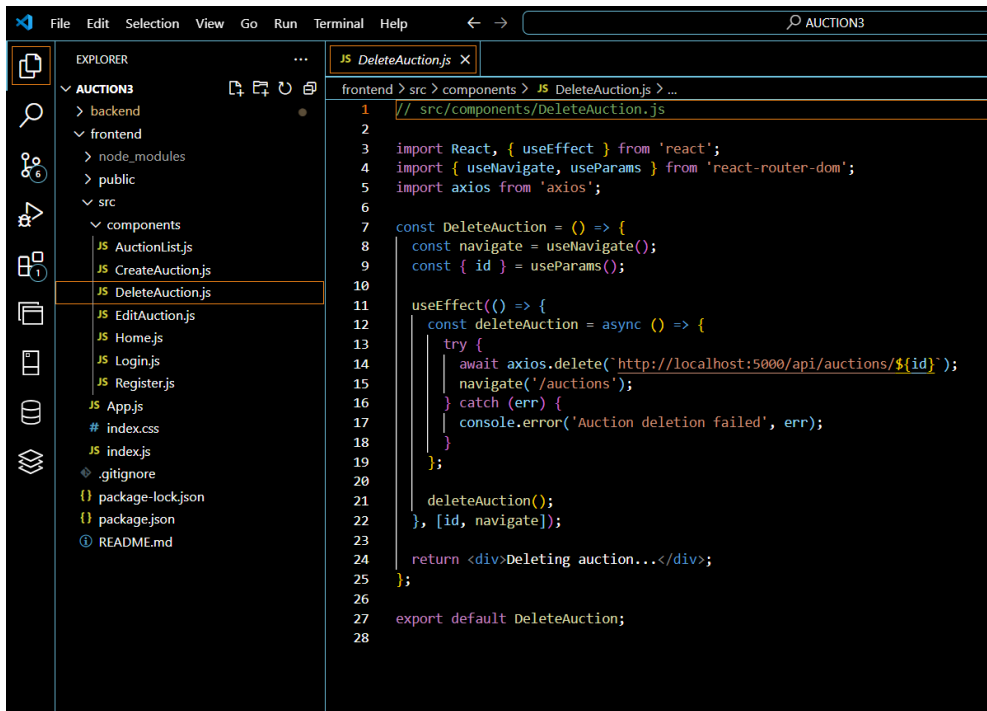
4.2.4 Edit Auction Module



```
1 import React, { useState, useEffect } from 'react';
2 import axios from 'axios';
3 import { useNavigate, useParams } from 'react-router-dom';
4
5 const EditAuction = () => {
6   const [title, setTitle] = useState('');
7   const [description, setDescription] = useState('');
8   const [currentBid, setCurrentBid] = useState('');
9   const [endDate, setEndDate] = useState('');
10  const [image, setImage] = useState(null);
11  const [imageUrl, setImageUrl] = useState('');
12  const navigate = useNavigate();
13  const { id } = useParams();
14
15  useEffect(() => {
16    const fetchAuction = async () => {
17      try {
18        const res = await axios.get('http://localhost:5000/api/auctions/${id}');
19        const auction = res.data;
20        setTitle(auction.title);
21        setDescription(auction.description);
22        setCurrentBid(auction.currentBid);
23        setEndDate(auction.endDate.split('T')[0]);
24        setImageUrl(auction.imageUrl);
25      } catch (err) {
26        console.error('Fetching auction failed', err);
27      }
28    };
29
30    fetchAuction();
31  }, [id]);
32
33  const handleSubmit = async (e) => {
34    e.preventDefault();
35
36    const formData = new FormData();
37    formData.append('title', title);
```

Figure.2.4: Edit Page Syntax Module

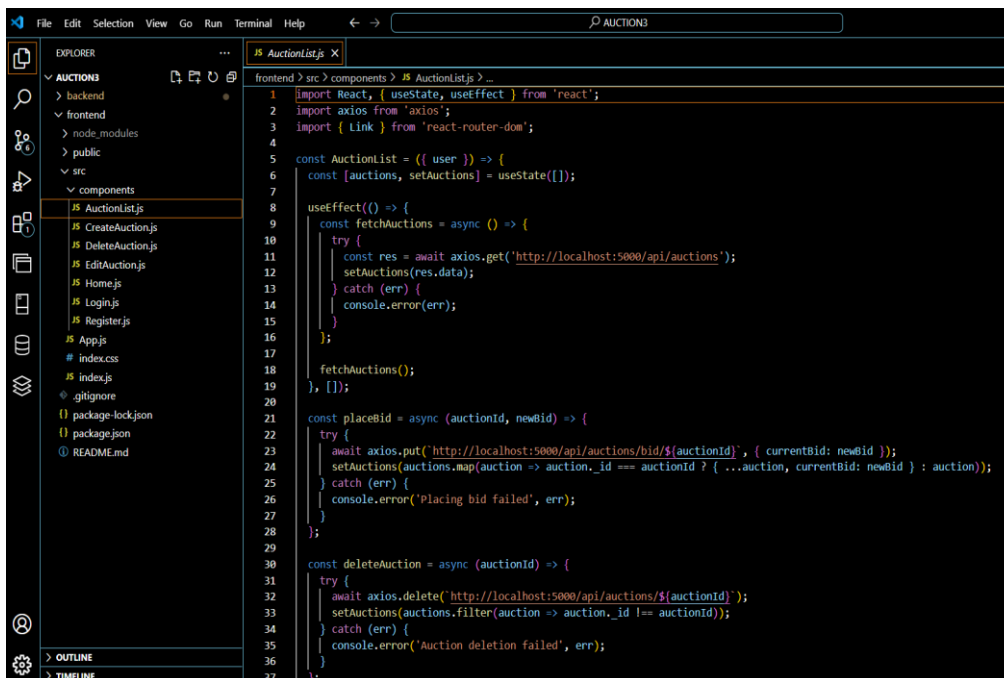
4.2.5 Delete Auction Module



```
1 // src/components/DeleteAuction.js
2
3 import React, { useEffect } from 'react';
4 import { useNavigate, useParams } from 'react-router-dom';
5 import axios from 'axios';
6
7 const DeleteAuction = () => {
8   const navigate = useNavigate();
9   const { id } = useParams();
10
11   useEffect(() => {
12     const deleteAuction = async () => {
13       try {
14         await axios.delete('http://localhost:5000/api/auctions/${id}');
15         navigate('/auctions');
16       } catch (err) {
17         console.error('Auction deletion failed', err);
18       }
19     };
20
21     deleteAuction();
22   }, [id, navigate]);
23
24   return <div>Deleting auction...</div>;
25 };
26
27 export default DeleteAuction;
28
```

