IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, December 2025
Impact Factor: 7.67

A Smart Campus Resource Management System

Dr. Parvati Kadli [1], Ms. Afreen S[2], Ms. J Zoya Meherin[3], Mehek Firdose[4]
[1]Professor, CS&E Dept, Proudhadevaraya Institute of Technology, Hosapete
[2,3,4]Students, CS&E Dept, Proudhadevaraya Institute of Technology, Hosapete

Abstract: *This project presents a Smart Campus Resource Management System that integrates IoT, artificial intelligence, and QR-based automation to improve campus operations, security, and resource utilization. The system combines three core modules: face-recognition-based smart attendance, IoT-enabled water level monitoring and automatic pumping system with automated alerts, and a QR- based navigation system for visitors and students. A digital library interface is also implemented to provide structured access to academic resources.*

Using ESP8266 NodeMCU, moisture sensors, Python-based facial recognition, and QR scanning technologies, the system continuously monitors campus activities and provides real-time updates. Water levels are tracked using moisture sensors, and alerts are generated when thresholds fall below predefined limits. The QR navigation module assists users in locating departments easily. By automating attendance, resource monitoring, and navigation, the system reduces manual work, improves accuracy, and enhances overall campus management efficiency. This integrated solution supports smart campus automation and enables scalable future expansion..

Keywords: Smart Campus, IoT, Face Recognition, Water Monitoring and automatic pumping, QR Navigation, Automation, Digital Library

I. INTRODUCTION

Educational institutions face challenges in managing daily operations such as attendance tracking, water-level monitoring, guiding visitors, and organizing academic resources. When handled manually, these tasks become time-consuming, inaccurate, and inefficient for large campuses. With the rise of modern automation technologies, campuses now aim to adopt IoT- and AI-driven systems to improve accuracy and reduce human effort.

The proposed Smart Campus Resource Management System integrates four major modules: face- recognition attendance, IoT-based water level monitoring and automatic pumping systems, QR navigation, and a digital library interface. Each module automates a specific campus task, and all data is combined in a central dashboard for real-time monitoring. This integrated approach improves operational efficiency and supports the development of a smart, technology-enabled campus environment.

II. LITERATURE SURVEY

Research in IoT applications shows that moisture sensors with ESP8266 provide reliable real-time monitoring for resource management. Studies on face-recognition systems using OpenCV and machine learning demonstrate improved accuracy and reduced manual errors in attendance tracking. Similarly, literature on QR-based navigation highlights its effectiveness as a low-cost, easy-to-deploy solution for guiding users in complex environments.

These findings from previous studies support the integration of IoT, AI, and QR technologies, showing that such systems enhance automation, accuracy, and overall management efficiency in campuses.

III. OBJECTIVES

- To automate student attendance using face-recognition technology.
- To monitor water levels using IoT sensors and generate threshold-based alerts, and automate the pumping system
- To implement QR-based navigation to assist visitors and students.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

- To develop a digital library system for organized academic resource access.
- To reduce manual workload and improve campus operational accuracy.
- To integrate all modules into a centralized dashboard for administrators.

IV. METHODOLOGY

Face Recognition Attendance: A camera captures images and extracts facial features using OpenCV-based recognition. Attendance is marked by matching data with stored student profiles.

Water Level Monitoring and Automatic Pumping System: Moisture sensors connected to ESP8266 measure tank water levels continuously. Alerts activate when water reaches Low (<20%), Safe (>30%), or Full (>50%) levels.

Threshold Alert System: A buzzer alert activates during low water levels until the tank is refilled above the threshold.

Hardware Used for Water Monitoring and Automatic Pumping:

- Moisture Sensor
- ESP8266 NodeMCU
- Relay Module
- Mini Water Pump
- 9V Battery
- Connecting Wires

Working Principle:

The moisture sensor detects the presence of water or moisture content in the tank/soil.

The ESP8266 reads this sensor value and determines whether the water level is LOW or HIGH.

When the reading falls below the threshold, the relay module activates the mini water pump, allowing water to be pumped automatically.

