SCENARIO CONTROL FOR SMART BUILDINGS USING RELATIONAL DATABASES

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Abstract: The modernization of the buildings with the most performing technologies starts to grow more and more, and like a consequence, many people appeal to this technique, to leave in a more safety house, and why not, more comfortable. We propose a relational database for controlling the sceneries of smart buildings. The sceneries include all the settings for the house (lights, temperature and music) in a special case, for example "romantic dinner".

Key words: *Databases, Smart buildings, Scenarios.*

I. INTRODUCTION

Many people with medium incomes start to invest in intelligent houses, with modern equipments, controlled by microprocessors made to easiest their lives and why not, to make it more beautiful.

A person that take into consideration the safety of the family, the comfort, that has medium incomes and an open mind, can transform the house into a paradise, as if it would be from the science fiction movies.

The modernization of the buildings with the most performant technologies starts to grow more and more, and like a consequence, many business people and celebrities appeal to this technique, to leave in a more safety house, and why not, more comfortable.

The systems that equip such an intelligent building gather, stock and process information about functional, accidental and undesirable elements, while a personal communication network assures telephonic services, fax, interphone, computers, Internet, sound effects, radio, television and satellite connections.

A security mechanism controls everything and watches to the safety of the house, having the mission to prevent, to detect and to solve each problem caused by malfunctions, fires, bad meteorogical phenomena or seism.

Other automated systems permit to adjust the debits, fluxes, to reconfigure the spaces, to open\close the traps.
From many advantages, which such a type of system offers to the potential inhabitants, we mention next:

- growing the comfort with 30-40%, when the construction costs grow only with 12-16%, for the same type of building without intelligent elements;
- the amortization of the investment in 5-7 years, such as growing the efficiency of the energetically consume.

It is a business with a high potential in future and it is assumed that the market will grow up very much in the next 10-15 years.

This business initially started from security, for the safety of people. In the beginning in house where installed movement sensors, water, noise and video cameras and the system responded, signaling intrusions or changes of parameters through an audible call. The technologies are changed now. Everything lives from the client imagination and from the Internet connection. All equipments are connected to a computer, which analyzes the dates, signals and takes decisions. One of the system functions is to create the so called sceneries. Let's say we push the button "Romantic dinner". It will be the next connections: the lights will be reduced, a blues will sound in the background, the blinds will go down and the fireplace will start.

The system can learn even the owner's program (fuzzy systems), so as when he is gone a longer period from home, the light from living bights when the owner gets home from office, the Tv starts in the bedroom in the evening, and in the morning the lights from the bathroom switch on, the water from the shower, the radio and the music start. Helped by a laptop connected to Internet, the owner can see what happens in each room and he can notice the parameters of the system wherever he is.

The price asked for the systems that transform a building in an intelligent one is not very high. The implementation of such a system can grow the price of an ordinary building with an average of 500 – 7000 euro, depending on the chosen solutions and of the complexity of the system [1],[2].

The technology "home automation" means for some people just a moreover small comfort, that permits them to switch on or to switch off the lights with the same remote control they use for Tv, but for others it is a new system that can change the manner of life.

From time to time, somebody has an idea, a concept, that if it is placed in the moment and the right time, it is able to change completely the manner of people's life. Such an idea (concept) was "the clever house". Who doesn't dream that all wishes and desires to become truth, everything without asking. For example, the house is clean without moving a finger, everything is done until you return from the office, just pushing a button or appealing a vocal command. Do you drink a black tea at 5 o' clock p. m. every day? Your house

will learn to do this and you will have the tea prepared without any command. It is late and you want a special dinner, something you haven't eaten before, but you don't know what to choose? Your fridge is intelligent and solves this problem. It shows a list with the food that is inside (through a code bar), then it choose from the possible receipts with that food. It selects from Internet the receipt that contains most of the aliments you like. These are only a few from sceneries, which grow the comfort and make from the intelligent house a guaranteed choice [3], [4].

Some people with high wages would affirm that a servant could do this thing. Yes, but after a long period spent at the same job the servant learns the owner's habits. The intelligent house makes this thing at the most 2 days. Moreover, the servants have to be paid. Your intelligent house will not ask anything for the made "efforts".

The reason we chose this theme is easy. First of all, the Home Automation technologies represent a domain in a continuous development, with very tempting perspectives for an engineer and with a practical applicability of almost 100%. A SH system (Smart home) is one of the best occasions to practice an informal structure, which otherwise remains a pure theoretical example, laid on a paper and many times incomprehensible. Everything you work in this domain has roughly a quick result.

