SPACE MANAGEMENT IN SMART ROOM

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Abstract. Seeking to be sensitive to users, smart home researchers have focused on the concept of control. They attempt to allow occupants to gain control over their lives. Home owners and occupants want more control *of their lives*. The study of Intelligent Home is now a common topic worldwide. In current quest for modernization designers need that the building owner receives the best product possible. Everyday, building designers face exciting new challenges in incorporating new and innovative technologies in designing an efficient integrated intelligent building in areas of the building structure and its mechanical and electrical systems. The innovative technologies would need to ensure that the end users achieve the utilization of its abilities in optimization of there home space. This paper is focused on the various functions available in Room Automation System (BAS) and the benefits in having such functions.

1. Introduction

People spend more time in their homes than in any other space. The home ideally provides a safe, comfortable environment in which to relax, communicate, learn, and be entertained.

Increasingly, it is where people connect with friends and family, conduct business, manage resources, learn about the world, and maintain health and autonomy as they age. People invest extraordinary amounts of time, money, and emotional energy to mould their homes into living spaces that meet their needs.

Unfortunately, homes today are ill-suited to exploiting the pervasive computing applications being developed in laboratories. Most homes do not easily accommodate even the simplest new technologies, let alone embedded sensor infrastructures and ubiquitous display technologies. Moreover, homeowners generally believe that computer devices make life more complex and frustrating rather than easier and more relaxing.

They are wary of the aesthetic, financial, and cognitive challenges of bringing new technologies into their homes. A smart house is a house that has highly advanced automatic systems for lighting, temperature control, multi-media, security, window and door operations, and many other automation functions. Researchers are investigating how the home and its related technologies, products, and services should evolve to better meet the opportunities and challenges of the future.

Now, new tools are required to study technology in the context of home life that will support qualitative and quantitative studies investigating the relationships between spaces, the behaviours of people, and pervasive computing technologies.

A smart home appears "intelligent" because its computer systems can monitor so many aspects of daily living; with just a single touch the lights dim, the shades close, the plasma TV turns on and your favourite movie begins; to adjust drapes, lights, temperature, and audio/video components; total control is always at our fingertips.

However, smart home technology is real, and it's becoming increasingly sophisticated. Coded signals are sent through the home's wiring to switches and outlets that are programmed to operate appliances and electronic devices in every part of the house.

One way to reduce resource consumption is to design a home environment that controls environmental conditions. The home's occupant informs the system via some type of user interface that he or she wishes to stay comfortable while saving as much energy or money as possible. The home then uses a set of optimization algorithms to simultaneously maximize savings and comfort by automatically controlling the systems.

Home automation can be especially useful for elderly and disabled persons who wish to live independently. In order for smart homes to achieve their promise of significantly improving the lives of families through socially appropriate and timely assistance, they will need to sense, anticipate and respond to activities in the home.

An important goal of smart home research then becomes how to appropriately expand system capabilities to produce more control – both perceived and actual.

The definitions of an intelligent building can be systemically classified by the information and control services that serve the needs and expectations of the occupants. The specially designed controlling software and actual electronic hardware and devices installed within the structure that manipulate the telecommunications and building automation functions are necessary to create such a facility. Thus, the study of Intelligent Building is now a common topic worldwide.

In our current quest for modernization in this particular scope, there are two areas which deserve added attention, both from the research and professional communities. Designers need to ensure that the building owner receives the best product possible. Hence, everyday, building designers face exciting new challenges in incorporating new and innovative technologies in designing an efficient integrated intelligent building in areas of the building structure and its mechanical and electrical systems.

The innovative technologies would need to ensure that the end users achieve the utilization of its abilities in the home space optimization.

2. Related works

In [1] paper is evaluated the intelligence of the home according to the level of systems integration. In this paper, a home (building} is considered an intelligent one only when it is able to provide an environment and the means to optimal utilization of the building according to its designation. In order to achieve an intelligent building, various building systems, example lighting system, air-conditioning system, communication system and others, are required to equip in the building.

These systems must able to integrate among the systems and between the systems and building structures in order to function well in the building. Therefore all these systems' integration has to be properly planned from the initial design stage of the building.

One approach views the problem of smart home control in terms of end-user programming. These end-user programming systems explore various interfaces to provide end-users control of home devices, including natural language [2], visual programming [3], programming by demonstration [8] etc.

