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Automated Baggage Storage System

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Abstract: ***This is highlights the potential of the Automated Baggage Stage Solution to revolutionise the baggage management process, offering benefits such as increased operational efficiency, enhanced passenger experience, and improved security. Implementing this innovative solution has the potential to redefine the way travel facilities handle baggage, ultimately contributing to a more seamless and enjoyable travel experience for passengers worldwide. Passengers can effortlessly drop off their luggage at designated terminals, where the system automatically categorises, tags, and stores the bags in a secure and organised manner. When passengers are ready to retrieve their belongings, they can input their unique identification code, and the ABSS will promptly locate and retrieve the specific luggage item.***

Keywords: IoT, Telecommunication, Smart Locker, Security & Privacy.

Abbreviations:
KYC: Know Your Customer
ABSS: Automated Baggage Storage Solution

I. INTRODUCTION

In the ever-evolving travel landscape, efficient baggage management is a crucial component for enhancing the user experience. This research project revolves around a web-based Automated Baggage Storage System (ABSS), designed to simplify and elevate luggage management in public spaces. Motivated by the necessity to streamline travel processes, empower public areas, and improve user satisfaction, the project adopts a comprehensive approach. With a focus on advanced security measures and user-friendly features, the research presents a robust system architecture that employs modern web technologies. The objectives encompass enhancing travel convenience, maximising space utilisation, enhancing security, promoting sustainable travel, and improving accessibility.

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By blending inspiration from successful global practices and leveraging cutting-edge technology, this project aspires to contribute to the evolution of baggage management systems, shaping a more efficient and user-centric future for travel-related services.

II. LITERATURE REVIEW

We reviewed more than 10 reference papers for "Automated Smart Baggage Storage System".

In [1], numeric codes, tracking numbers, customer login credentials, barcodes & QR Codes are used as authentication methods.

[2] advocates the use of bluetooth along with passwords for the opening of a locker as a verification mechanism.

Automated pin generation is used in [3] to increase the security of locks without adding extra burden on the users.

[4], [7] both use OTPs to implement customer authentication [8] uses face recognition along with OTPs.

We drew inspiration from coin lockers in Japan, which are widely available for public use and are extremely popular in the country. Its detailed working and customer journey are elucidated in [5].

[6] uses RFID and Password authentication for implementing a 2-level security for the retrieval of luggage.

III. PROPOSED METHODOLOGY

Our project is designed as a web-based Baggage storage system, comprising a client-side interface and a server-side backend. The system architecture includes components for User Registration, User Authentication, Locker Selection and Payment Interface.

A. User Request and Locker Assignment

The process begins when a user requests a storage locker through the system's interface. The user is authenticated, selects locker size and duration, and provides payment information. The system checks availability, assigns an appropriate locker, and generates an access code for the user. The user receives their unique access code or QR code to open the designated locker.

B. Luggage Placement and Monitoring

The user places their luggage in the assigned locker and securely closes it.
Sensors within the locker detect the presence of luggage and environmental conditions. Surveillance cameras and alarms monitor the storage area for security breaches.

C. User Access

Users can track the status of their stored luggage and the security of the storage area in real-time. The system verifies user requests and provides access to the assigned locker upon confirmation.

D. Payment Processing and Locker Reset

The system automatically charges the user's payment method based on the storage duration. After the user removes their luggage, the locker is reset for the following user, ensuring it is empty and ready for use.

We have utilized modern web technologies such as HTML5, CSS3, and JavaScript to develop user interfaces, ensuring cross-browser compatibility and responsive design.

The server-side logic is built using Node.js, while Express.js is employed for routing and API development. MongoDB is the primary database system, offering scalability and flexibility.

To ensure data security, we have implemented the JWT technique for user authentication to check the role of the user and encryption techniques for sensitive data storage.

IV. STAGES OF ALGORITHM

A. Problem Statement

Develop an automated baggage storage system to enhance the efficiency and reliability of luggage handling in transportation hubs, such as airports. This system aims to streamline baggage check-in, storage, and retrieval processes while minimizing wait times and human errors. Key features include automated storage and retrieval, intelligent tracking, and seamless integration with existing infrastructure.