Once enough moisture or water is detected, the ESP8266 switches OFF the pump, ensuring automatic control and preventing overflow or dry running.

QR Navigation: QR codes deployed across the campus redirect users to location information or navigation maps upon scanning.

Digital Library: A web-interface library organizes subject-wise materials, notes, and reference resources.

Dashboard Integration: All outputs (attendance logs, water levels, navigation data) are displayed on a unified dashboard for administrative monitoring.

V. BLOCK DIAGRAM

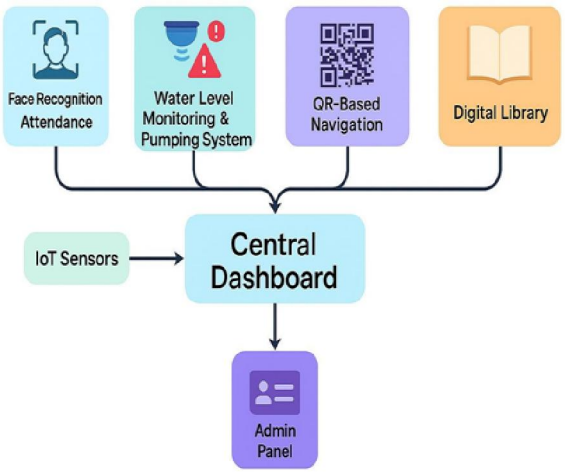


Fig. 1 Block Diagram of Smart Campus Resource Management System

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

The architecture consists of:

- IoT Moisture Sensors connected to Esp8266 for water monitoring and pumping system
- Camera Module for face-recognition attendance
- QR Codes linked to navigation pages for campus guidance
- A centralized web dashboard displaying module outputs
- Admin monitoring controls for alerts and logs

VI. RESULTS AND DISCUSSION

The integrated dashboard enabled administrators to monitor all modules simultaneously, enhancing operational efficiency.

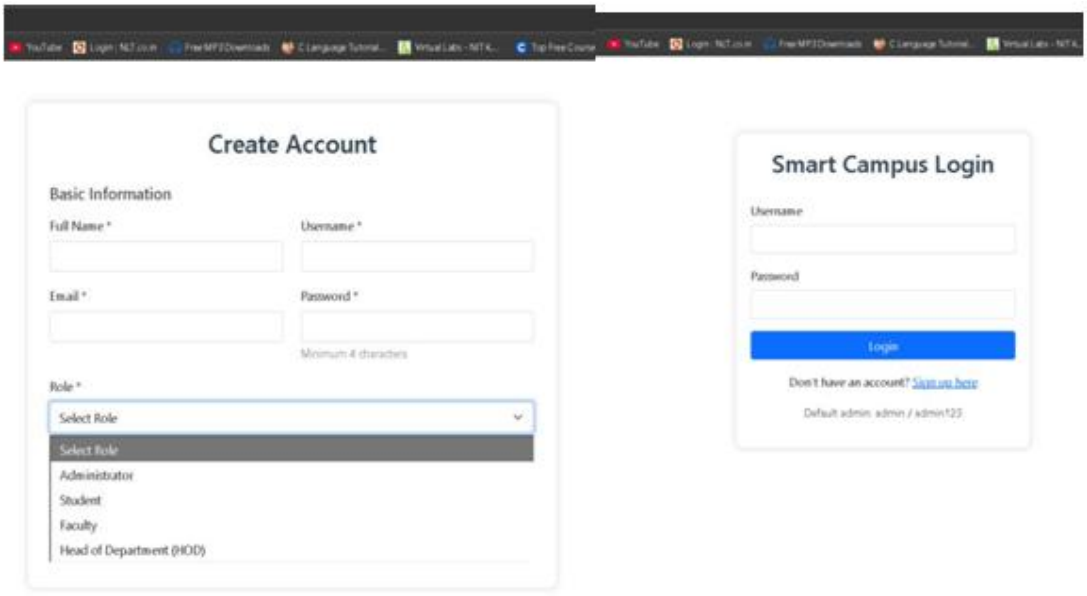


Fig.2 User login page:

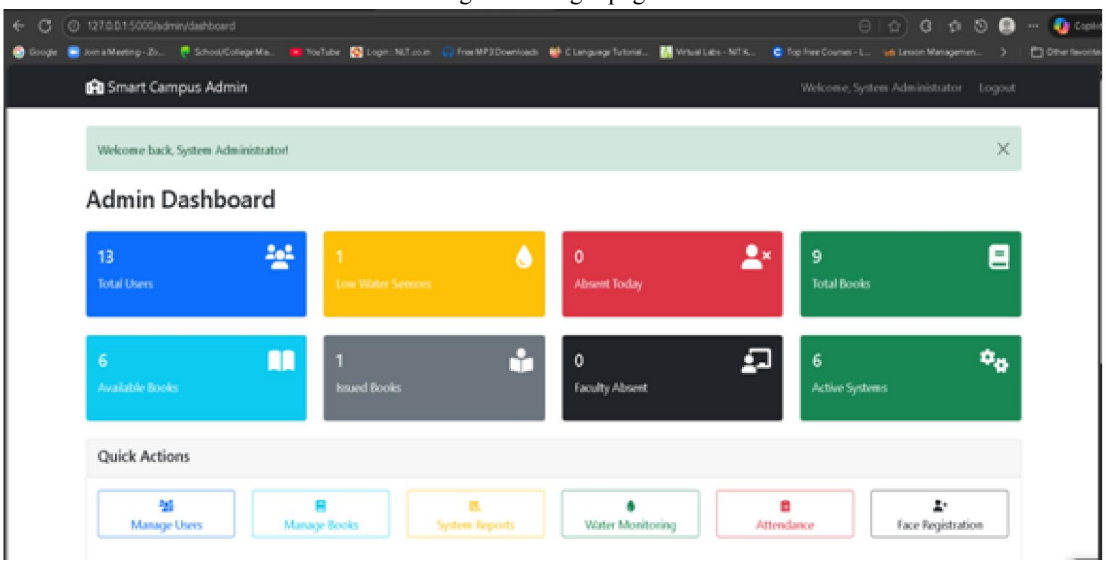
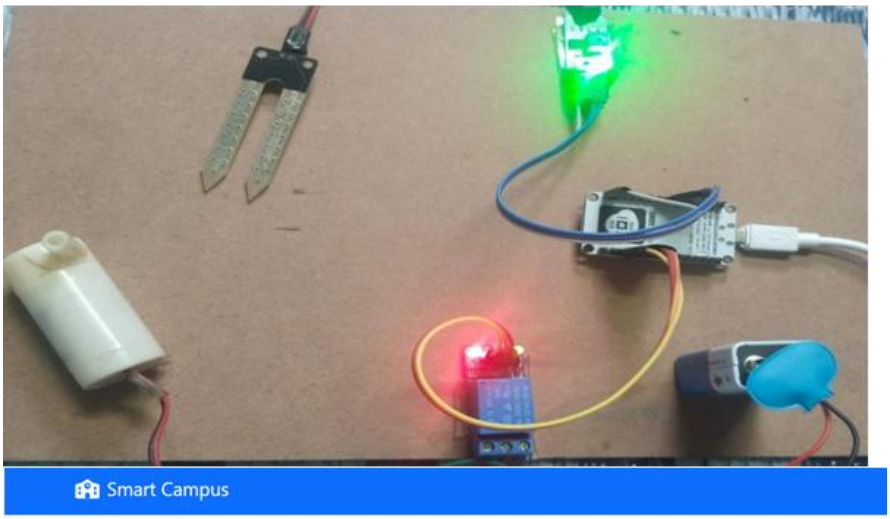


Fig.3 Admin Dashboard showing system overview and key statistics:

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, December 2025
Impact Factor: 7.67



