

Smart Department Library BMS

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ABSTRACT

The convention library book management system development in academic institutions or department is often physical record keeping, inefficient, low security, leading to inaccurate tracking and user inconvenience. This paper proposes a smart department library book management system. The smart department library book management system acts as a tool to handover traditional libraries into smart libraries. The smart department library assist the librarians to work easily. The single computer stores all data. The users need not stand in a queue for extended duration to issue/return book. It creates an automated circulation process. The users easily track the book accessibility. The smart department library equipped with function to add or remove of student and book information. The smart department library keep a record of issue/return dates along with the corresponding times for students. It will automatically send notifications to students before the due date.

Keywords: IOT module, Fingerprint module, ARDUINO UNO, 2*16 LCD, RFID card reader/tag, Regulator, Battery unit 12DC /7Ah

INTRODUCTION:

In every institution or division, the library is an important place where students and staff can find useful books and study materials. In many departments, the book issue and return process is still done by hand, which takes more time and exertion. Keeping records by hand often leads to errors, misperception, and difficulty in chasing which books are available or issued. Students also need to wait in long queues to issue or return books. To address these issues, a smart department library book management system based on RFID technology is introduced. The system uses simple components such as Arduino Mega micro controller and LCD display.

The Smart Department Library system helps to make the entire library process quicker, easier, and more precise. It uses RFID (Radio Frequency Identification) technology to identify and manage books automatically. Each book has a small RFID tag embedded with data such as the book ID, title, and author. Similarly, each student has an RFID card with their particulars. When a student places the book near the RFID reader, it automatically reads the tag and updates the database for issue or return. This removes the need for manual entry and reduces the chances of user error.

The system uses simple components like an Arduino Mega microcontroller, LCD display, Wi-Fi module, and a database to store all the information. The database keeps records of all students, books, and their issue or return history. The system can also transmit alert to students before the book due date, helping them return books on time. This improves book circulation and reduces late returns.

The Smart Department Library BMS also improves safety by keeping a clear record of all book transactions and preventing illegal book handling. Librarians can easily add or delete book and student information through the system. It saves time for both students and librarians and makes the administration of books more organized and efficient.

LITERATURE SURVEY :

This paper [1] explain about a system that uses Near Field Communication technology to simplify book issuing, returning, and tracking. It highlights how NFC enhances speed and accuracy by allowing quick scanning without traditional barcode limitations.

This paper [2] provides an extensive review of Internet of Things concepts, architectures, and emerging applications across various fields.

This paper [3] provides the key future research challenges in IoT, including reliability, security, scalability, and real-time data management. It emphasizes the need for advanced architectures and standards to ensure efficient, safe, and seamless IoT system deployment.

This paper [5] presents an Internet-based RFID library system that automates book identification, issuing, and tracking with high accuracy. It demonstrates how RFID and web integration reduce manual effort and improve the efficiency of overall library operations.

