

IOT-ENABLED MULTIFUNCTIONAL BEDROOM LAMP WITH SIX-MODE LIGHTING SYSTEM USING ESP32

ABSTRACT

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With the rising incidence of fire-related disasters, as highlighted by the National Fire Protection Association (2023), there is an increasing demand for more advanced and inclusive safety solutions. Conventional fire alarm systems, which rely primarily on audible alerts, are often ineffective for individuals with hearing impairments or those in deep sleep. To address this gap, the study developed a multifunctional smart lamp integrating essential safety features: a fire alarm, smoke detector, SMS notification system, mini-camera, exhaust fan, and six customizable lighting modes. Powered by an ESP32 microcontroller with a backup power source, the system is designed to deliver comprehensive, multi-sensory alerts. Prioritizing user accessibility and intuitive operation, the device aims to improve household safety and encourage widespread adoption through its innovative and user-centered design. This study utilized the Experimental Prototyping Method to design and continuously enhance a multifunctional lamp integrated with fire alarm and smoke detection capabilities. User feedback was collected through a self-administered survey using a four-point Likert scale to evaluate performance, usability, and overall user satisfaction. Participants were chosen through convenience sampling to ensure accessibility. The data gathered was analyzed using the weighted mean to assess feedback patterns. The iterative process of prototyping, testing, and feedback analysis allowed for progressive refinements, ensuring that the final product effectively met the users' safety and functionality needs. Survey results revealed strong user approval of the IoT-enabled multifunctional lamp, with most features scoring above 3.0 on a four-point scale, indicating high appeal and practical value. Extensive testing validated the lamp's performance, utilizing durable, commercially available components. Integrated sensors and protective features—such as voltage regulators, heat-shrink tubing, a single-phase terminal block, and a circuit breaker—ensured safety and compliance with design standards. The ESP32 microcontroller demonstrated high efficiency in managing the core functionalities of the multifunctional lamp, while the Arduino Uno successfully supported secondary tasks, enhancing overall system responsiveness. For future development, it is recommended to conduct more extensive testing across diverse environmental conditions, upgrade hardware components to increase functionality, and develop a user-friendly mobile application. Additional enhancements may include integration with existing smart home platforms, implementation of a real-time user feedback mechanism, and the formulation of commercialization strategies to maximize market potential and accessibility.

RECOMMENDED CITATION

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