Figure.2.5: Delete Auction Syntax Module

4.2.6 Auction List



```
1 import React, { useState, useEffect } from 'react';
2 import axios from 'axios';
3 import { Link } from 'react-router-dom';
4
5 const AuctionList = ({ user }) => {
6   const [auctions, setAuctions] = useState([]);
7
8   useEffect(() => {
9     const fetchAuctions = async () => {
10       try {
11         const res = await axios.get('http://localhost:5000/api/auctions');
12         setAuctions(res.data);
13       } catch (err) {
14         console.error(err);
15       }
16     };
17
18     fetchAuctions();
19   }, []);
20
21   const placeBid = async (auctionId, newBid) => {
22     try {
23       await axios.put('http://localhost:5000/api/auctions/bid/${auctionId}', { currentBid: newBid });
24       setAuctions(auctions.map(auction => auction._id === auctionId ? { ...auction, currentBid: newBid } : auction));
25     } catch (err) {
26       console.error('Placing bid failed', err);
27     }
28   };
29
30   const deleteAuction = async (auctionId) => {
31     try {
32       await axios.delete('http://localhost:5000/api/auctions/${auctionId}');
33       setAuctions(auctions.filter(auction => auction._id !== auctionId));
34     } catch (err) {
35       console.error('Auction deletion failed', err);
36     }
37   };
38
```

Figure.2.6: Auction List Syntax Module

4.3 Backend Implementation

4.3.1 RESTful APIs:

The backend of the Online Auction System is built on **Node.js** and **Express.js**, providing a RESTful API to handle various data operations such as user registration, authentication, auction management, and bidding functionality. The RESTful architecture ensures that the system is scalable, allowing for easy communication between the frontend and backend components. Key API routes include:

- **POST /register:** Registers a new user.
- **POST /login:** Authenticates the user.
- **GET /auctions:** Retrieves all active auctions.
- **POST /auctions:** Creates a new auction (for sellers).
- **PUT /auctions/**

Edits auction details.

- **DELETE /auctions/**

Deletes an auction.

- **POST /bid/**

Allows users to place a bid on an auction item.

These APIs ensure seamless interaction with the frontend, handling user input and data manipulation securely.

4.3.2 Data Handling and Security:

For data storage, **MongoDB** is used, offering a flexible and scalable NoSQL database solution. MongoDB's document-based structure is ideal for managing auction data, including:

- **User Information:** Stores user credentials, personal data, and roles (buyer or seller).

- **Auction Listings:** Stores details about auctions such as item names, descriptions, current bids, and durations.
- **Bidding Information:** Tracks bid histories, including the bidder's identity and bid amounts.

To ensure security, **JWT (JSON Web Tokens)** are used for user authentication, providing a secure and stateless method for verifying user identity on API requests. Additionally, **bcrypt** is used for password hashing, ensuring that sensitive data is securely stored.

4.4 Frontend Implementation

4.4.1 React.js:

The frontend of the Online Auction System leverages **React.js** to create a dynamic and responsive user interface. React's component-based architecture is used to build reusable UI elements such as auction lists, user profile pages, and bidding components. React's state management features allow for efficient updates to the user interface as auction statuses, bids, and user data change in real-time. Key components include:

- **AuctionList:** Displays all active and upcoming auctions.
- **AuctionDetails:** Shows the details of a selected auction, including the current bid and bid history.
- **CreateAuction:** Allows sellers to list new auction items.
- **BidAuction:** Displays a form for placing bids on an ongoing auction.
- **UserProfile:** Displays the user's registered information, auction history, and active bids.

