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**INFORMACIONE
TEHNOLOGIJE**

SADAŠNJOST I BUDUĆNOST

Urednik
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Urednik
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OD PAMETNIH SOBA DO PAMETNIH HOTELA

FROM SMART ROOMS TO SMART HOTELS201

Nebojša Delibašić, Novak Jauković, Milovan Radulović

KOMUNIKACIONI PROTOKOLI U INTELIGENTNIM OBJEKTIMA

COMMUNICATION PROTOCOLS IN INTELLIGENT BUILDINGS205

Ana Grbović

CFC U STEP7 OKRUŽENJU - INTERKONEKCIJA I PARAMETRIZACIJA UMJESTO
PROGRAMIRANJA

CFC IN THE STEP 7 ENVIRONMENT - INTERCONNECTION AND PARAMETERIZATION
INSTEAD OF PROGRAMMING209

Kenan Duraković, Ramo Šendelj

ANALIZA SAJBER INCIDENATA U CRNOJ GORI

ANALYSIS OF CYBER SECURITY INCIDENTS IN MONTENEGRO.....213

Saso Gelev, Goce Stefanov, Vlatko Cingoski, Vasilija Šarac

DETEKCIJA I IZOLACIJA NEISPRAVNOSTI U SISTEMIMA AUTOMATSKOG UPRAVLJANJA
SYSTEMS FOR DETECTION AND IDENTIFICATION OF AUTOMATION SYSTEM

FALURES217

Tijana Radulović, Luka Lazović, Ana Jovanović, Vesna Rubežić

HAOS U MIKROTALASNOM KOLPICOVOM OSCILATORU

CHAOS IN MICROWAVE COLPITTS OSCILLATOR221

Marko Babić, Luka Lazović, Ana Jovanović, Vesna Rubežić

HAOTIČNA DINAMIKA U VIBRACIJAMA NA HELIKOPTERU

CHAOTIC DYNAMICS IN HELICOPTERS VIBRATIONS225

Luka Lazović, Ana Jovanović, Vesna Rubežić, Dragan Filipović

IMPLEMENTACIJA SOFTVERSKOG PAKETA AWR ZA PROJEKTOVANJE MIKROTALASNIH
FILTARA

IMPLEMENTATION OF AWR FOR MICROWAVE FILTER DESIGN229

Luka Lazović, Žarko Zečević, Vesna Rubežić, Ana Jovanović

PREDLOG ALGORITMA ZA ADAPTIVNI BEAMFORMING

A NEW ALGORITHM FOR ADAPTIVE BEAMFORMING233

Arsenije Maliković, Milica Ljumović, Dragan Filipović

IMPLEMENTACIJA WIPL-D SOFTVERSKOG PAKETA U PROJEKTOVANJE MULTISEKCIONOG
ČEBIŠLJEVLJEVOG TRANSFORMATORA

IMPLEMENTATION OF WIPL-D SOFTWARE PACKAGE IN CHEBYSHEV MULTISECTION
MATCHING TRANSFORMER DESIGN237

Jelena Šoškić, Budimir Lutovac, Dragan Filipović

ANALIZA PATCH ANTENE NA OSNOVU REZONATORSKOG MODELA

PATCH ANTENNA ANALYSIS BASED ON CAVITY MODEL241

OD PAMETNIH SOBA DO PAMETNIH HOTELA FROM SMART ROOMS TO SMART HOTELS

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Sadržaj: *Ovaj rad daje prikaz potencijalnog puta koji novi hoteli mora zadovoljiti kako bi poboljšali svoj status iz hotela s pametnim sobama prema punom obimu pametnog hotela. To predstavlja mogući prelazni način, uključujući inovativne aplikacije utemeljene na savremene informacione tehnologije za ambijentalne postavke u domenu hotelske industrije koja ima za cilj poboljšanje kvaliteta pruženih usluga, a polazeći od sadašnjeg nivoa pametne sobe. Glavni cilj ovog rada je da postavi osnovu koju pametni hoteli moraju zadovoljiti korištenjem sofisticiranih informacijskih tehnologija za direktnu interakciju sa gostom. Time bi gost koristio hotelske usluge u zavisnosti od svojih želja i zahteva tako da bi njegov boravak bio što ugodniji. Na osnovu toga, zaključujemo da budućnost hotelske industrije leži u okviru razvoja koncepta pametnih hotela, koji omogućuje da gost ne oseti da je daleko od kuće i da dobije jedinstveni doživljaj.*

