IoT Integrated LMS for Real Time Learning Analytics Using Smart Sensors: Toward Smart and Adaptive Education Systems

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Abstract:

The integration of Internet of Things technologies into educational settings is opening new pathways for data-driven, student-centered learning. This study proposes a conceptual model for an IoT integrated Learning Management System designed to capture real time data on student engagement, classroom activity, and environmental conditions through smart sensors. Devices such as wearable trackers, smart badges, and ambient sensors continuously monitor learner participation and emotional responses, generating real time insights that inform teaching strategies and classroom dynamics. The paper examines the technical structure of the proposed system, with emphasis on sensor communication protocols, data processing workflows, and compatibility with existing LMS platforms. It also addresses practical challenges in deployment, including network stability, privacy concerns, and cost considerations for educational institutions. A modular, scalable integration approach is introduced to enhance adaptability and institutional readiness. This framework aims to support personalized and inclusive learning environments by allowing educators to make timely, informed decisions based on dynamic learner data. The findings contribute to the development of smart educational systems that bring together innovations in computing, electronics, and instructional design, offering a promising step toward more adaptive and responsive classrooms.

Keywords:

Adaptive Learning Systems, IoT in Education, Learning Management Systems, Real Time Learning Analytics, Smart Sensors.