METHODOLOGY

BLOCK DIAGRAM

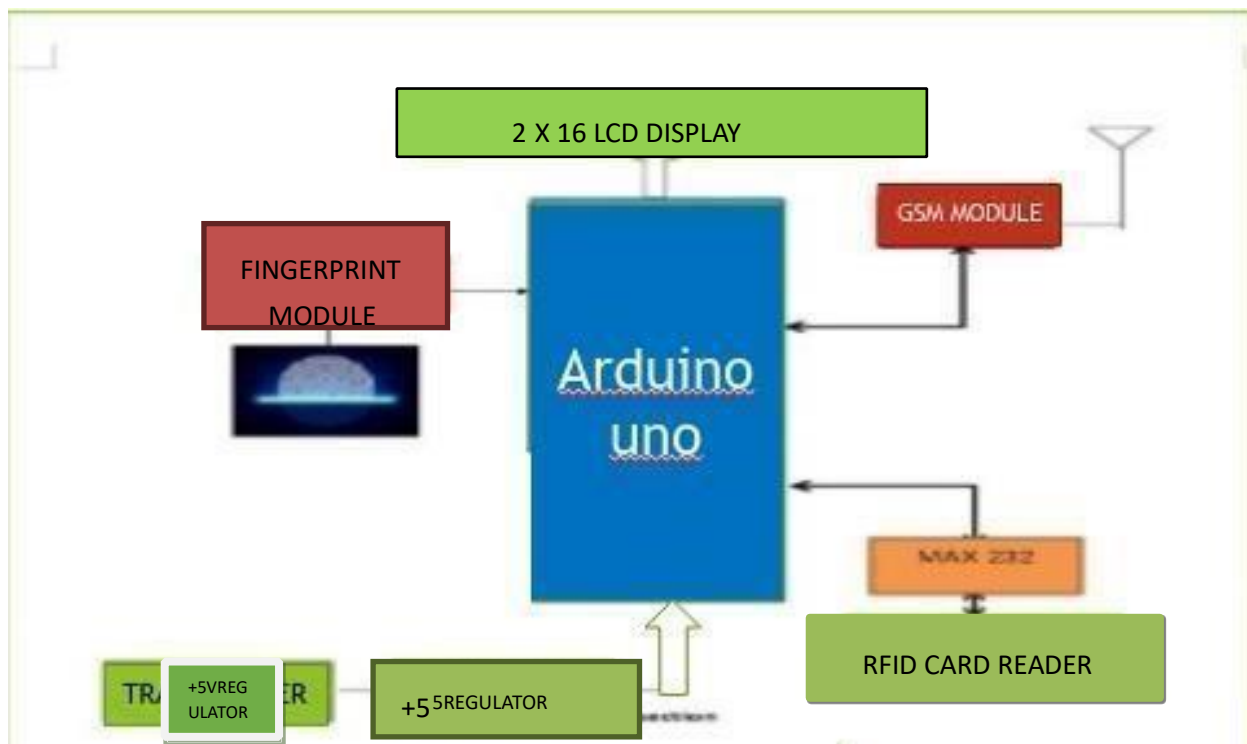


Fig 1: Block Diagram of smart department library BMS

Overall System Functions: This block diagram represents a Biometric and RFID-based Attendance or Access Control System. The system is designed to authenticate a person using either their fingerprint or an RFID card.

The central “brain” (Arduino Uno) processes this information, displays the status on a screen, and uses a GSM module to send notifications (likely SMS texts) to a remote phone number (e.g., a parent, manager, or security office). Here is a detailed explanation of each block in the diagram: **Central Processor (The Brain) Arduino uno:** This is a microcontroller board. It acts as the central processing unit for the entire system. It runs a program (firmware) that reads inputs from the sensors, makes decisions (e.g., “Is this fingerprint authorized?”), and controls the output devices like the display and the GSM module.

Input Devices (Identity Verification) FINGERPRINT MODULE: This sensor scans a person’s fingerprint. It transforms the physical fingerprint image into digital data and transmits it to the arduino for verification against the stored records.

RFID CARD READER: This device accesses data from RFID (Radio-Frequency Identification) cards or tags after being installed near it. **MAX 232:** This is an interface chip placed between the RFID reader and the Arduino. It is likely used to convert signal voltage levels so that the RFID reader can communicate correctly with the Arduino.

Output Devices (Communication & Display) 2 X 16 LCD DISPLAY: A small screen that shows two lines of text

with 16 characters per line. It is used to provide real-time feedback to the user, displaying messages such as “Place Finger,” “Access Granted,” “Welcome

[Name],” or “Try Again.” **GSM MODULE:** This module allows the Arduino to connect to a cellular network, just like a mobile phone. It is used to send SMS messages. For example, when a person clocks in, the system might send a text saying “[Person’s Name] has checked in at [Time].”

Power Supply System

TRANSFORMER: Takes high-voltage AC power from a wall outlet and steps it down to a lower AC voltage.

+5v REGULATOR: Takes the output from the transformer sub-circuit and converts it into a stable, steady +5 Volt DC supply. This is critical because the Arduino and most of the modules shown operate on 5V.

Typical Workflow Scenario

Power Up: The system turns on using power from the transformer and regulator. The LCD displays a “Welcome” or “Scan Ready” message. **User Action:** A user places their finger on the sensor OR taps their RFID card on the reader. **Processing:** The Arduino receives the unique ID from the fingerprint or the card. It compares this ID against a database stored in its memory. **Result – Match Found:**

The LCD shows “Access Granted” and the user’s name. The Arduino triggers the GSM module to send an SMS notification confirming attendance.

Result – No Match:

The LCD shows “Access Denied” or “Unknown User.”