4.4.2 UI/UX with Ant Design:

For a consistent and polished user experience, **Ant Design** components are utilized throughout the application. Ant Design provides pre-built, customizable UI elements

such as buttons, forms, tables, and modals, ensuring a clean and intuitive interface. For example:

- **Button components:** Used for actions like placing bids, submitting auctions, and navigating between pages.
- **Form components:** Used for user registration, login, and auction creation.
- **Table components:** Used to display auction listings and bid histories in a structured, easy-to-read format.
- **Modal components:** Used for confirmations, alerts, and user notifications.

4.5 GitHub for Version Control and Continuous Integration

4.5.1 Version Control:

GitHub is used to manage source code, enabling smooth collaboration among team members. Separate branches facilitate isolated feature development and bug fixes.

4.5.2 Continuous Updating:

Integration with GitHub's deployment pipeline ensures that every code change is automatically updated.

4.6 Implementation Screenshots

4.6.1 Registration and Login Module

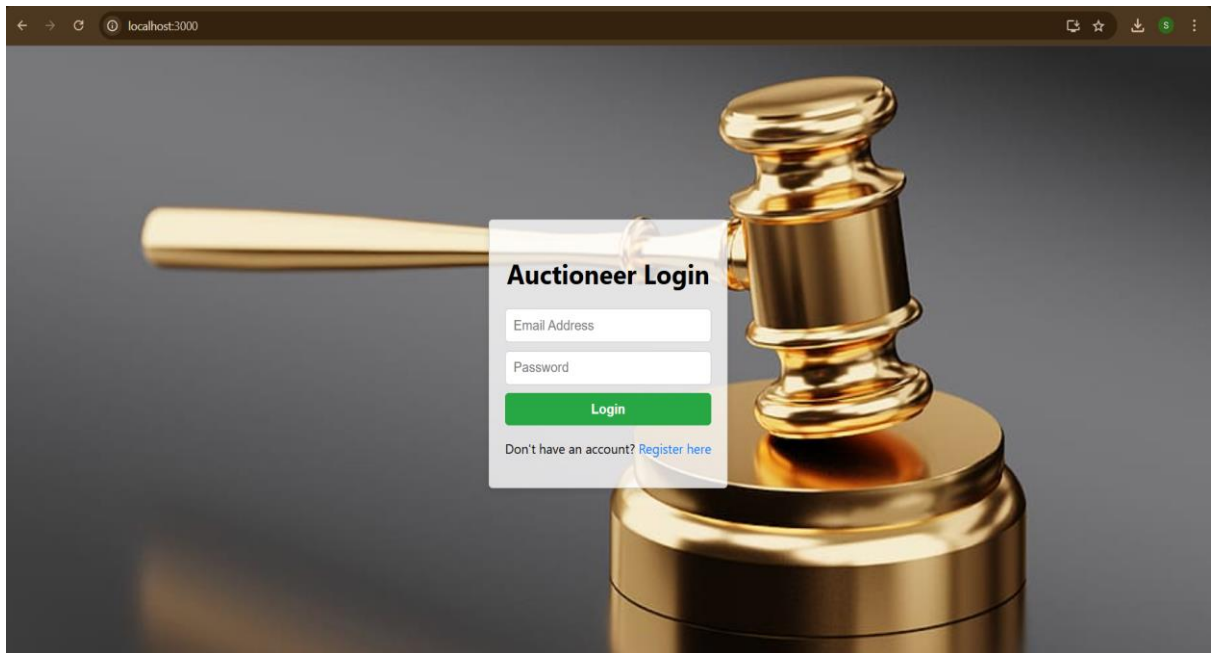


Figure.2.7.1: Login Module

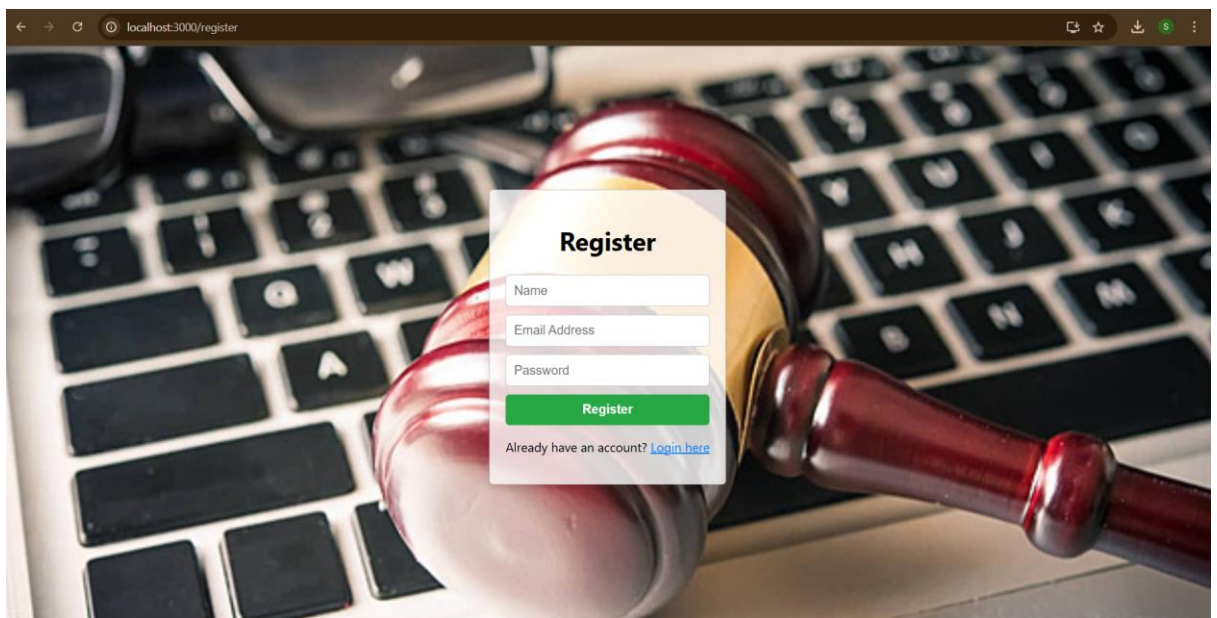


Figure.2.7.2: Registration Module

4.6.2 Home Page Module

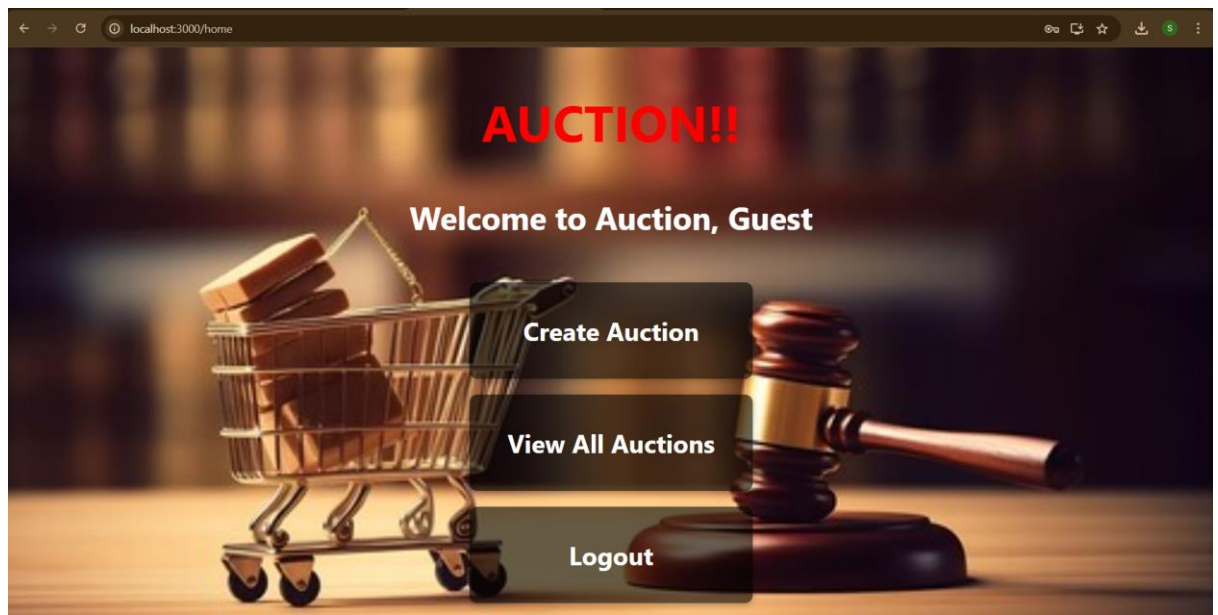


Figure.2.8: Home Page Module

4.6.3 Create Auction Module

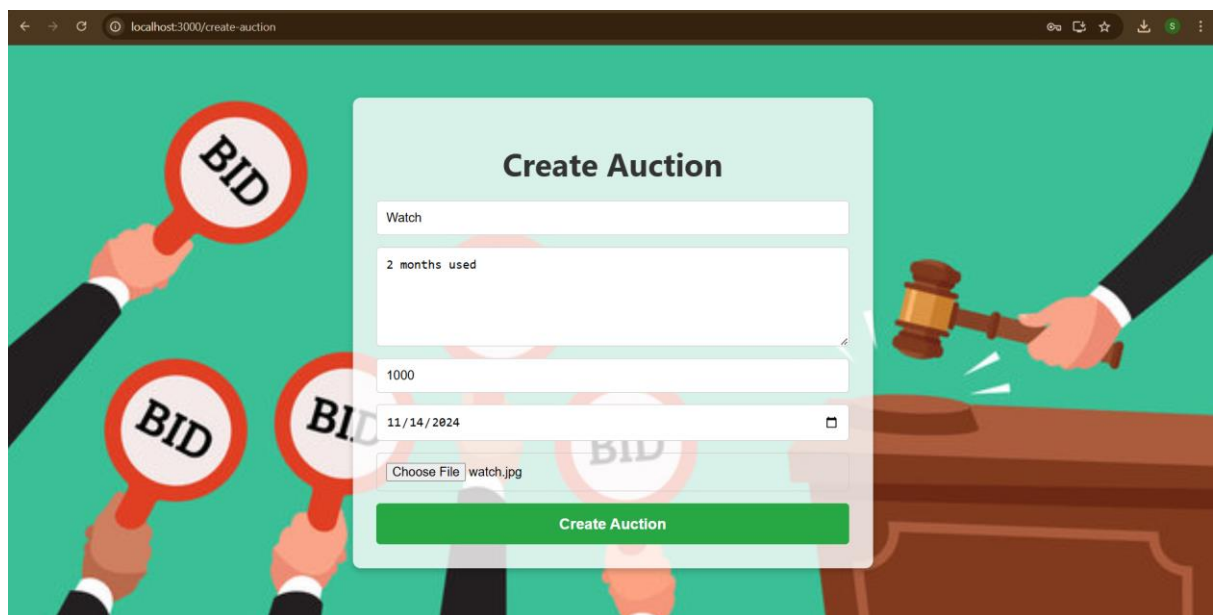


Figure.2.9: Create Auction Module