Abstract: *This paper gives an overview of a potential path that new hotels have to satisfy to improve their status from a hotel with smart rooms towards a full-scale smart hotel facility. It presents a possible transitional way including innovative applications based on modern information technology for ambient settings in the domain of hotel industry that aims to improve the quality of offered services towards clients, starting from the present level of smart rooms. The main objective is to pose the basis that hotels must satisfy by utilizing sophisticated information technologies for direct interaction with the guest, as well as to accommodate hotel services depending on guest's wishes and needs in order to make their stay as pleasant as possible. Accordingly, the paper concludes that the desired future of the hotel industry is within the concept of being a smart establishment aiming to leverage the disadvantages of being away from home and offering a unique guest experience.*

1. INTRODUCTION

The hotel industry is growing worldwide rapidly with high and good outlook of occupancy, the revenue per available room and the average daily rates. Even more, by 2016, total hotel revenues are expected to exceed half a trillion USD [1]. Yet, the managers working in the hotel industry always face with constant challenges how to attract larger number of guests in a time of ever changing guests' preferences and an increased demand for tailored-made services.

The time has passed when the guests were satisfied with only clean linen, and the gym and spa are no longer extras, but essential amenities. Nowadays, guests can search, compare prices, check reviews and book online, seeking for new and even higher standards. Consequently, the opportunities are immense for those hotels which are flexible enough and willing to change their services rapidly with the time, transforming their business concept from hotels that include smart rooms, into an up-to-date concept of the so-called smart hotels. Moreover, becoming a smart hotel is the only way to achieve differentiation in an increasingly crowded and competitive hospitality market. By achieving this, hotels often aim at promoting some design features that bring a luxury status of the establishment [2 – 7]. Furthermore, smart hotels are environmentally-friendly oriented since they help mitigate many problems related to providing healthier indoor environment [8 – 12].

The purpose of this study is to identify, analyze and generalize the potentials for improving hotel services based on implementation of modern, mainly information technologies, towards enhancement of the quality of services from a high-scale hotel with smart rooms, towards a full-scale smart hotel. To achieve the purpose, the case study research method was chosen because it provides a detailed and in-depth conceptual analysis of a limited number of event conditions and their relationship [13]. Therefore, a five-star hotel "Flamingo" - Gevgelija on the border between Macedonia and Greece is discussed throughout the paper, as a case study that possesses some valuable findings for application of several issues related to the investigated subject. More precisely, the presented study contributes to assessment of the possibilities of evolving from a smart room concept to a smart hotel within the elaborated case.

2. SMART ROOM CONCEPT

The term 'smart' or intelligent room basically refers to a hotel room with a microprocessor operated station that monitors parameters important for normal functioning. Mainly, it includes supervision of temperature, movement of the guests in/out of the room, some sensors and alarms, etc. To achieve greater efficiency, such room stations are connected to the central computer, which provides centralized control not only on a single room bases, but rather on a set of rooms, floors or even the entire hotel.

With implementation of a smart room concept, one may accomplish the following objectives:

- Reduce the consumption of energy and water;
- Smooth and harmonious operation of all devices;
- Maximum convenience and comfort to the room occupants, including security of the guests and supervision of their belongings in the room;
- Increase of the reliability and quality of services;
- Improve hotel staff efficiency based on constant reception of new and most reliable information, regarding the status of the room parameters;
- Develop an "environmental awareness" among guests and operational hotel staff, etc.

Table 1 presents the estimated investment cost and the expected return period of these investments for achieving some common energy efficient measures taken in hotels. As noted, depending on the type of measures, the expected energy savings could be estimated between 25-70%, and the yearly cost savings between 6,000-20,000 €.

The following measures are taken into account:

- Short-term measures (*amendment of thermostatic valves, replacement of the showers, temperature adjustment, etc.*);
- Medium-term measures (*installation of solar thermal systems for hot water, installation of mixed valves and pumps, replacement of boilers, insulation of the water and heat pipes, etc.*); and
- Long-term measures (*installation of PV solar systems, restoration and replacement of the facade of the building, etc.*).

Table 1: Investments and effects calculation

Type of taken measures	Investment recovery	Energy savings	Cost savings (per year)
Short term	< 5 years	25 %	6,000 €
Medium term	> 5 years	37 %	10,000 €
Long term	> 10 years	70 %	20,000 €

In addition, a modern control system goes step further in the field of energy efficiency improvements and the decrease of hotel operational costs. These modern systems usually come under the short name of HVAC systems (Heating, Ventilation and Air Conditioning), can provide additional services towards accumulation of any unused energy, such as the hot water, the temperature and lighting control in the unoccupied rooms, etc., as shown in Fig. 1.

In this line, we present a way of energy saving as implemented in the case of hotel "Flamingo". It is achieved through the simple fuzzy logic operation of the HVAC system depending on the guest presence in the room. The prescribed levels of temperature are set with three easy steps in manner as shown in the Table 2.

