The priorities and comfort of the smart home

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Abstract—The article contains a theoretical study, which reflects the importance and priorities of smart homes in everyday life. The houses of the past, museum models, with utilitarian functions for living, constructions and small spaces, handmade furniture in small numbers, illuminated with torches and candles, while today the house is a refuge from everyday life, where possibilities and comfort for residents are provided by controlled devices and systems. Smart homes, also known as automatic homes, smart buildings, integrated home systems with home automation applications, are a contemporary development in architectural design to promote controlled interior comfort. The author reflects the role of research on the development of smart homes, becoming an ordinary necessity of contemporary society, which incorporates common devices that control the characteristics of smart homes. Initially, smart home technology was used to control, for example, lighting or heating, recently the use of smart technology has developed, so that we can include almost any electrical component in the house in the control and management system. One of the most important features that allows us to make the "smart home" special is the efficient organization of living space and efficient control, but also an ecological environment. By establishing the most efficient concept of interaction between human and house, we can organize and implement in the house an optimal, healthy and economical environment. In the smart home, the human with the help of small impulses can manage the systems inside and outside the building, even remotely, which will determine the individual needs of man, the current priority in architectural design.

Keywords—smart home, comfort, control system, interior design, green energy

I. INTRODUCTION

„…At home we need to feel safe and comfortable..."
/ Catherine Pulsifer/

Today's architects and designers, in the design of residential and public constructions, apply the principles of functionality of the premises but also the thermal, sound, technical comfort, accessibility and speed to services and information, all ensured by the automation of technologies in the home [1]. The smart home with home automation applications, controlled and programmed systems from a gadget, fixed panel or portable device, all ensure the principles of comfort in the contemporary house. Home automation is considered a science of the future for humanity, which aims to ensure a directed and controlled comfort, very useful for the home of the XXI century [11], [16].

The smart home is a system of devices in the house that can perform actions and solve certain tasks without the participation of a person. Smart homes and the technologies used in their operation are becoming more and more sought after today, which are rather related to comfort, security, economy and a greener way of life. The priorities of contemporary residential or public buildings are complemented by intelligent operating systems, with multifunctional interior spaces, made of construction materials, finishes, ecological textiles, autonomous energy [4]. The traditional Romanian houses of the peasants, the houses of our ancestors, classic houses, differ from today's smart houses, which were entirely made of simple but healthy materials, today successfully implemented in tourism, promoting culture, tradition, folklore and national cuisine, located in a landscape of the native land (fig. 1 a, b). However, the eco-village and urban stylistic trend allows the construction of a house made of natural materials and does not exclude the creation of an urban comfort with all living conditions at the highest standards. This state of well-being can be provided by modern engineering networks, which, being correctly arranged, offer you a healthy and comfortable environment [2].

Fig. 1. Traditional peasant house (a); Contemporary, smart house

II. METHODS AND SOURCES ABOUT SMART HOMES

The evolution of the notion of smart home, a researched topic for practical application, is historically followed and described in the collection of essays Vers une nouvelle architecture - Towards a new architecture (1923), by the Swiss architect Le Corbusier (1887-1965), from which comes the term of modern architecture, with ideas for functionality and comfort in the interior space provided by some technology, elaborating a first project [3] Thus, Vila Savoye (1928-1931) is a smart home, a stylistic concept developed by the architect, engineer and painter Le Corbusier and architect Pierre Jeanneret, a construction that represents a minimalist aesthetic of shapes that incorporates functionality. We

consider it an inspiration from Japanese philosophy for interior space, free facades and openness to the natural environment (fig. 2). Aerated spaces, unloaded of shop window furniture, a clear linear graphic of the interior design concept, today would be like the contemporary stylistics of the 21st century - japandi style, being a fusion between Scandinavian aesthetics and the simplicity and naturalness of Japanese style [14], [17]. The concept for the house Villa Savoye, is comfort and naturalness, open horizontal planes, habitable flat ceiling, intertwining with some technologies [15].
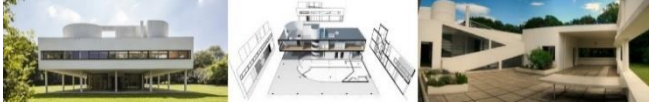

Fig. 2 Le Corbusier and Pierre Jeanneret, Villa Savoye (1928-1931), Poissy in France

Therefore, the development of technologies has contributed to the improvement of life with appliances connected to the electricity source, household objects exhibited in exhibitions from 1970-1980. New technologies offered culinary, maintenance and hygienic possibilities, new concepts of buildings in which there were controllable objects on the computer for example, doors with sensors that opened on their own and other technologies [7].