4.6.3 Delete Auction Module

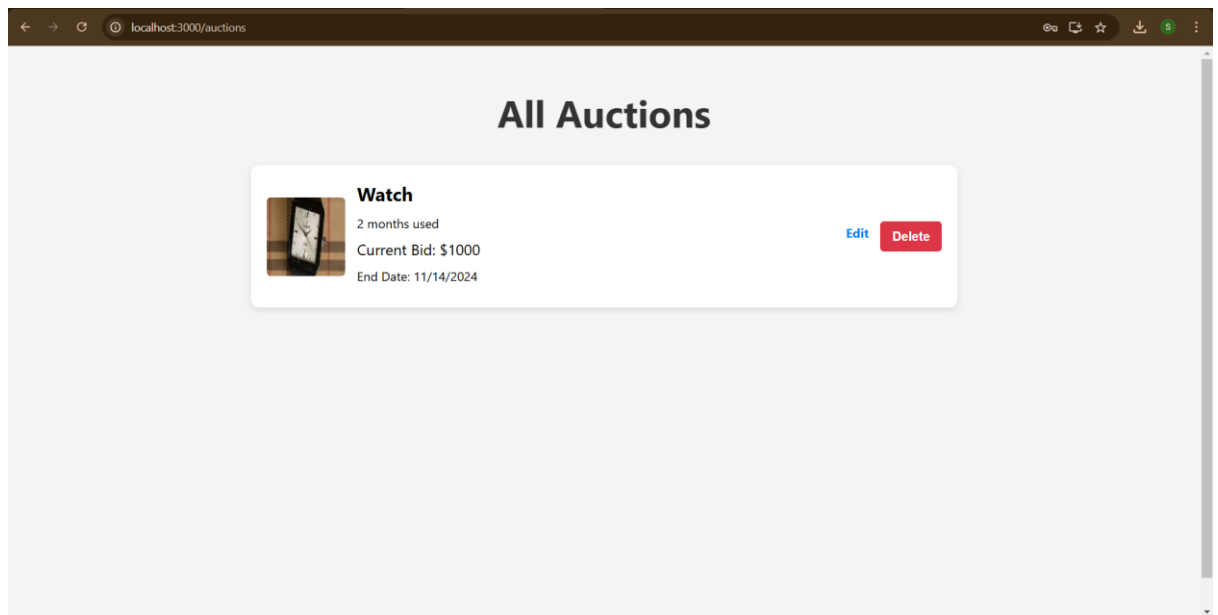


Figure.2.10: Delete Auction Module

4.6.4 Edit Auction Module

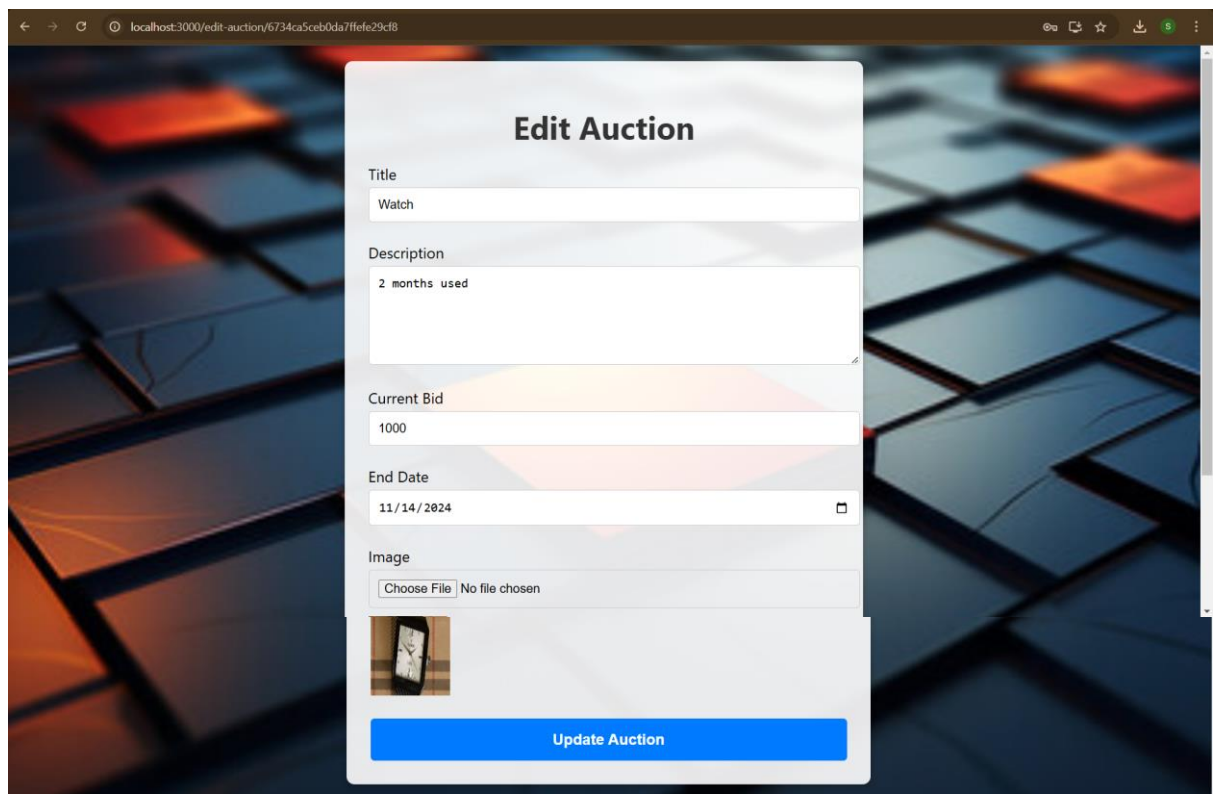


Figure.2.11: Edit Auction Module

4.6.5 Auction List Module

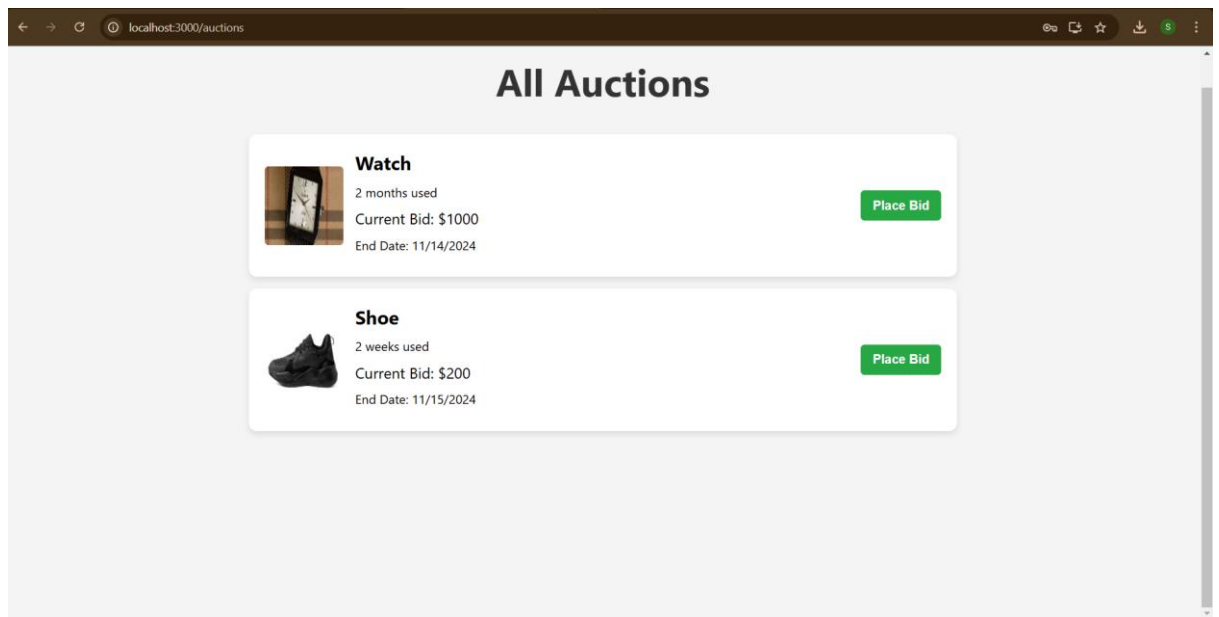


Figure.2.12: Auction List Module

4.6.6 BACKEND MONGODB – USERS MODULE

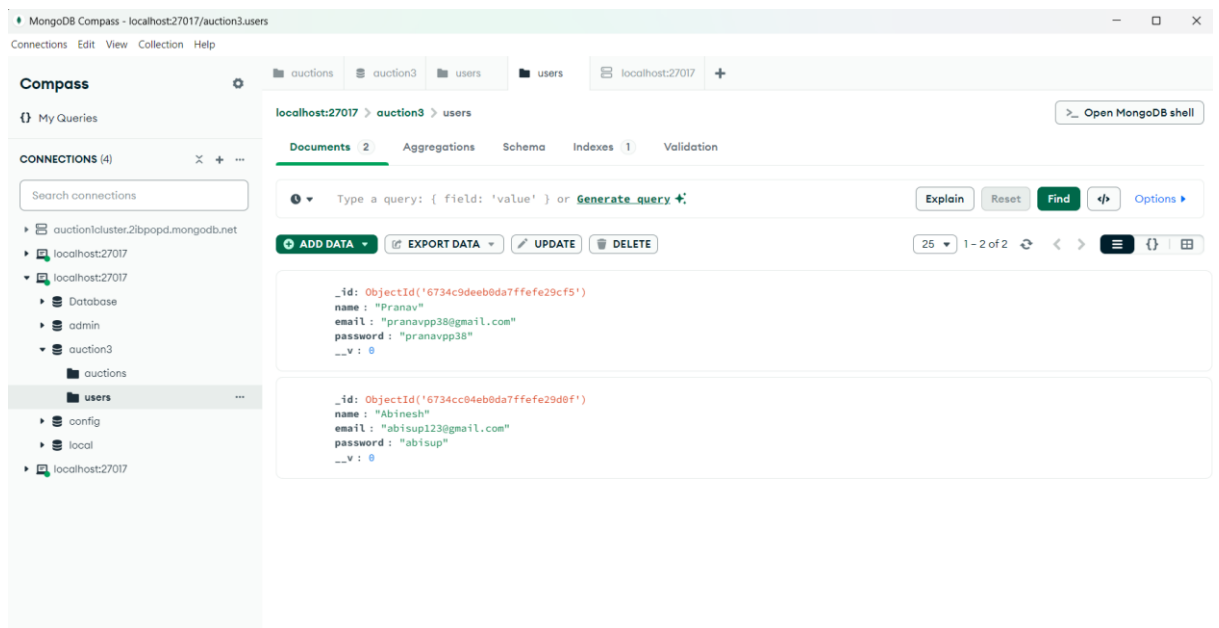


Figure.2.13: MongoDB Users Module

4.6.7 BACKEND MONGODB – AUCTION LIST MODULE

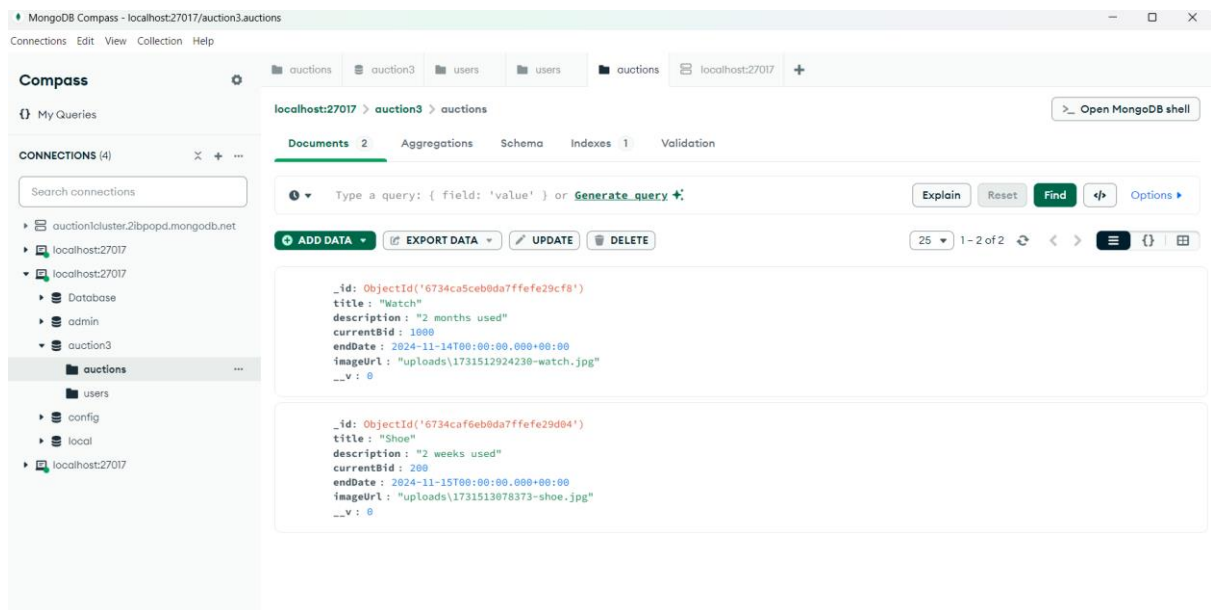


Figure.2.13: MongoDB Auction Module

5.TEST RESULTS

5.1 Test cases

Table.1.1: Test Cases for User Authentication

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
TC01	User Registration - Valid Input	Test the registration functionality with valid user details.	User is on the registration page.	1. Enter a valid username, email, and password. 2. Click on the "Register" button.	User is successfully registered, confirmation message displayed, redirected to login page.
TC02	User Registration - Invalid Input	Test the registration functionality with invalid or	User is on the registration page.	1. Enter invalid or incomplete details (e.g.,	System displays an error message indicating

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
		incomplete user details.		empty email or password). 2. Click on the "Register" button.	invalid or missing input. No registration occurs.
TC03	User Login - Valid Credentials	Test the login functionality with valid credentials.	User is on the login page and is registered.	1. Enter a valid username and password. 2. Click the "Login" button.	User is logged in successfully and redirected to the home page.
TC04	User Login - Invalid Credentials	Test the login functionality with incorrect credentials.	User is on the login page.	1. Enter an incorrect username or password. 2. Click the "Login" button.	System displays an error message indicating incorrect credentials. No login occurs.
TC05	User Login - Empty Fields	Test the login functionality with empty input fields.	User is on the login page.	1. Leave the username and password fields empty. 2. Click the "Login" button.	System displays an error message indicating that fields cannot be empty. No login occurs.

