An AI and Blockchain-Based Auction Platform for Vintage Items

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Abstract – *The growing demand for vintage goods is driven by factors such as sustainability, nostalgia, and collectible value. This paper presents a web-based auction platform tailored specifically for vintage items, addressing the limitations of conventional e-commerce systems. The platform integrates real-time bidding features, blockchain-based provenance tracking, and AI-powered price prediction to ensure transparency, user trust, and scalability. Built using the MERN stack (MongoDB, Express.js, React.js, Node.js), the system offers a secure, responsive, and user-friendly interface. This approach not only enhances user engagement but also supports the preservation and responsible trading of culturally significant vintage artifacts.*

Key Words: **Vintage Items, Online Auction, Blockchain, Artificial Intelligence, Provenance, Bidding System, Digital Preservation, Web Platform.**

1. INTRODUCTION

The vintage market has evolved from physical flea markets to digital platforms. With growing interest in sustainability and heritage preservation, this project proposes a specialized online auction system for vintage items. The platform bridges collectors, sellers, and institutions with advanced tools for authentication, cataloging, and secure transactions.

2. OBJECTIVES

The Bid-Bud was developed with the following objectives:
1. **Build a Secure, Scalable Auction System:** Designed specifically for vintage goods with trust and performance in mind.
2. **Incorporate Blockchain for Provenance Tracking:** Ensure item authenticity and transparent ownership history.
3. **Provide AI-Based Predictions for Item Valuation** Help users make informed decisions by estimating market value.
4. **Enable Real-Time Bidding with Responsive UI:** Offer a competitive and engaging user experience for auctions.

5. **Support Multimedia Cataloging :** Allow rich item listings with detailed metadata for accurate discovery.

How Achieved: Data accuracy is maintained through AI-driven item verification and metadata tagging. Redundancy is minimized by a unified, normalized database schema. Scalability is supported by a modular MVC-based architecture and cloud deployment

3. MODULES OF PROJECT

Module 1: Admin module User Management.
- User & listing verification
- Report generation, moderation
- Dispute resolution and compliance tools
- **Purpose:** Provides centralized control over users, content moderation, and ensures trust through verified listings.
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Module 2 : Seller Module
- List vintage items with images/videos
- Set auction parameters
- Track bids and buyer inquiries
- **Purpose:** Allows sellers to manage vintage listings with rich multimedia and configure auction settings; ensures item metadata is accurate and complete.

Module 3: Buyer Module
- Browse vintage listings
- Participate in real-time auctions
- View provenance and AI-predicted item values
- **Purpose:** Facilitates a secure and engaging user experience through real-time bidding and transparent access to item history and value insight.

Module 4: AI Module
- AI: Predict price trends, detect counterfeits
- Blockchain: Immutable history of item ownership
- **Purpose:** Enhances data authenticity, minimizes fraud, and enables trust via smart AI analytics and blockchain-based provenance.

Module 5: UI/UX Module
- Responsive design for web/mobile
- Real-time auction experience with countdown and alerts
- **Purpose:** Ensures accessibility and usability across devices; provides a smooth, interactive bidding experience.

4. SECURITY AND PRIVACY

The incorporates robust security measures:
- **Role-Based Access Control (RBAC):** Permissions are granted based on user roles (e.g., admin, buyer, seller), ensuring that users can only access features relevant to their responsibilities.
- **Blockchain Provenance:**
  Every item's ownership and transaction history is recorded on a tamper-proof blockchain ledger, ensuring transparency and trust.
- **AI Fraud Detection:**
  Machine learning algorithms analyze item details and patterns to detect potential counterfeits or suspicious listings in real time.
- **HTTPS & JWT:**
  HTTPS encrypts all data transfers between client and server, while JWT (JSON Web Tokens) ensures secure, token-based user authentication and session management

Enhancement: Future iterations could adopt more robust HTTPS protocols, introduce routine security audits, and integrate advanced monitoring tools to proactively detect vulnerabilities.

5. REQUIREMENT

The development of the CMS utilized the following hardware and software resources:

Name of Equipment	Specification	Cost	Available
Laptop / Desktop	I5 processor, 4 GB RAM, Mouse, 500 GB HDD	Rs. 55,000	Yes
Operating System	Windows 10 proper setup	-	Yes
Visual studio code	17.0	Free	Yes
Git	Latest Version	Free	Yes
React	React.js	Free	Yes
Node.js and npm	Latest LTS version	Free	Yes
Firefox/Chrome	Latest version	Free	Yes
Localhost	3000(React),27017(Mon goDB), 5000(Express backend)	Free	Yes
Postman(API testing)	Latest version	Free	Yes
Total		**Rs 55,000**	

Table: Materials used.