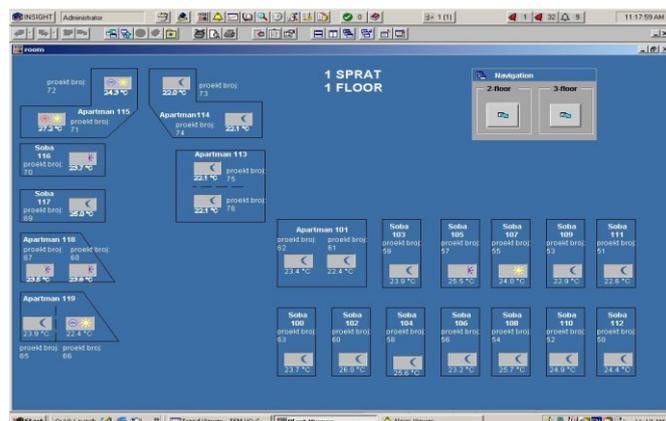


Fig. 1: Control panel for HVAC system (1 floor) Hotel Flamingo - Gevgelija.

The high tech environment established inside the smart rooms offers the guests a combination of a discrete sophisticated technology (*Satellite & Pay & Internet TV, radio, DVD, bill-check, etc.*), and superior comfort such as a smart-key, large working area, specific designed bed-desk for the workaholics, selection of bed and pillow types, various and selectable lighting options, and a large rain shower to unwind when the work is finally over.

Table 2: Automation of room temperature settings

Room status	Status of the HVAC System
Room is available	Only the refrigerator from the mini bar is in function.
Room is occupied, but the guest is outside the room	The refrigerator is in function, room temperature is set 3°C lower than the outside temperature. If the window is open, the HVAC system does not operate.
Room is occupied, and the guest is inside the room	All functions (<i>temperature, air-flow, etc.</i>) within the room may be set by the guest. If the window is open, the HVAC system does not operate.

The general feature model which actually possesses the functionality of the smart room along with its possible variations is presented in Fig. 2. Accordingly, the grey colored squares represent the active features in the smart room, while the white ones, the inactive. More precisely, the model presents all different features that the smart room can implement in order to satisfy the guest's needs. Therefore, depending on the guest's choice and intentions (*enter the room, work, watch movie or TV, sleep, leave the room, etc.*), the model activates and deactivates the appropriate features in the smart room control system.

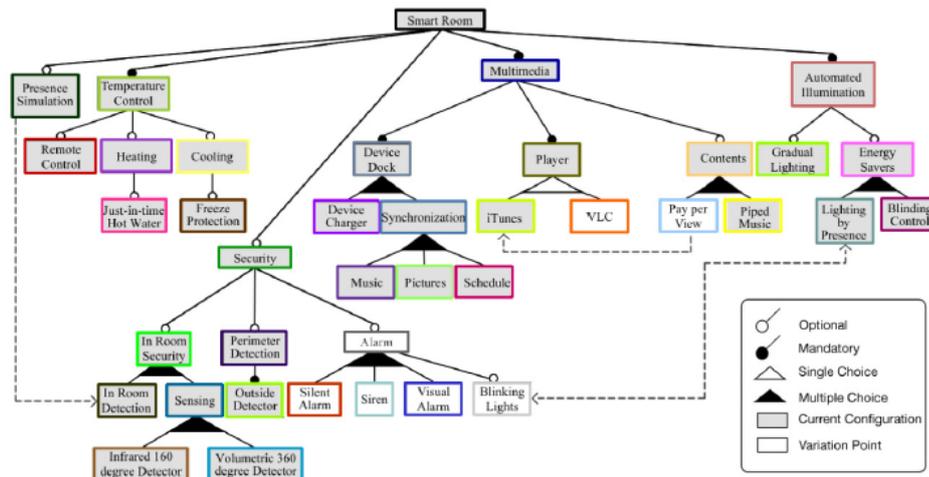


Fig. 2: General feature model of a modern smart room.

Having smart rooms, the hotel management could obtain real savings while simultaneously becoming eco-friendly in providing guests a superior, personalized experience. These intelligent rooms easily integrate lighting, shade, HVAC, entertainment and security controls into a single platform, which results in significant operational savings in a short period of time and make a quick return on investment. Hence, they offer an unobtrusive way to conserve money and resources by giving the guests environmentally green settings. The guests are able to use a single remote unit to control draperies, lighting, room temperature, room status, TV, music, video systems, to schedule wake-up calls and make various requests for services as housekeeping, room service, spa and many more services which make their stay perfect.