B. Algorithm Initialisation

i. Initially, we create one or more admin accounts by using the register button located on the homepage.

ii. Next, we establish locations for locker systems by inputting their names, dimensions, and the number of rows and columns they will contain.

iii. Next, users will be able to create their accounts by providing basic information such as their name, phone number, and email address.

iv. Then, users can browse through all available lockers to store their luggage, where they can see which lockers are available, rented, or undergoing maintenance.

v. Users will then have the option to rent any available lockers. However, for security purposes, their request must be accepted and verified by an admin account before finalising the rental process.

vi. If a user fails to collect their luggage before the stipulated checkout time, the admin reserves the right to cancel the rental and clear out the belongings.

vii. The admin can oversee the entire process through the admin portal, where they can monitor active, expired, checked-out, and abandoned lockers.

C. Complexity Analysis

The rental process is designed to be seamless and user-friendly for both administrators and users. Complexity is minimised at every stage, while still offering a wide range of functionalities for administrators to efficiently monitor the entire locker system.

D. Experimental Validation

We have conducted comprehensive white box, integration, and unit testing on our entire portal. Additionally, we have included images of our operational portal for reference, demonstrating successful performance across all parameters.

V. IMPLEMENTATION

A. Technology Stack

i. *PHP Composer*: Utilised PHP Composer as the dependency manager to facilitate the installation and management of PHP packages for the project.

ii. *PostgreSQL:* Choose PostgreSQL as the database management system due to its scalability, ACID compliance, and support for complex data types.

B. Database Schema

i. Defined the database schema in PostgreSQL to store locker system data, including tables, columns, and relationships representing the locker grid, available lockers, rented lockers, and user information.

C. Logic System Logic

i. *Admin Interface:* Implemented an admin interface in PHP to create the locker system, utilizing a nested array structure to represent the locker grid.

ii. *User Interface:* Developed a user interface for users to interact with the locker system, allowing them to view the grid, select available lockers, and complete rental

iii. *Backend Logic:* Implemented PHP backend logic to manage locker rentals, including input validation, database updates, and concurrency handling.

D. Integration and Deployment

i. Managed PHP Composer dependencies and integrated them into the project, deployed the system by configuring servers and databases, and set up necessary environment variables.

VI. BLOCK DIAGRAMS

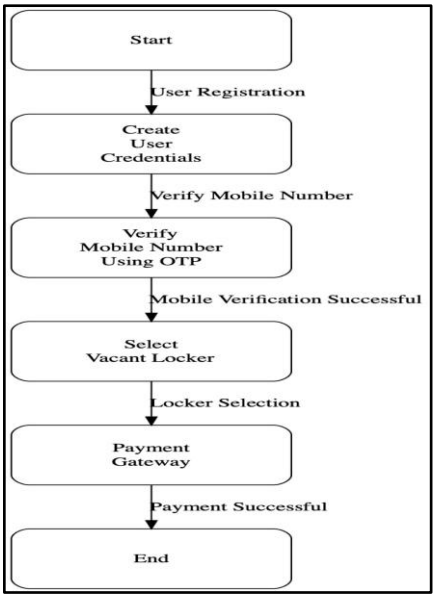

Diagram 1: Luggage Storage Block Diagram

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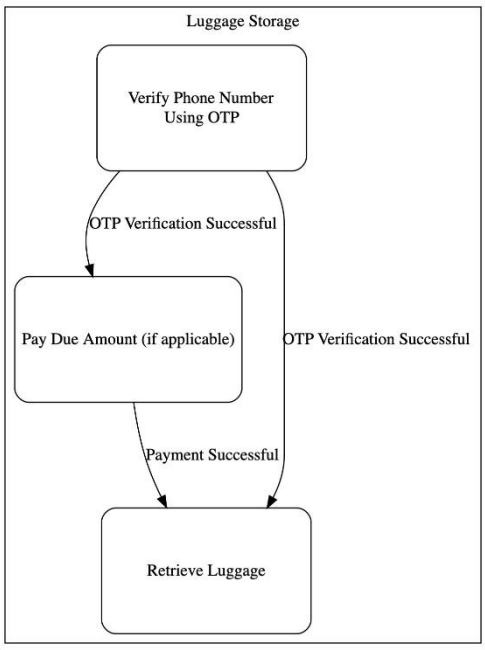


Diagram 2: Luggage Retrieval Block Diagram

VII. RESULTS

A. Enhanced User Experience

Users are provided with a better UI than competitors. A remarkably optimised layout is provided, making the rental experience very seamless.

