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A MAS integrated into Home Automation system, for the resolution of power management problem in smart homes

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Abstract

The world human population increases today more than 80 millions of individuals per year, therefore, the energy needs increase more and more. The buildings represent the most important part of the energy consumption and the greenhouse effect. the inhabitants are confronted to a variable tarifs of energy and some heater setpoints effects according to hour and days and to energy producers. In this dynamic context of production and consumption of energy that a building, equipped with a Home Automation system to control the energy, takes its importance. In this paper, we describe the architecture of a Home Automation system. The system is divided into two parts: a centralized part represented the resolution of linear problems noted regular service part and a Multi-Agent part noted singular service part.

Keywords: Multi-Agent Systems, Home Automation, Power management

1. Introduction

The world human population increases today more than 80 millions of individuals per year, therefore, the energy needs increase more and more. In

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[1], the buildings represent 47% of the energy consumption and it is responsible for 25 % of the greenhouse effect. the inhabitants are confronted to a variable tarifs of energy and some heater setpoints effects according to hour and days and to energy producers. It is in this varied and dynamic context of production and consumption of energy that a building, equipped with a Home Automation system to control the energy, takes its importance.

A Home Automation system basically consists of household appliances linked via a communication network allowing interactions for control purposes [2]. Thanks to this network, a load management mechanism can be carried out: it is called distributed control in [3]. Load management allows inhabitants to adapt the power consumption to the available power resources in taking into account user comfort criteria. For instance, during the consumption peak periods when power plants rejecting higher quantities of CO2 are used and when energy price is high, it could be possible to decide to delay some consumption activities by reducing some heater set points, for example. Load management is all the more interesting that the availability and price of the energy vary. It is very complex to manage by users in a dynamic pricing context. Therefore, A Home Automation system has to reach a compromise between the priorities of the user in term of comfort and in term of cost while satifying technological constraints of equipments and heater setpoints effects.

In this study, we present a Home Automation system that resolve the power management problem in smart homes. In the first part, we present the general notions of the system. In the second part, we details the MAS integrated in the system that resolve a part of the power managment problem.

2. Problem description and general architecture

In this paper, energy is restricted to electricity consumption and production. Each electrical activity is depicted by an amount of consumed/produced electrical power, it is called service and can be supported by one or several appliances.

Housing with appliances aims at providing comfort to inhabitants thanks to services which can be decomposed into three kinds: the end-user services that produce directly comfort to inhabitants, the intermediate services that manage energy storage and the support services that produce electrical power to intermediate and end-user services. Support services deal with