FLOW CHART

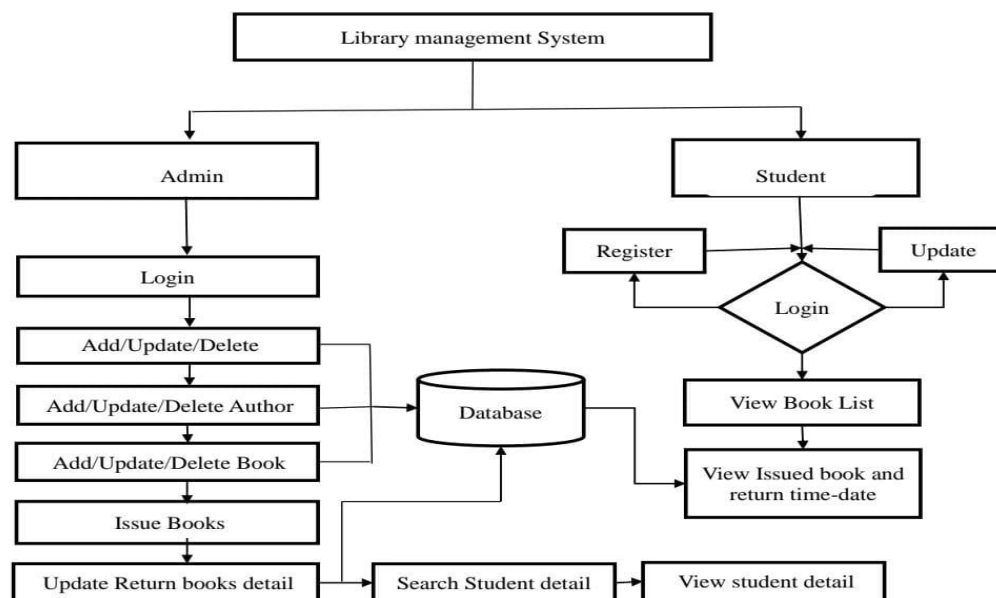


Fig 02: Flow chart of smart department library BMS

COMPONENTS

Arduino Uno	5V
LCD	2*16
Fringerpint Model	R307
RFID	RC522, 3.3V
Transformer	230V, 1A
Regulator	12V
IOT module	FT232RL, 5V
Auduino Shield	12V

ADVANTAGES

Smart Library Book Management System is extremely beneficial for libraries. It simplifies the process of monitoring books and identifying who has taken them. Learners can look up books online and check their availability. It also automates activities such as issuing and returning books, which saves time for the library personnel. The system provides insights into which books are in demand and how learners are utilizing the library.

RESULT

The Smart Department Library Book Management System effectively modernized major library operations such as book detection, issuing, and returning. The system precisely recognized books using its digital tracking mechanism, which helped lower manual mistakes during transactions. During experimentation, students could view book availability instantly, and staff found it simpler to manage records without checking physical registers. The integrated database recorded every book movement, making the system more transparent and dependable. Automated notifications and activity logs increased responsibility by providing real-time updates on issued and returned books. When compared to the traditional approach, the system saved time and reduced the chances of books being misplaced. Overall, the outcomes indicate that the smart system makes library activities smoother, quicker, and more structured. The discussion shows that such automation can significantly benefit department libraries by offering stable performance and decreasing manual workload for both students and faculty members.

CONCLUSION

The smart department library book management system significantly enhances the way books are monitored, borrowed, and submitted. Through automation and digital data handling, it minimises human mistakes and saves

precious time for both learners and faculty. The system offers instant access to book details, helping the library function in a more structured and effective manner. It also boosts transparency since every activity is documented. Overall, this system delivers a smoother, quicker, and more dependable library experience, making library operations simpler for many Years.

ACKNOWLEDGEMENT

We, the project team, would like to convey our heartfelt appreciation to our project guide for their constant support, valuable suggestions, and meaningful feedback throughout the development of this major project. We also extend our thanks to the Head of the Department and all the faculty members of the Electrical and Electronics Engineering Department for offering the required facilities, resources, and encouragement. We are thankful to the lab assistants and technical staff for their cooperation during the implementation and testing stages. We would further wish to recognize the teamwork and mutual support within our group, which played an important role in completing this project. Lastly, we sincerely thank our families and friends for their motivation, patience, and continuous support throughout the course of this work.

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