These resources ensured a cost-effective and efficient development process.

Note: Tools were chosen for their cost-effectiveness, compatibility Mern Stack and widespread use in academic projects.

6. DIAGRAMS

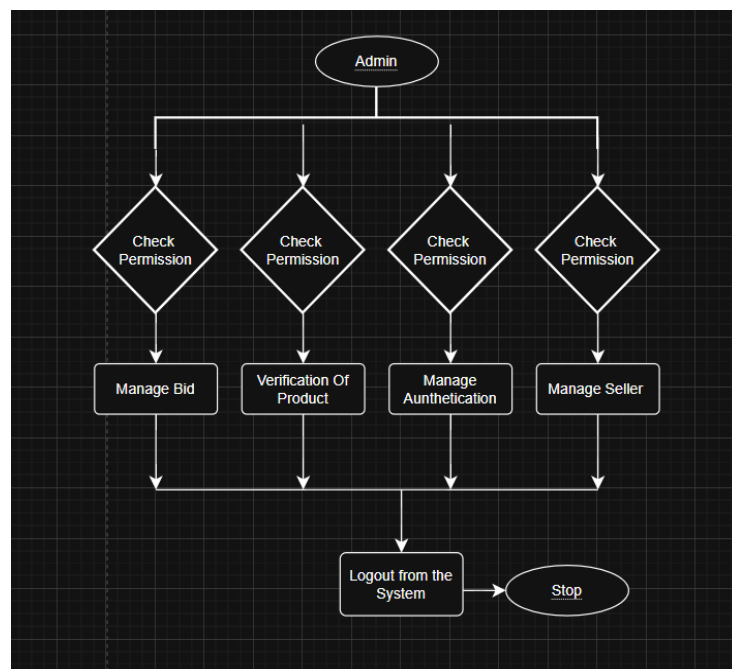This paper includes activity diagrams for each module to illustrate workflows:

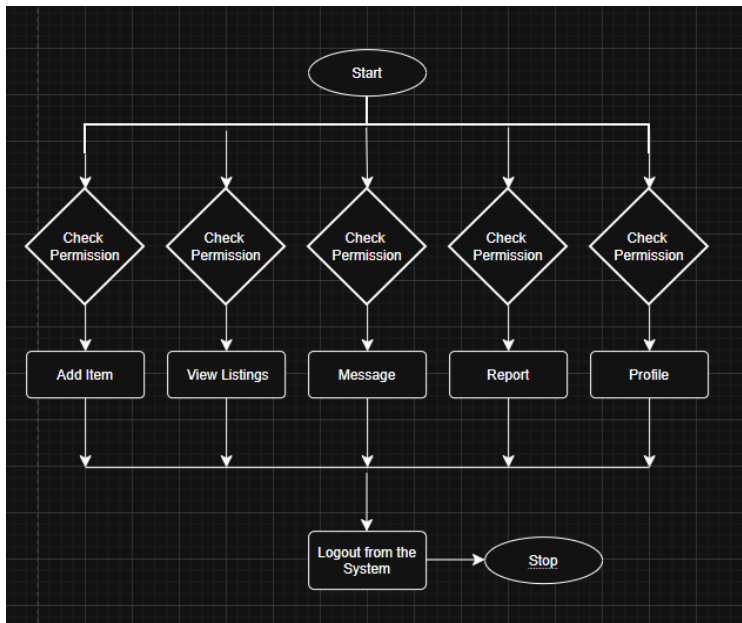Fig. 1: Admin Panel Activity Diagram

Fig. 2:Seller Panel Activity Diagram

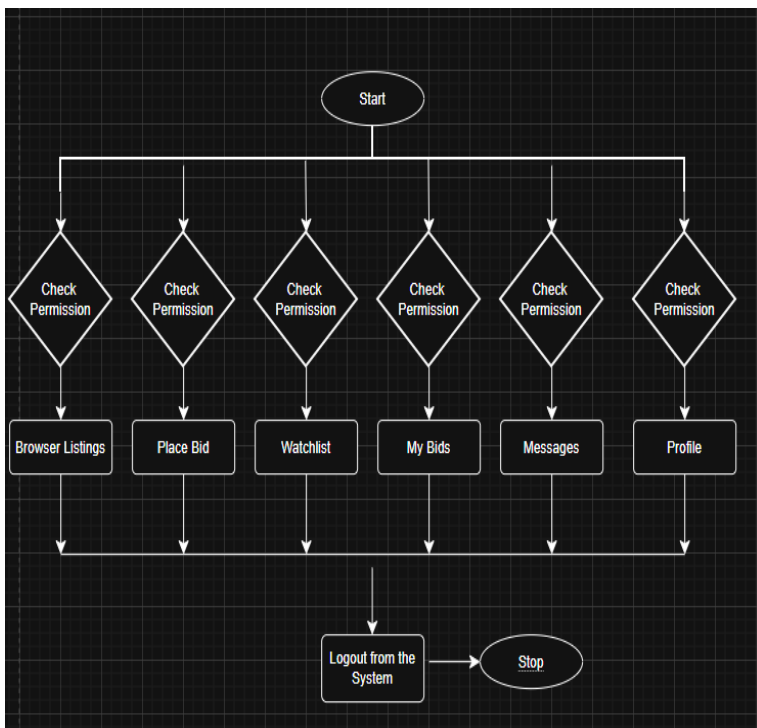
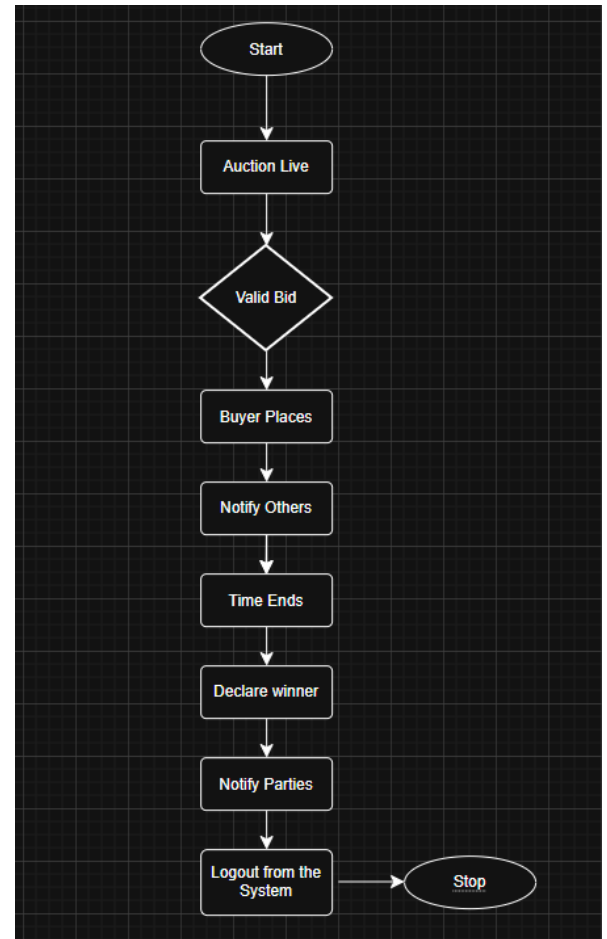Fig. 4: Auction Panel Activity Diagram

Fig. 3: Buyer Panel Activity Diagram

7. RESULT AND DISCUSSION

The deployement of the Bid Bud yielded significant improvements:

- The platform enabled real-time bidding with countdown timers, leading to higher buyer engagement and competitive participation.

- Blockchain-based provenance tracking ensured transparent and tamper-proof ownership records, increasing user trust.

- AI fraud detection helped identify suspicious listings, reducing the risk of counterfeit items on the platform.

- Users reported a smooth and intuitive experience due to the responsive UI and advanced search/filter features.

- The system performed reliably under multiple concurrent bidding sessions, confirming its scalability for moderate traffic.

- The platform supported the broader goal of vintage preservation by promoting the reuse and responsible trading of historical items.

8. CONCLUSION

The vintage auction platform successfully addresses the need fora secure, scalable, and user-friendly system tailored specifcally for vintage item trading. By integrating blockchain technology, the platform ensures transparent and tamper-proof Provenance tracking, which builds trust among users. The of AI-based features such as value prediction and fraud detection Enhances both the intelligence and reliability of the system. Developed using modern web technologies and a modular architecture, the platform is easy to maintain and capable of handling increased user demand. Beyond its technical strength, the system also promotes sustainability and by facilitating the Responsible reuse of vintage items.

9. REFERENCES

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