The applicative part of my project lies in creating a database to administrate dates in an intelligent house. The database contains optimizations and sceneries, which improve the comfort and the safety, transforming the house in a real intelligent medium.

II. DATA BASES FOR MANAGING AN INTELLIGENT HOUSE

SQL is the main language used in communication with relational databases. A database is a collection of inter-related information managed by a single unity. An object of a database is a structure of dates named stocked in database, such as a list, visualization or an index [6],[7].

A database management system is a software product delivered by the producer of the database. The DBMS system sets all the main services, required in organization and supporting the database, including the following aspects:

Transferring the dates in and from the data physical files, depending on tasks:

- managing the competitive access at dates of many users, including the prevention of conflicts which could be caused by simultaneously up dates;
- managing the transactions, so as all the changes made on a data base through a transaction, to be made with only a unity. In other words, if the transaction is made, all the changes made by the transaction will be record in a database.
- It accepts an interrogation language that represents the system of commands used by the user, so as to obtain dates from data base;
- Functions for saving the database and for reconstruction the data base due to the errors.
- Mechanisms of security for stopping an unauthorized access at the dates and their changes.

A relational data base is recommended being used in an application SMART HOME because of the extraordinary flexibility of the relational data bases given by the possibility of using tables independently or in combinations, without any hierarchy or predefine sequence in which has to be done the access to the dates [8].

III. SMART HOME DATABASE IMPLEMENTATION

Authentication

The authentication is the first stage that has to be done in managing the database.

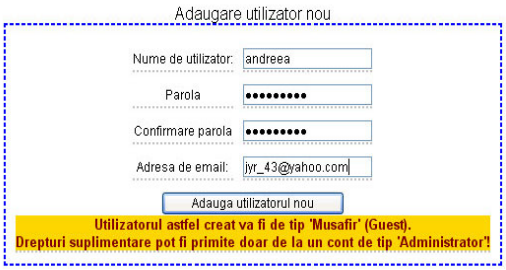

Figure 1. The login form.

For growing the security of the name of the users and the passwords are both of them sensitive cases. In the same time, to protect the dates and to avoid the agglomeration on server of the users, I realized the authentication, with the specification of the oneness of the user's name, of the password and of the address of the email simultaneously.

From a new administrator's point of view, this has to complete a form, to may access the dates from the database. The administrator will confirm the right of user.

Products

The products field contains the list of all the things that are in the house so automatically in the database too. These are grouped on categories and each product/record can be modified.

The administrator can add or erase products, can change the characteristics and the names of those that exist, and the actions that they do. The form of the products looks like this:

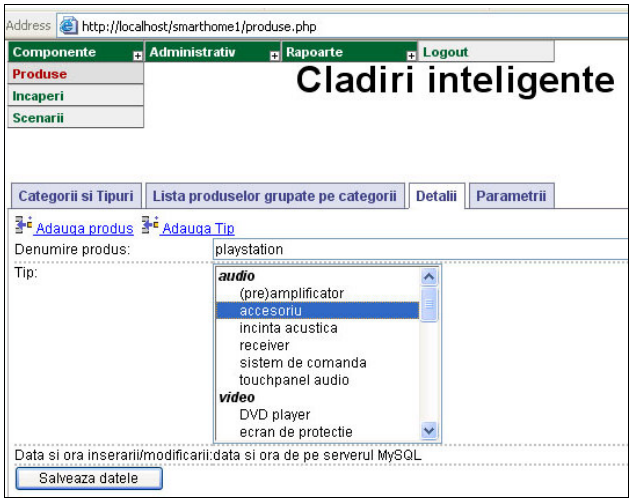

Figure 2. The product form.

Sceneries

The most exciting aspect of the intelligent house represents the make of the sceneries. The owner can realize its sceneries, fixing the parameters of the existing things from the house at the values that he deserves.

We will describe the realization of new scenery in the situation when the owner leaves home for a long time. Iwill emphasize easier the stages in realizing the scenery. We enter in the "Sceneries" field where we find the link "New Scenario". In the field below, we will write the name of the scenery, like in figure nr. 3:

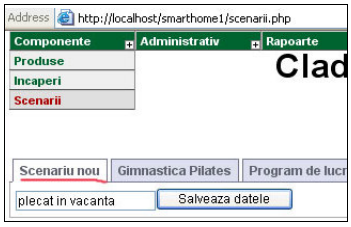

Figure 3. New scenario definition.

After the dates are saved, we pass to the stage of fixing the parameters, which means to add the details in the scenery. These make the scenery to differ from those existent at that time.