The end-user programming approach has several benefits. It provides users control over an unpredictable amalgamation of interoperating devices [4], and allows users to customize services as they might see fit [5], even inventing new services [6].

3. Intelligent Building

An intelligent building must performs three conditions. They are:
- The building should have advanced automatic control system to monitor various facilities, including air-conditioning, temperature, lighting, security, fire etc. to provide a comfortable working environment for the tenants.
- The building should have good networking infrastructure to enable data flow between floors
- The building should provide adequate telecommunication facilities.

An intelligent building must be smart enough to vary the environment and also to provide various means of communication or network regardless of whether it is internal or external.

Room intelligence starts with monitoring and controlling information services known as Room Automation System (RAS). RAS is able to optimize environmental and safety aspects in an economical way. This can be achieved by using computers, together with function distribution control techniques, to optimize the usage of various pieces of equipment within the building such as the electrical facilities, the air-conditioning systems, fire-prevention equipments and security devices.

Intelligent building, with the use of automated control system such as BAS, enables both building owners and occupants enjoy the benefits of financial gain and enhanced accommodation /management quality.

4. Room Automation System (RAS)

A room is the entity into which buildings are structured and used. Buildings are regarded as a collection of rooms. All analysis on smart house is done in the context of a particular room. The overall goal of the RAS is to satisfy the inhabitants of the building. This is achieved with changing certain aspects of the room accessible volume, before a human inhabitant needs to manually instruct the building to do so.

Traditionally every room in a building serves a certain purpose and is thus dealt with differently by the occupants using it. To reflect this in this paper the main logical concept on which the architecture of Room Automation System (RAS) is based, is a room (Figure 1). The authors are designing and building virtual prototypes, demonstrating how to create environments that need people.
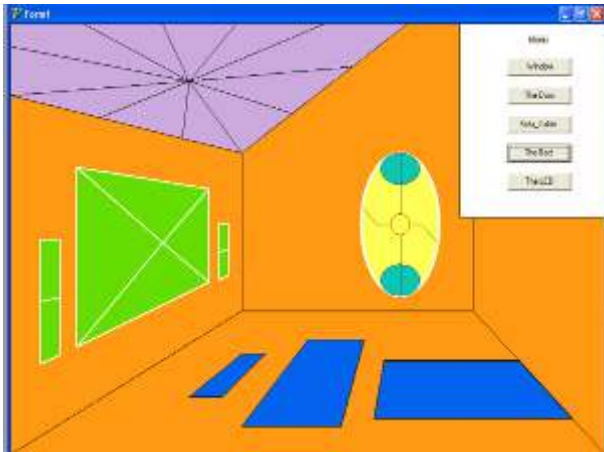
Fig. 1. Smart room - Configuration hall

All sensory input values are regarded as being related to one single room. This is also valid for decisions taken by the system.

Room Automation System (RAS) comprises of electronic equipment that automatically performs specific facility functions. The commonly accepted definition of a RAS includes the comprehensive automatic control of one or more major building system functions required in a facility, such as heating, ventilating, and air conditioning system, lighting, power, lifts, security and more. In short, RAS is to integrate the traditionally separate functions under one common operation.

RAS includes a collection of sensors that determine the condition or status of parameters to be controlled, such as temperature, relative humidity, and pressure. Similarly, output devices impart electronic signals or physical action to control the devices. Examples include electric relays or damper and valve actuators.

Building Automation Network (RAS LAN) provides the lowest level network structure interconnecting various LAN Controllers for electrical system. All LAN controllers are connected directly on to the RAS LAN. Once configured, controllers operate autonomously with no interaction required from other system. All the control application modules (power failure, auto restart time schedules, optimal start stop, etc) are resident in LAN controller memory for individual operation.

The Room Automation System (RAS) is an important part of the overall Intelligent Room Management System (IRMS) [7]. It not only shows the energy consumed in the building, it also provides monitoring and controlling functions of all the building services within the building. The RAS Workstation is loaded with Supervisory Control and Data Acquisition (SCADA) software along with the necessary drivers to interface to the controllers for monitoring and control.