Table.1.2: Test Cases for Auction Management

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
TC06	Create Auction	Test the auction creation functionality	User is logged in and is on the	1. Enter valid auction details (item name, description,	Auction is successfully created and added to the list

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
	- Valid Input	with valid details.	create auction page.	starting bid, etc.). 2. Click the "Create Auction" button.	of active auctions.
TC07	Create Auction - Invalid Input	Test the auction creation functionality with invalid or incomplete details.	User is logged in and is on the create auction page.	1. Leave required fields empty or enter invalid data. 2. Click the "Create Auction" button.	System displays an error message indicating invalid or missing details. No auction is created.
TC08	Edit Auction - Valid Input	Test the auction edit functionality with valid changes.	User is logged in as the auction creator and is on the edit auction page.	1. Modify valid auction details (e.g., starting bid, description). 2. Click the "Save Changes" button.	Auction details are successfully updated and saved.
TC09	Edit Auction - Invalid Input	Test the auction edit functionality with invalid changes.	User is logged in as the auction creator and is on the edit auction page.	1. Enter invalid data (e.g., negative starting bid). 2. Click the "Save Changes" button.	System displays an error message indicating invalid input. No changes are saved.
TC10	Delete Auction - Valid Input	Test the auction deletion functionality.	User is logged in as the auction creator and is on the auction details page.	1. Click on the "Delete Auction" button. 2. Confirm the deletion.	Auction is successfully deleted from the list.
TC11	Delete Auction	Test the auction deletion functionality by	User is logged in as a non-creator and is on	1. Click on the "Delete Auction"	System displays an error message

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
	- Invalid Input	trying to delete an auction as a non-owner.	an auction details page.	button. 2. Attempt to confirm deletion.	indicating that the user is not authorized to delete the auction.

Table.1.3: Test Cases for Bidding

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
TC12	Place Bid - Valid Input	Test the bidding functionality with valid bid details.	User is logged in and is on an auction details page with an active auction.	1. Enter a valid bid amount greater than the current bid. 2. Click the "Place Bid" button.	Bid is successfully placed, current bid is updated, and user is notified of successful placement.
TC13	Place Bid - Invalid Input	Test the bidding functionality with an invalid bid amount (e.g., less than current bid).	User is logged in and is on an auction details page with an active auction.	1. Enter an invalid bid amount (e.g., less than the current bid). 2. Click the "Place Bid" button.	System displays an error message indicating that the bid is lower than the current bid. No bid placed.
TC14	Place Bid - Empty Bid Amount	Test the bidding functionality with an empty bid amount.	User is logged in and is on an auction details page with an active auction.	1. Leave the bid amount field empty. 2. Click the "Place Bid" button.	System displays an error message indicating that the bid amount cannot be empty. No bid placed.
TC15	Real-Time Bid Update	Test the real-time bidding feature by placing a bid	User is logged in and is on an auction details	1. Place a bid. 2. Refresh the auction details page	The auction page updates in real-time to reflect

Test Case ID	Test Case Name	Test Description	Precondition	Test Steps	Expected Result
		during an active auction.	page with an active auction.	or observe the real-time update of the auction.	the new bid amount.

6.RESULTS AND DISCUSSIONS

The Auction System, developed using React, CSS, MongoDB, and Node.js, has been successfully implemented and is actively used by participants to engage in online auctions. One of the key benefits of the system is its ability to allow users to browse, create, edit, and delete auctions with ease, providing full control over their listings. Sellers can set starting bids, auction durations, and other relevant details, while buyers can place bids on active auctions in real time. The system also provides a user-friendly registration and login process, ensuring secure access to the platform.

A significant feature of the Auction System is its dynamic bidding experience, where users can view the current bid, countdown timer, and auction status in real-time, enhancing the overall auction engagement. The system also includes an "Add Auction" feature for sellers to quickly list new items and an "Auction List" page to browse ongoing and upcoming auctions. For security and user satisfaction, the platform ensures data protection, offering secure transactions and a transparent bidding process.

Overall, the Auction System is a valuable tool for both buyers and sellers, providing a reliable, efficient, and secure platform to participate in online auctions. It streamlines the auction process and promotes a seamless user experience, enabling users to easily manage their auctions and bids.

7.CONCLUSION AND FUTURE WORK

7.1 Conclusion

The Online Auction System provides a dynamic and secure platform for users to participate in auctions from any location, overcoming the limitations of traditional, physical auctions. By leveraging the MERN stack (MongoDB, Express, React, Node.js), this project achieves a seamless integration between frontend and backend components, delivering a responsive and user-friendly interface. The system includes essential features like user authentication, real-time bidding, and auction management, creating a trustworthy environment for buying and selling goods. This solution successfully meets the core objectives by providing accessibility, scalability, and flexibility, making it a viable choice for modern online auctions.

7.2 Future Work

While the Online Auction System fulfills its primary goals, several enhancements can improve its functionality and user experience in the future:

- **Mobile Application:** Develop a mobile app version to expand accessibility and allow users to participate in auctions conveniently on mobile devices.
- **Advanced Bidding Features:** Add functionality for proxy bidding, where users can set maximum bids in advance, and the system automatically bids on their behalf.
- **Integration with Payment Gateways:** Incorporate secure payment options to facilitate transactions within the platform, streamlining the post-auction payment process.
- **Enhanced Security Measures:** Implement two-factor authentication and encryption for sensitive data to further secure user accounts and transactions.
- **User Feedback and Rating System:** Introduce a rating system for buyers and sellers to improve trust and transparency.
- **Auction Analytics:** Provide sellers with detailed analytics on auction performance, including bid frequency and final bid statistics.

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