Chapter 15
AI-Driven Computer Vision for Intelligent Home Automation and Surveillance Systems

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ABSTRACT

Home automation is a rapidly advancing field, driven by its increasing affordability and convenience. The ability to control various aspects of our homes and have them respond to automated events has gained immense popularity due to its inherent safety features and cost-effectiveness. In this chapter, the authors have developed a model for fully automating our household while incorporating a robust security system. The core objective of this chapter is to build a completely automated home that can be economically viable. The authors were able to drastically lower the overall cost of installation by utilizing off-the-shelf components. This research further explores pertinent literature, analyses optimal current datasets, and ceases operations by addressing home automation issues while suggesting potential future paths. The central concept of this paper revolves around proposing a system that seamlessly integrates MATLAB with a camera and an Arduino board to monitor and control various household appliances. In this envisioned system, the Arduino board communicates with MATLAB via serial connectivity to simplify household gadget control. MATLAB is linked to image-capturing equipment by enabling real-time monitoring of the status of different household equipment through a Graphical User Interface (GUI) developed in MATLAB. This GUI allows users to issue commands for the corresponding household appliances, interface

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with the Arduino through a relay board, and respond by turning ON/OFF as instructed. Moreover, the system can send alert messages or signals if any abnormalities are detected. This enhances the overall security and functionality of the home automation setup. The field of human motion recognition, a vital component of this paper, has a rich history spanning over two decades, resulting in a substantial body of literature. As the paper advances, it contributes to this existing body of knowledge while addressing contemporary challenges in the domain. Looking ahead, the future of home automation holds promising prospects for enhancing our daily lives with convenience, security, and efficiency.

INTRODUCTION

An innovative technology that is revolutionizing our relationship with our appliances and electronic products is IoT-based scheduling for appliances. This innovative technology leverages the power of the Internet of Things (IoT) to give users unprecedented control and convenience in managing their electrical consumption (Abdullah & Sai, 2023). This article will delve deeper into this cutting-edge system's myriad benefits and potential applications, shedding light on how it can reshape our daily lives and the future of our homes and buildings (Abdullahi et al., 2023).

One of the standout features of the Scheduling Electrical Devices system is its low-cost design (Alfaifi & Khan, 2022). Unlike traditional home automation solutions that often require significant investments in specialized hardware and infrastructure, this system is remarkably cost-effective (AlAjmi et al., 2013). It achieves this by capitalizing on existing IoT technology and making it accessible to many users. The affordability of this system ensures that it is not limited to the privileged few but can be embraced by individuals from all walks of life (Bin Sulaiman et al., 2023). Furthermore, the user-friendly interface of the system is a game-changer. The days of complex installations and convoluted setups are over. Users can effortlessly connect their electrical devices to the system with a simple and intuitive interface, allowing for quick and hassle-free integration (Bose et al., 2023). Whether you are tech-savvy or not, the system empowers everyone to easily take control of their appliances (Anand et al., 2023).

Installation is another area where Scheduling Electrical Devices shines. Unlike traditional home automation systems that often require professional installers, users can set up this system (Calo et al., 2023). With clear instructions and straightforward procedures, homeowners and building managers can enjoy the benefits of automation without the need for costly installation services (Cirillo et al., 2023). This democratization of technology ensures that automation is not limited to the elite but can be embraced by a wider audience (Devi & Rajasekaran, 2023). One of the most compelling advantages of Scheduling Electrical Devices is its potential for energy savings (Ghozali et al., 2023a). With the ability to monitor and schedule home appliances, users can optimize their energy consumption (Gaayathri et al., 2023). Imagine being able to turn off lights, adjust thermostat settings, and power down electronic devices remotely, ensuring that energy is not wasted when it is not needed. This level of control not only contributes to reduced energy bills but promotes sustainability by lowering the carbon footprint of homes and buildings (Kaliyaperumal et al., 2021).

Moreover, the system's self-control and automation capabilities provide immense comfort and convenience (Ghozali et al., 2023b). Managing numerous appliances efficiently in a private home can be challenging. With Scheduling Electrical Devices, manual control is lifted, and the system takes care of routine tasks (Ghozali et al., 2022). Imagine waking up to a warm and well-lit home as the system has