Proactive Smart Home Assistants for Automation- User Characteristic-Based Preference Prediction with Machine Learning Techniques

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ABSTRACT

AI-powered smart homes bring high-quality intelligent services to occupants with digital virtual assistants. Through interactions with occupants, the Smart Home Assistants (SHAs) can develop occupants' profiles using a number of personal characteristic features for tailored and smart interactions. Based on these profiles, smart home systems can *proactively* offer automation services while conserving occupants' comfort and convenience. In this study, we have sought to investigate characteristic features that affect occupants' perception of the proactive concept, as well as their preferences for modes of interactions through an application of automation for energy efficiency management. Upon a data collection through an online experiment on campus, 58 valid responses with personal characteristic features were utilized to develop predictive machine learning models. These models can predict participants' general attitude towards proactive SHAs, as well as their preferences for interaction modes with good performance (accuracy between 0.67 to 0.82 and F-score between 0.66 to 0.74). Various features were identified to have considerable significance, including personal beliefs of taking actions and energy expenses, as well as environmental protection values. The findings of this study provide an insight into the design of learning processes for virtual assistants in smart home ecosystems and the effect of the individual characteristics on the users' preferences for interactions with SHAs.