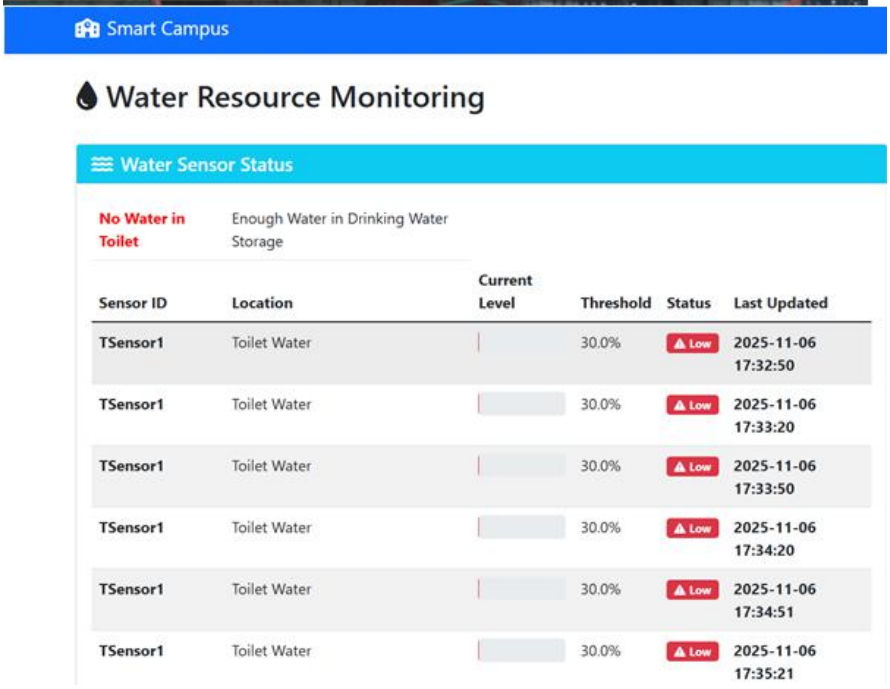
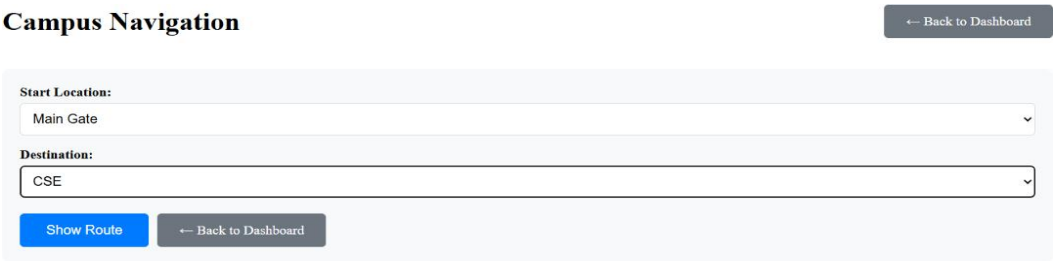


Fig.4 The IoT-based water monitoring and automatic pumping system effectively measured water levels and generated real-time alerts at threshold points.



IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, December 2025
Impact Factor: 7.67

Fig.5 The QR navigation module successfully redirected users to correct locations when QR codes were scanned.

Fig.6 The digital library system provided structured access to study materials, improving learning resource availability.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, December 2025
Impact Factor: 7.67