Today we have the possibility to choose between individual smart products for example, robot vacuum cleaner, automatic thermostats or smart bulbs, each with remote control or with its application and services or commands for example, automatic lowering of blinds and lighting of lamps, controlled from the same remote control or phone application. The most common examples of such smart opportunities would be: automatic switching on and off, automatic correction of the heating system or air conditioner and automatic notification of intrusion, fire or water leaks. Automated home technology in modern conditions is an extremely flexible system that the user and in the case of the elderly build and configure independently according to their own needs. This assumes that each smart home owner independently determines what devices and where to install and what tasks and how they will perform [9].

Fig. 3. Control systems in a smart home

A. The possibilities offered by a smart home

A smart home is actually a network of technologies and devices connected to each other via the Internet. These technologies can be monitored and controlled remotely, with applications available on mobile or other smart devices, for more comfort, more safety and low maintenance costs.

TABLE I. CONTROL SYSTEMS (COMFORT, SAFETY, SECURITY) IN THE SMART HOME

Comfort	Electrical control Lighting control Temperature control Ventilation / conditioning control Control of curtains / blinds Garden irrigation control Remote control
Safety	Fire prevention Predicting gas leaks Flood prevention Prevention of degassing of carbon monoxide „CO" Warning about open windows / doors Remote information
Security	Active security Room access control Video monitoring Trigger sound alarm Disability information

The intelligent system for a house or public space includes a range of security and video surveillance systems up to security systems with motion sensors and flood detection systems, electronic locking systems, or temperature regulation (tab.1, fig. 3, 4). All systems in a smart home are harmonized in a single smart device, which can facilitate and ensure a comfortable life in any space and functional area inside. These coordinated intelligent possibilities are welcome for both private homes, residential and public buildings, provided with systems and autonomous energy collectors.

Fig. 4 Control systems inside a café

The intelligent control systems ensure safety, security, but also passive energy systems with the installation of thermal and photovoltaic panels, wind turbines of the beneficiaries depending on the package of services, today being suitable for private or office electric transport. The intelligent technologies provided by green electricity, necessary for indoor comfort, has a positive impact on the environment, as harmless systems installed on the roof or facade of buildings, a current eco principle, both for rural and urban areas (fig. 5) [12].

Fig. 5 Smart homes, green energy

Implementing control systems in homes, smart buildings are useful for reducing energy consumption, heat regulation system, and electricity with reductions in monthly bills. According to the classification by Frances Aldrich in the book Smart Homes: Past, Present, and Future (Inside the Smart Home), smart homes can be distinguished by the categories: houses in which there are smart objects; smart devices that

communicate with each other, houses that include networks that can be accessed and changed even remotely; houses that record the frequency with which you use certain appliances around the house and use this data to anticipate future needs [13]. The house, the smart home, is the most progressive conception of human interaction with advanced technologies in the living space, wherein automatic mode, according to external and internal conditions, is established and monitored by all modes of operation of systems and engineering devices.

Fig. 6 Remote controlled smart home

B. The advantages and disadvantages of the smart home

Current trends in smart homes in the field of home automation include mobile remote control, automatic lights, automated thermostat change, programming devices, mobile / e-mail/text notifications, and remote video surveillance (fig. 6). The smart home but also the smart building is the one that, using automation, offers the possibility to the space beneficiaries to access and remote control systems such as lighting, heating, operation of appliances or security, as well as optimization of these functions in real-time. (tab. 2) [10].

The many advantages of a smart home are the simplicity and speed with which we can control or carry out certain household activities directly from the smartphone or other device. But many of those who want a smart home with a controlled control system can face several obstacles, high prices, attacks and computer leaks, the difficulty of managing the system. However, smart systems offer the possibility of connectivity and interactivity because of the way of life, even when we have to be in more places because of business trips, children's school programs, or social activities. Thus, the high level of automation allows more comfort, control, and safety in homes, smart office buildings, etc. (Fig. 7) [5].