B. Reduced Errors

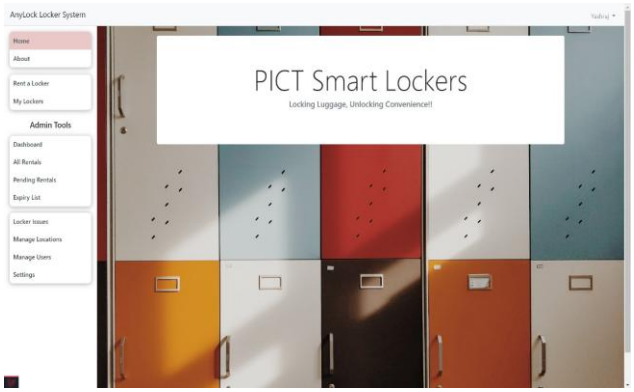
Due to the automated rental process, the probability of errors is drastically reduced. Users can accurately find and rent lockers which are available for use and see which ones are engaged or under maintenance.

C. Improved Security

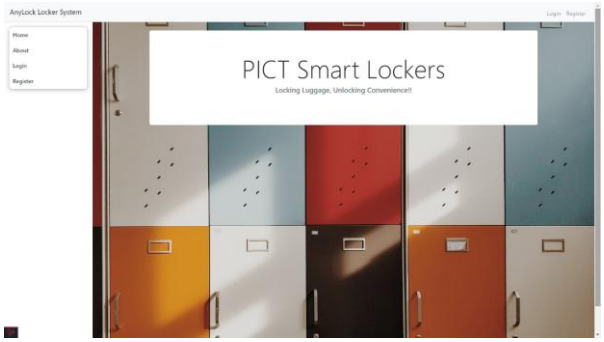
Due to a foolproof system in place, the portal is highly secure, and user details are safely stored with us and are highly protected against hacks and predatory attacks.

D. Scalability

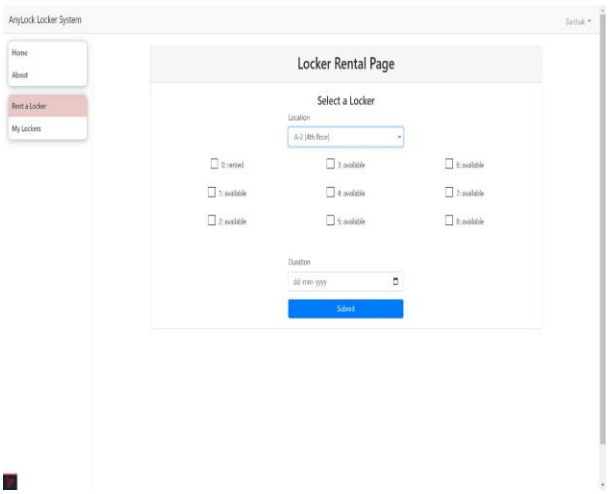
A large number of admin and user accounts can be created, and a considerable number of locker locations can also be added. Our portal can easily handle a large number of data points for processing, ranging from users and admins to locker locations, rental details, and the status of every locker in every area.



[Fig.1: Admin Main Login Page]

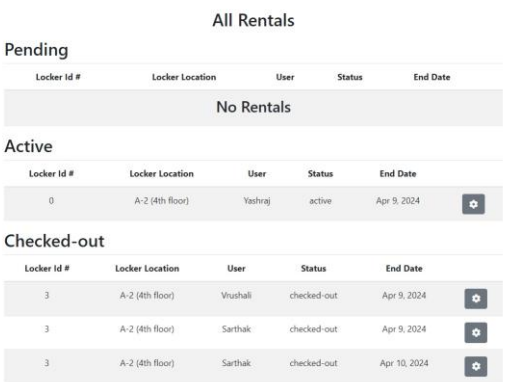


[Fig.2: User Main Login Page]



