Indian Journal of Computer Science and Technology
Volume 4, Issue2 (May-August 2025), PP: 271-273.
www.indjcst.com
ISSN No: 2583-5300

Safety and Security in Educational Institutions

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To Cite this Article: *A. Manusha Reddy[1], Rohith Reddy[2], Harini[3], Prathiba[4], Kavana[5], Jaswitha[6], "Safety and Security in Educational Institutions", Indian Journal of Computer Science and Technology, Volume 04, Issue 02 (May-August 2025), PP: 271-273.*

Abstract: *This journal presents a comprehensive security and safety organization designed to address critical problems prevalent in universities and institutions. These susceptibilities include unsecured entry points, inconsistent enforcement of security policies, and inadequate emergency crises readiness, which collectively compromise the security and safety of students and faculty, creating territories susceptible to different safety warnings also problems such as uncertified entries, bullying incidents, and delayed crucial feedback scenarios. To counter these issues, the proposed solution utilizes components like advanced smart locks and entry enabling servers, cameras integrated with AI-powered observations for enhanced menaces detection, emergency notification structures for rapid communication, an anonymous reporting bot to facilitate discreet reporting of concerns, and smart ID with geo-fencing for location tracking and access observation. This combined server aims to enhance safety, improve objective observation and threat observation capabilities beyond the scope generally used CCTV systems safe learning environment while aligning with sustainable development goal SDG 9 by focusing on building resilient infrastructure. Furthermore, the journal explores the innovative emerging technology, specifically motion detection sensors utilizing passive infrared (PIR) technology controlled by Arduino chips, to further extend the structural enterprising potentials and provide additional terms of safety.*

Key Words: *Smart Locks and AI Surveillance, Emergency Notification System, Anonymous Reporting Bot, Geo-fencing and Smart ID, PIR motion sensor with Arduino.*

I.INTRODUCTION

Ensuring the safety and security of students and staff is a foundational requirement for establishing and maintaining a productive and nurturing learning environment. A secure atmosphere not only protects individuals from possible harm but also fosters a sense of well-being that is crucial for academic and personal growth. However, the reality for many schools and institutions is that they grapple with significant and multifaceted challenges in providing truly comprehensive security. These challenges manifest in various forms, including vulnerabilities in physical infrastructure such as easily breached entry points, inconsistencies in the application and enforcement of established wellbeing rules, limitations in awareness and response capabilities for critical situations, and often a lack of cohesive involvement of all relevant stakeholders within the educational community. The needed ramifications of these safety deficits can be far-reaching and deeply impactful. They extend beyond mere inconvenience to encompass serious threats such as uncertified access to school premises, the prevalence of unreported incidents of bullying and harassment, and critically, an inadequate and potentially delayed response when emergencies arise. Such vulnerabilities erode the fundamental sense of safety and security that freshmen, staff, and parents alike should rightfully expect and rely upon. This erosion can lead to increased anxiety, decreased engagement, and an overall undermining of the educational mission. Current safety rules and the underlying architecture often fall short of providing the necessary level of integration, cleverness, and adaptability required to effectively address the increasingly complex safety landscape. There is a clear and urgent need for the development and implementation of enhanced safety measures that strategically leverage progress in technology. These innovative rules can pave the way for the creation of security systems that are not merely reactive but are instead proactive, intelligent, and capable of providing timely and effective responses to a wide range of security challenges. The proposed solution aspires to cultivate demonstrably safer and more safe territory that benefits the entire academic community.

II.LITERATURE SURVEY

Existing literature highlights the increasing importance of technology in improving safety and security across different settings. Studies emphasize structured, layered security frameworks (Wang, 2012) and the use of IT tools for safety training. The growing concern of cybersecurity in all sectors, including education, is also noted. Research on digital investigations (Sokolov et al., 2018) underscores the need for data integrity in security incidents. Furthermore, the role of physical design in crime prevention on campuses (Wang et al., 2015) complements technological solutions. Intrusion detection systems (IDS) and their integration with AI and machine learning for abnormality identification in educational systems are being explored (Xie, 2011). The literature advocates for complete and adaptive safety solutions integrating technology, policy, and

community engagement. Our proposed system builds on this by offering a holistic framework combining different safety rules and improved technologies

III.EXISTING SECURITY MODEL

The role of CCTV (closed-circuit television) systems has been a cornerstone of safety infrastructure in schools and institutions for many years. Existing CCTV setups typically involve strategically placed cameras that record footage which is then monitored in a central control room or stored for later review. However, conventional CCTV systems often have limitations. They can generate vast amounts of data, requiring significant human resources for effective monitoring and analysis. Identifying specific events or patterns within the recorded footage can be time-consuming and prone to man error. Moreover, the effectiveness of CCTV as a proactive security measure is limited, as it primarily functions as a reactive tool for post-incident analysis. Environmental factors such as poor lighting or obstructions can also impact the quality and usability of the footage.