If we click on the link of adding details, it will appear a field of introduction, fixing of parameters, field that is under this form:

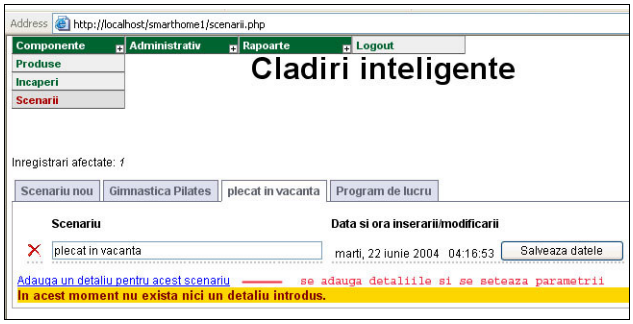

Figure 3. New scenery definition.

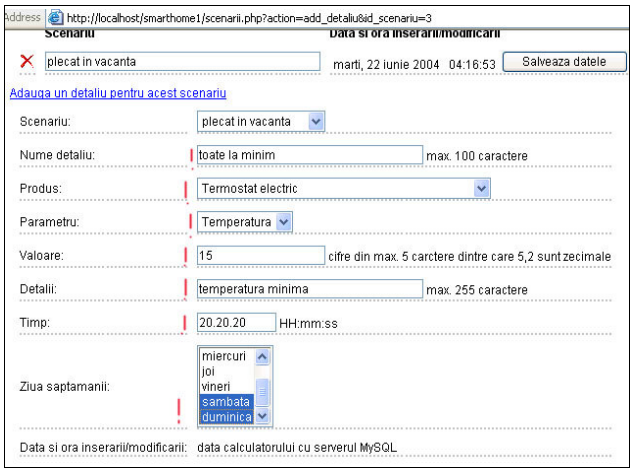

Figure 4. New parameters definition for scenery.

I choose for the beginning to set up the temperature of the thermostat at 15 ˚C on weekend, because for example I am gone to the mountain. The field will show like in figure no. 4.

After saving the adjustments in the database, the changes will appear like in figure 5.

Figure 5. The scenery editing form.

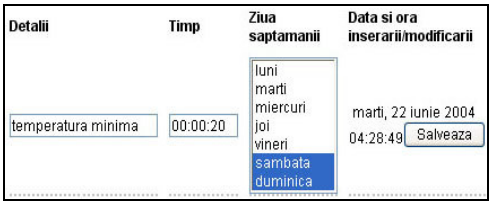

Figure 6. Time scenery definition.

The main advantage of the application presented in this paper is their flexibilities. The databases offer:

- Unlimited number of the smart home equipments;
- The sceneries are defined by user not by programmer;
- Threshold an presented values for the parameters;
- Record at different moments of time for all the parameters of the equipments;
- Unlimited number of descriptive parameters for equipments. The sceneries can be very complex and the control is very fine;
- Including new equipments and setting the parameters we define new sceneries.
- Temporal scheme for the sceneries application.
- The programmer intervention is necessary only if the new equipment added to the smart home don't have a interface for read/write in database.

Using a global relational database for the control of the smart home permit the optimization of the consumes, growing the comfort with 30-40%, when the construction costs grow only with 12-16%, for the same type of building without intelligent elements.

The storage of parameters for a long period permits to analyses all the used sceneries and to generate automatically new sceneries.

The equipments producers can use the information's from databases for the evaluation of the exploitation conditions. The database can generate conclusions regarding the equipment weakness and is useful in the design process of new equipments.

IV. CONCLUSIONS

The study described in this paper, manages to cover just a little part from the variety of applications realized by the Home Automation systems. We are used to name them intelligent buildings, although their IQ results from the way they are controlled by the systems from the buildings.

In a traditional building, the individual systems are independently controlled but their parameters that are not affected by themselves. A building can be named intelligent when the control of its systems is integrated and the decisions are taken by the evaluation of the dates collected from all equipments.

Although there are a lot of skeptics looking this concept, even from the developed countries, being considerate a luxurious or even more an un-useless investment, these intelligent buildings represent one of the many growings of science and technology.

Developments in future: "intelligent cities". The concept of intelligent buildings is related by the vast domain of intelligent cities. In this way, the intelligent buildings are not only independent entities but hubs interrelated in the infrastructure of city [9],[10].

The normal consequence of this thing is the development of cities inside the cities: smaller ecosystems, covering a network integrated in buildings, which optimizes the management of systems and resources. This thing is important because it generates a motor system, which reduce the costs, optimizes the number of employment and improves the quality of services consolidating the automation of systems.

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