[Fig.3: Locker Rental Page]

[Fig.4: Pending Rentals Page]



[Fig.5: Admin All Rentals Page]

VIII. CONCLUSION

In conclusion, the Automated Baggage Storage Solution (ABSS) represents a transformative leap in baggage management for travel facilities worldwide. Its potential to enhance operational efficiency, passenger experience, and security cannot be overstated. By streamlining the baggage drop-off and retrieval process, ABSS promises a future where

passengers can enjoy a seamless and stress-free travel experience. With the ability to effortlessly store and retrieve luggage items in a secure and organised manner, this innovative solution has the power to redefine how we approach baggage handling in the travel industry. As we look ahead, the ABSS offers a promising vision of travel made easier, more efficient, and more enjoyable for passengers everywhere.

FUTURE SCOPE

In the realm of automated baggage storage solutions, there exists a promising avenue for future enhancements that aim to augment user experience and system functionality further. One such avenue involves integrating a secure payment gateway, which facilitates seamless transactions for users renting lockers. By incorporating a payment gateway, users can easily complete rental payments online, streamlining the process and enhancing convenience. Additionally, the implementation of Know Your Customer (KYC) protocols presents another valuable opportunity for advancement. Introducing KYC procedures for new users ensures enhanced security and regulatory compliance, fostering trust and confidence in the system. Through robust KYC verification, the system can verify the identity of users, mitigating the risk of fraudulent activities and safeguarding user data. Moreover, the integration of KYC functionality aligns with industry best practices, elevating the overall credibility and reliability of the automated baggage storage solution. Embracing these future enhancements not only enriches the user experience but also fortifies the system's capabilities, paving the way for continued innovation and growth in the dynamic landscape of transportation infrastructure.

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DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted with objectivity and without any external influence.
- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Author's Contributions:** The authorship of this article is contributed equally to all participating individuals.

REFERENCES

1. Borwankar, Janak and Pandit, Sanika and Patel, Vilok and Nirmal, J. H., IOT-Based Smart Warehouse Monitoring System (May 28, 2023). Available at SSRN: https://ssrn.com/abstract=4461490 or DOI: https://dx.doi.org/10.2139/ssrn.4461490
2. Bharatiraja, C. & Chittoor, Prithvi, & Bhargava, Yash. (2023). An IoT-based centralised smart locker using RFID technology. AIP Conference Proceedings. 2427. DOI: https://dx.doi.org/10.1063/5.0101139
3. Raihanah, N., & Syafariani, R. F. (2019). Coin Lockers as a Technology-Based Public Facility. In IOP Conference Series: Materials Science and Engineering (Vol. 662, Issue 3, p. 032047). IOP Publishing. DOI: https://doi.org/10.1088/1757-899x/662/3/032047
4. Naik, Chaitanya & Pandit, Sakshi & Gokhale, Sudhanva & Kulkarni, Mihir. (2021). IoT-Driven Smart Storage Solutions for Managing Volatile Resources in Hospitals. https://www.researchgate.net/publication/354477320
5. Mostakim, Md. Niaz, & R. Sarkar, Ratna, & Hossain, Md. (2019). Smart Locker: IoT-based Intelligent Locker with Password Protection and Face Detection Approach. International Journal of Wireless and Microwave Technologies. 9. 1-10. DOI: https://doi.org/10.1088/1757-899x/662/3/032047
6. Kook, Joongjin. "Design and Implementation of an OTP-based IoT Digital Door-lock System and Applications. https://www.ripublication.com/irph/ijert19/ijertv12n11_02.pdf
7. P V L N Phani, O Narendra Kumar Reddy, R Manisha Reddy, 'Keypad Based Bank Locker Security System Using GSM Technology' (2015). https://www.ijres.org/papers/Volume%203/v3-i1%20Ver%202/I03014853.pdf
8. Anand, Abhijeet. (2021). IOT-based Bank Locker. International Journal for Research in Applied Science and Engineering Technology. 9. DOI: https://doi.org/1248-1253.10.22214/ijraset.2021.35257.