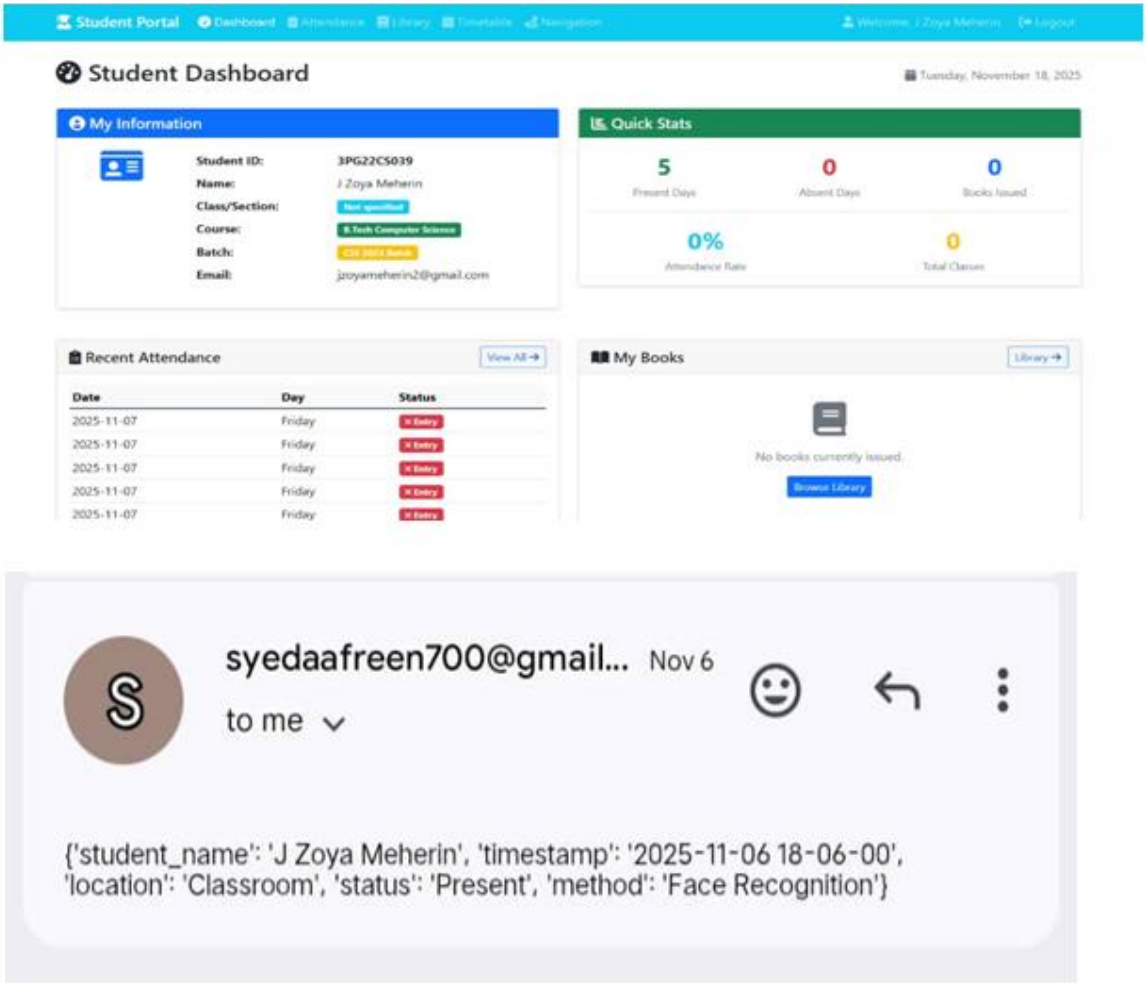


Fig.7 Student Portal displaying attendance and Mail is sent to the parent; whether the student is present or absent.

VII. CONCLUSION

The Smart Campus Resource Management System combines IoT, AI, and automation to streamline essential campus operations. Automated attendance, water monitoring and pumping, and navigation improve efficiency, accuracy, and administrative convenience. The digital library enhances academic resource accessibility. Overall, the system provides a scalable, low-cost, and high-impact solution for developing smart educational campuses.

VIII. FUTURE SCOPE

- Integrating additional IoT sensors for environmental and energy monitoring and pumping.
- Developing a mobile application for real-time alerts and dashboard access.
- Enhancing face-recognition accuracy using advanced deep-learning models.
- Implementing SQL storage for multi-campus data access.
- Adding emergency alert systems and smart parking solutions.

REFERENCES

[1] OpenCV Documentation – Face Recognition Methods.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

[2] Esp8266 Technical Reference Manual, Espressif Systems.
[3] YL-69 / FC-28 Moisture Sensor Datasheet
[4] Research on QR-Based Navigation Systems, 2021.
[5] IoT-Based Water Monitoring Studies, IJERT, 2022.