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**Махмуд.А.Т**  
 Науч. Рук. Кандидат технич. Наук., доцент Мухаметгалеев Т. Х,

кафедры мехатроника и робототехника

1ФГБОУ ВО «КГЭУ»,г.Казань,Республика Татарстан

1gp745@yandex.ru

**The smart home system using mechatronics**

Abstract: The smart home system uses mechatronic devices to automate and remotely control various aspects of the home. Sensors (temperature, light, motion) collect data that is processed by microcontrollers.

Based on data analysis, actuators (e.g. servos, relays) control lighting, heating, ventilation and other systems

The user can control and configure the system through the application, getting comfort, safety and energy efficiency.

Keywords: mechatronics, smart home , Automation , Sensors , Motors , Control, Artificial Intelligence (AI) ,Machine learning ,Robotics.

A smart home is a living space in which household appliances, lighting, heating, security and other components are integrated into a single network and controlled using an intelligent device such as a smartphone or tablet. The smart home system uses various technologies, including mechatronics, to automate and optimize home functions.

Mechatronics in the smart home system

Mechatronics is an interdisciplinary field that combines mechanics, electronics and computer science. It allows you to develop systems that can perceive, process and respond to the environment in real time.

:**In smart home systems, mechatronics is used to**

\* Control of actuating mechanisms such as door locks, thermostats and blinds.

\* Collecting data from sensors such as motion, temperature and humidity sensors.

\* Data processing and decision-making based on algorithms and machine learning.

**Advantages of a smart home with mechatronics :**

The use of mechatronics in smart home systems provides a number of advantages, including:

\* Convenience: Automating household tasks frees up time and allows you to focus on other things.

\* Efficiency: Optimizing the use of energy, water and other resources reduces operating costs.

\* Security: Integrated security systems provide protection against intrusions, fires and other hazards.

**Cons of having smart devices in your home:**

1. It’s difficult to link systems from different vendors.

Many manufacturers develop disctinct systems, making it difficult to integrate new devices with your existing ones made by a different brand.

Integrating different devices from different vendors may result in limited functionality and unreliable service.

1. The systems can be costly.

The market is expanding and costs are decreasing, but many systems still come with a hefty price tag.

Most devices cost several hundred dollars each; the cost of a complete home upgrade could be thousands of dollars.

1. These devices have security flaws and can be hacked.

In early 2015, one tech company tested 16 home automation devices and found only one that its researchers couldn’t easily break into.

Some companies that make these products don’t have strong backgrounds in security.

There are currently no industry standards for security on these devices.

If cyber criminals breaks into your home devices, they can learn your patterns of behavior and use that to their advantage.

\* Personalization: Individual adjustment of the system parameters to the needs and preferences of the user increases comfort.

**The mechatronics-based smart home system finds application in various field**

\* Lighting control: Motion sensors turn on the light when detecting presence and turn it off when not present, saving electricity.

\* Temperature control: Thermostats connected to the mains automatically adjust the temperature according to the set settings, optimizing energy consumption.

\* Security: Door locks with fingerprint sensors provide reliable access, and surveillance cameras with motion detection function enhance security.

\* Voice Control: Virtual assistants such as Amazon Alexa and Google Assistant allow you to control devices using voice commands, increasing convenience.

The mechatronics-based smart home system provides many benefits, increasing comfort, efficiency, safety and personalization of living spaces. The integration of mechatronics allows you to automate home functions, optimize resource use and improve the quality of life.

As technology develops, smart homes will become an integral part of modern housing, providing a comfortable, efficient and safe living space.