Improvements in innovation have led to the development of more sophisticated CCTV organizations. These include features such as higher resolution cameras, wider fields of view, night vision capabilities, and digital recording systems that allow for easier storage and retrieval of footage. Some new age CCTV systems also incorporate basic video analytics such as movement identification, which can alert when movement is detected within a specific area.

In the context of educational institutions, existing safety rules often include a mixture of CCTV surveillance, safety guards, and access control systems. However, these measures may not be fully combined or utilize improved technologies to their full capability. Gaps in safety can include unsecured access points, lack of active monitoring, inconsistent policy enforcement, after-hours and extracurricular vulnerabilities, and digital safety concerns. Our proposed system aims to address these gaps by improving everyday monitoring with AI, enforcing security policies continuously, improving after-school safety, and boosting digital security by integrating smart locks, intelligence-powered monitoring, emergency notification systems, anonymous reporting, and smart ID with geo-fencing

IV.PROPOSED SYSTEM

The proposed safety and security system is made to address the observed gaps through a multi-faceted approach that builds upon existing security measures while integrating advanced technologies. The system integrates several key components:

- **Smart Access Control:** Utilizes smart locks and access control systems to secure entry points and monitor access.
- **AI-Powered Surveillance:** Employs surveillance cameras with AI to detect suspicious activities and unauthorized access, going beyond basic motion detection to analyse behaviour and patterns.
- **Emergency Notification System:** Enables rapid communication of alerts and notifications to parents, staff, and security personnel via app, SMS, and email.
- **Anonymous Reporting Bot:** Provides a platform for students to report safety concerns, bullying, and mental health issues discreetly.
- **Smart ID and Geo-fencing:** Uses RFID/NFC ID cards and geo-fencing to track the location of students and staff and manage access to restricted areas.

  These components work together to create a comprehensive safety net that enhances physical security, improves monitoring capabilities significantly beyond traditional CCTV, and facilitates swift emergency response.

V.SYSTEM ARCHITECTURE

The system architecture is designed to be modular and scalable, allowing for easy integration and expansion:

- Entry Points (Main, Side, and Back Entrances): Equipped with smart locks and access control systems.
- Smart Lock/Access Control System: Controls and monitors entry and exit.
- Surveillance Cameras: Capture video footage for monitoring and analysis
- Monitoring AI: AI algorithms observe surveillance footage to detect anomalies and generate alerts, which are reviewed by human operators.
- Emergency Notification System: Sends alerts to parents, staff, and security personnel via multiple channels

VI.RESULTS

The proposed system offers several significant benefits:

- Enhanced Security: Through smart access control and AI-powered surveillance that provides intelligent monitoring beyond traditional CCTV.
- Improved Emergency Response: With rapid notification and communication.
- Increased Stakeholder Engagement: Through anonymous reporting and mobile app integration.
- Greater Efficiency: In monitoring and managing safety and security

VI.CONCLUSION AND FUTURE SCOPE

The safety and security of schools and institutions are of utmost importance, and the proposed system offers a comprehensive and integrated solution to address critical vulnerabilities and enhance the safety of students and staff. By leveraging smart technologies such as AI-powered surveillance, smart access control, and rapid emergency communication,

while also facilitating stakeholder engagement through anonymous reporting, this system can create a demonstrably safer and more secure learning environment, significantly contributing to the well-being of the entire educational community.

Looking towards future enhancements, we are actively exploring the integration of additional sensor technologies to further augment the system's proactive and responsive capabilities. A key area of development involves incorporating motion detection sensors utilizing passive infrared (PIR) technology controlled by low-cost and efficient microcontrollers like the Arduino chip. These PIR sensors could be strategically deployed across school premises, including hallways, classrooms, libraries, and administrative offices, to detect movement during off-hours, weekends, or within restricted zones. Integrating the data from these PIR sensors with the existing AI-powered surveillance system and the central monitoring platform could provide an additional crucial layer of security. For instance, the detection of unexpected motion by PIR sensors in normally unoccupied areas could trigger immediate alerts to security personnel, even in conditions where visual monitoring might be limited or less effective, such as during power outages or in areas with obstructed views. The Arduino chip's low power consumption and ease of integration make it an ideal choice for deploying a widespread network of these motion sensors. This future direction, focusing on the synergistic integration of PIR-based motion detection with our current AI-driven system, aims to create an even more robust, proactive, and energy-efficient security framework for schools and institutions, ultimately contributing to a safer and more secure environment for all occupants.

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