Moreover, the guests can make their own ‘green settings’ which allow them to select the preferences for light level, room temperature or the frequency of linen and bathing changes. The smart hotel concept deals with a creation of new life to the ordinary and common known hotel landscape. It is stylish, fresh and completely opposite from the traditional midscale accommodation which fails to adapt to the needs of modern guests. Today’s guests are looking for a new level of comfort and convenience similar to that in their homes, which only modern technology can provide. Due to the fact that they travel equipped with laptops, tablets, smart phones and other tech devices, the guests expect the hotel to offer a place where they can easily be ‘plugged in’.

All these amenities available to the guest, enable them to feel not only as welcomed guests in the hotel, but they could also get the feeling which significantly contributes towards the development of a better and greener environment, along with their unique and enjoyable stay in the hotel.

3. SMART HOTEL CONCEPT

A simple idea which normally appears of having a smart hotel as a hotel containing only smart rooms, does not fit the concept of the modern smart hotels. More has to be done and

implement in order the hotel industry to be able to enlist one hotel as a smart facility. The general model of a smart hotel concept, is schematically presented in Fig. 3. It is noticeable that it possesses a huge technical capability to capture the guests’ touch point opportunity on the hotel grounds - from the time they step into the lobby, to the time they leave the hotel.

Having only a smart room is just a small part of what is considered to be the least necessary for the development of a smart hotel. Starting from the lobby and registration desk, restaurants and bars, a full high-speed Wi-Fi in all facilities is considered as a must in one smart hotel. Each guest should freely enjoy using automatic check-in and check-out, digital concierge and restaurants with specially designed POS terminals where the guest can automatically set their food and drink preferences, eating time and table selection, variety of room and hotel entertainments, all other hotel services, video-surveillance, etc.

Having all this in mind, the concept of a smart hotel reaches far beyond having only smart rooms. A smart hotel represents a simple fail-safe model that can be developed double as fast as any traditional hotel. The stress is put on the return on investment due to its modal construction and innovative operational integration methods. It takes into account the whole facility integration such as energy efficiency improvements, inclusion of renewable energy sources, environmentally green policy and treatment towards all waste products in the business such as waste food, waste and sewage water treatment, energy recuperation, etc. Therefore, the smart hotel concept is rather an integrated concept which includes automation control system based on modern information technology, sophisticated set of sensors and actuators, optical or any other source of speedy communication facilities and protocols, wireless technology, integrated renewable energy sources, modern waste treatment technology and constant education and training of all hotel staff employees to achieve its successful implementation.

The staff education is one of the crucial steps towards the successful implementation of the proposed idea. Namely, the whole smart hotel concept strongly depends on the staff

knowledge and their commitment towards full and continuous implementation at all levels. Otherwise, the model can collapse leading towards additional costs and investments without fulfillment of the expected and desired results.

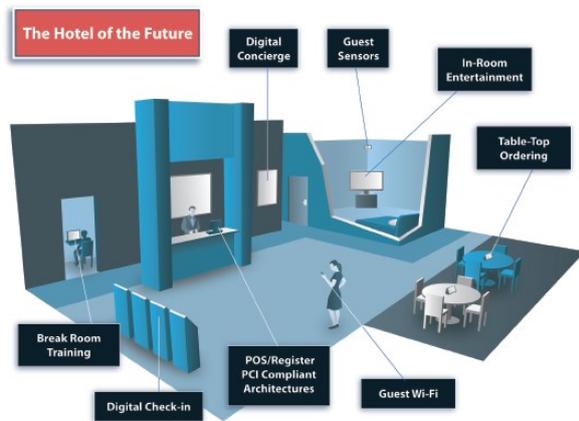


Fig. 3: The concept of a smart hotel.

4. CONCLUSION

In order to meet the high service expectations of new-style hotel consumers, hotel establishments move towards development and implementation of a new smart hotel concept. Their major business challenges include an increase of occupancy rates, return visits, and new business opportunities led by the reduced complexity and improved operational cost efficiency. The smart hotels take the best the technology has to offer in order to provide the guests a highly personalized experience. Hence, hotels create a smart environment which enables integration of voice, mobility, high-speed Internet access, and TV entertainment services, which on the other hand result in new experiences and improved services for guests. Moreover, the smart room technology is often combined with super-efficient service since this kind of room is customizable to individual preferences, learning guest habits and anticipation throughout their stay.

Even though the paper contributes to the state of art referring to the evolution of the smart room concept into the smart hotel concept, several issues arise which might be addressed in some future work. The presented data in the elaborated case study is reliable, but it is difficult to assess to what extent represents an example for development from a hotel with intelligent rooms to a hotel of the future. Therefore the study may be enhanced by addressing new aspects that clarify the idea of smart hotel in more in-depth manner.

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