Methods and algorithms for controlling devices in the office

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Abstract: This thesis presents novel methods and algorithms for the intelligent control of office devices to enhance energy efficiency and user comfort. Addressing the limitations of traditional rule-based systems, the research proposes a hybrid control architecture that integrates real-time sensor data, including occupancy, ambient light, and temperature, with predictive models. A key contribution is the development of an adaptive algorithm based on reinforcement learning, which dynamically optimizes the operation of lighting, HVAC, and workstation equipment without requiring explicit user programming. The system learns individual usage patterns and environmental responses to minimize energy waste while maintaining predefined comfort thresholds. Extensive simulations and a physical prototype deployment demonstrate a significant reduction in energy consumption—averaging 25-30% compared to conventional scheduling—while improving user satisfaction scores. The findings offer a scalable and practical framework for smart building management, bridging the gap between autonomous control and human-centric workplace design.

Keywords: IoT control, office automation, control algorithms, smart devices