TABLE II. SMART HOME, ADVANTAGES AND DISADVANTAGES

Advantages	Disadvantages
Efficiency of electricity, gas and water consumption	High costs for a control system
Much more efficient security of the house	The control system of the house connected to the internet network is exposed to a potential computer attack
Increased safety in case of fire or flood	Possibility of leaking personal information
Efficient lighting depending on your needs and the time of day or night	Difficulty using and managing the control system with the help of a pawn
More free time	

Fig. 7 Private house, building with intelligently controlled offices

The benefits of an intelligent lighting system in the home are represented by the much lower consumption of electricity, generated by both ecological bulbs and intelligent lighting of lights, when there is no presence in a certain space, colored and adjustable lighting, etc. A lot of other processes can be automated so that the coffee machine starts with the alarm, the intensity of the artificial lighting can be adjusted according to the amount of natural light in the room, and the lawn is always watered according to the humidity level and of the temperature recorded outside. The ambiance, the mood of the interiors can be changed by the colored lighting system, the play with the shape and size of the space changes by accentuating or diminishing some areas (fig. 8).

Fig. 8 Colored lighting system

In the "smart home" man, with the help of small impulses can monitor the surrounding technique that will determine the daily needs of the individual, just as the system of regulation of heat and electricity brings benefits with large discounts on monthly bills [6].

III. SMART HOME SERVICES IN THE REPUBLIC OF MOLDOVA

Today in the 21st century, to benefit from the services and opportunities of a smart home in the Republic of Moldova, truly automated, we can turn to specialists in the field, companies that provide such services. Meeting the consumer needs of the population for automated comfort in the home, which speeds up as the development of science and technology is complicated by minimal services or expensive costs, which seem unfeasible for low-income Moldovans [16]-[19].

However, the agencies on the market in the Republic of Moldova present smart house services, with regulation and control systems for light, indoor climate, doors or doors, automatic blinds or curtains, monitoring of necessary rooms, unsanctioned access to the home or danger fire etc. Thus, we can transform the house, apartment or office into a comfortable and safe living space through guidance systems, video surveillance, etc. from a distance.

Therefore, in 2016 in Chisinau was launched a project in the field of the Internet of Things - The First Housing Block based on the Smart House system in Moldova. The house system offers the inhabitants of the smart block the most modern level of services, as well as the possibility to use new tools for more efficient and convenient management of the houses, according to the latest trends in the field of information technologies and electronic communications. Thus, the basic components of the smart home, installed in each block: security, video, access control, lighting,

automation, and telemetry, will make the operation of the complex safer and more energy-efficient. With a simple touch of the smartphone, users will control the light, temperature, doors, blinds or curtains, the video surveillance system, to be promptly informed about gas or water leaks, fire danger, or unsanctioned access to the home (fig. 9) [18]-[19].

Today, when humanity is going through the covid-19 pandemic, we have all adapted to the requirements of isolation at home, and we have made communication, work, studies, purchase offers all remotely. Thus, smart devices have ensured our comfort and collaboration by remote control. The home, office, gallery or shops have become spaces and domains of distant, virtual digital communication, which ensures the stability and balance of human society in the 21st century overwhelmed by the pandemic.

Fig. 9 The first housing block based on the smart home system, Chisinau, Republic of Moldova

Along with the high pace of technology development, but also the speed with which it enters people's lives, in front of architects, designers and engineers is the challenge of satisfying the requirements of smart homes - smart houses. And the recommendations for the home of the future, different from the classic house, the smart home involves the integration of certain services and technologies in order to automate the living space and increase the quality of life of tenants. Digital intelligence comes from the possibility of a system to "learn" and "adapt" to the user's profile in satisfying the functions in the smart house. Therefore, the concept of the "smart home" in the 21st century, represents the need of people to have an intelligent control system directed on the space in which the family carries out their daily activities. The classic house known so far will change its status into a smart home, being a traditional home for the near future. Change is inevitable, and services and technologies will become a new model of ordinary life and like this, the smart homes will become part of our daily lives.

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