Consolidated Artificial Intelligence Method for A real-Time Energy Management

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Abstract

Social distancing restrictions due to covid-19 pandemic calls for automation of homes/offices to avoid clustering remotely control of appliances upon necessary authorization therefore becomes expeditious in observing social distancing. This paper proposes a tinyML-like concept that addresses real-time constraints in the control of electronics appliances especially at this pandemic era and equally serves as energy conservation scheme. Existing automated home energy management methods was holistically investigated, and a real-time monitoring and control system called Home Energy Management System (HEMS); developed using Smart Phone, Message Queuing Telemetry Transport (MQTT), and ESP32 microcontroller proposed. Considerations on coverage, security, and appropriate place of implementation were incorporated in the design. This efficient and smart App is proposed for a low-powered and low memory storage device like mobile devices due to their relevance in real-time monitoring of individual load profile and mobility advantage. This semi-automated HEMS was based on edge computing to reduce high latency often associated with cloud computing. The motivation behind this system is the need to monitor and remotely control electronics appliances including the smart meter itself irrespective of the location. Partial automation was implemented to allow human user a reasonable control. We tested this system in the Naresuan University, School of Renewable Energy & Smart Grid Technology's smart office. Its energy management capabilities, response time to command and processing speed proved its promptness and energy saving potencies. A comparative analysis carried out between the energy consumption of a manually operated office and a smart office using the proposed HEMS showed the latter saved about 24% energy.

Biography

ALEXANDER N. NDIFE is a Research Assistant and Doctoral candidate in Smart Grid Technology at Naresuan University, Thailand. He obtained a bachelor's degree in Electrical/Electronic Engineering, Anambra State University, Nigeria in 2008 with specialty in telecommunications and subsequently a master's degree in Electronics and Computer (Communications) Engineering from Nnamdi Azikiwe University, Nigeria in 2014. His research interests include Wireless Networks, Artificial Intelligent Systems, Deep Learning, Cyber Networks, Image and Digital Signal Processing. He is a registered engineer in Nigeria and a member of various engineering organizations including Nigerian Society of Engineers (NSE), IEEE, IAENG and belongs to Society of Wireless Networks.