4.1. Intelligent Feature

When occupants in the room increase, the RAS (Figure 1) will sense the increase in the room volume. RAS will then open the trapper to allow to the bed disappears. More volume is accessible in the room, thus this will cause a good space manage (Figure 2).
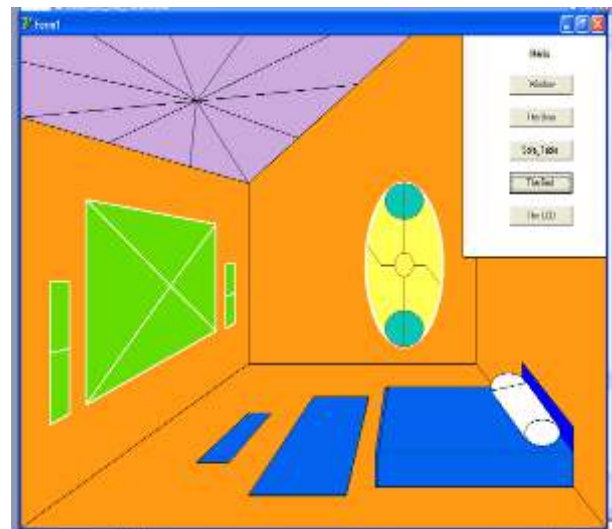

Fig. 2. Smart room -Configuration bedroom

In order to maintain the static state of the bed, the RAS activates in the sense to fix them to the desire position. Daytime the bed is trapped in the background of the room.

During this operation outside trappers are opened but the bed is closed and key 'the bed'' will be command to "on" position. This operation is normally scheduled after occupant sleep hour.

4.2. Control and operation

Every room is provided with selector switch for selecting either Manual or RAS operating mode. Under RAS mode, the selector switch will operate according to the time schedule. Under Manual mode, RAS controls are disabled but monitoring functions will be retained.

When manual mode is selected, key 'the bed'' will show "pushed". When RAS mode is selected, key 'The bed'' will show "not pushed". In order to control the AHU from the control panel, the switch mode of the equipment must be at RAS. Figure 3 shows the manual switch mode indication.

The user can also manually control, any furniture piece in the room by the selecting of the

corresponding key (Figure 3). This will allow user manual control by activating the selector switch to do the task that the user wants. Normally manual control is depending on the user requirement and is needed when an error or fault occurs in RAS.

Fig. 3. Switch Mode for BAS and Manual

A multifunctional room in a building serves a multiple tasks such seating and sleeping and is thus dealt with differently by the occupants using it. The architecture for the seating and watching task is show in the Figure 3, when the bed is disappeared and the table and the sofa become visible.
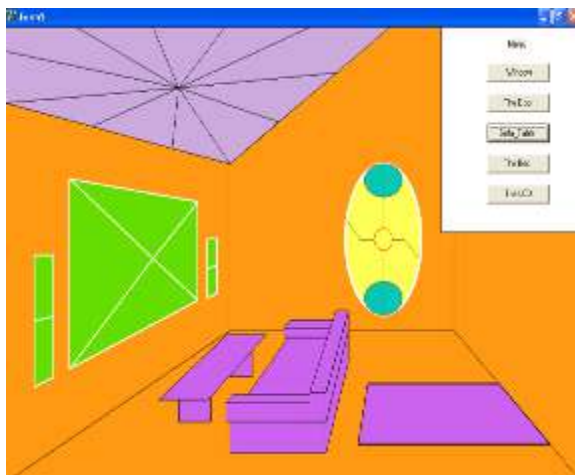

Fig. 4. Smart room - Configuration student house

5. Conclusions

Preferences of inhabitants, the inhabitants itself, the structure of the building and the distribution of the rooms are things that continually change over time. Intelligent Room Management System will actually become less predictable as it acquires more expertise, and the system's success some or most of the time will raise user expectations about what the system is capable of doing.

The authors aim to create design strategies for more flexible environments that better meet occupants' physical and cognitive needs than current environments.

The authors present a prototype application that illustrates how users can create their own smart home functions on a handheld device. This concept emphasizes the user's individual and unique lifestyle by letting him define his own criteria.

This approach lets the user stay in control of the technology and thereby prevents the user from not using the application due to irrelevance.

It is our belief that this type of context-aware applications will, in many environments, be preferred over the more autonomous ones, which, in their effort to work smooth and transparent, leaves little free choice to the users.

The Smart Home may become newest room study and coolest dormitory on campus. From an idea to a reality is a long way.

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