economies. Simultaneously, innovative technologies derived from the aerospace and computer industries will be incorporated and tailored for high-performance artificial limbs, aiming to closely mimic the functionality of the missing limb.

Initially, prosthetic innovations are predominantly utilized by amputees with private funding, particularly competitive athletes. As experience is gained, manufacturers learn how to apply the same principles to moderately priced devices intended for less active individuals. Consequently, the overall performance of prostheses will gradually improve.

Likewise, certain new materials and applications will be employed to benefit amputees in developing countries, despite variations in the causes of amputation and individuals' specific needs. The rate of progress in prosthetic rehabilitation is primarily hindered by financial constraints. Thus, one of the significant challenges for the new millennium will be to establish the necessary resources and means to fund the widespread implementation of prosthetic innovations.

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BASIC PRINCIPLES OF INTERACTION IN COLLABORATION BIM AND IOT [MINI REVIEW]

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Аннотация: This paper provides a mini-review of the basic principles of collaboration between Building Information Models (BIM) and the Internet of Things (IoT). BIM and IoT are two different technologies that have the potential to be integrated to enable management that is more efficient and operation of buildings. The work examines the basic principles of interaction between BIM and IoT, such as data exchange, sensor network, automation and analytics. The benefits and advantages that can be achieved when BIM and IoT work together are also discussed, such as increasing management efficiency, optimizing the use of resources and increasing the comfort and safety of buildings.

Ключевые слова: BIM, IoT, collaboration, building information model, internet of things, collaboration, building management, efficiency.

Introduction

BIM (Building Information Modeling) is the process of creating a digital representation of a building that includes information about its construction, materials, heating, ventilation, air conditioning, lighting, and electrical systems. This information can be used to create a virtual building model that aids in planning, designing, constructing, and operating buildings [1].

IoT (Internet of Things) is a network of physical objects connected to the internet that can exchange data. In the context of buildings, IoT can include sensors that measure temperature, humidity, air quality, lighting levels, and other environmental parameters within the building [2].

BIM and IoT can work together to enhance building management and improve comfort and safety for occupants. For example, using data from the BIM model, IoT sensors can be strategically placed throughout the building to gather information about environmental parameters. This

information can be used to optimize the operation of heating, ventilation, air conditioning, lighting, and electrical systems, leading to energy cost savings and increased comfort for occupants. Additionally, IoT data can be utilized to monitor the condition of the building and its systems, helping to prevent issues and reduce downtime [3].

The purpose of the work is to study the main possibilities of interaction from the interaction of BIM and IoT technologies. The relevance is caused by the development of combining these technologies to obtain a twin of the model, a specific structure in which meters with the Internet of things are used. Building Information Modeling (BIM) [1] and the Internet of Things (IoT) [2] can work together to improve building management and improve the comfort and safety of occupants.

Results and discussion

The convergence of these two technologies is revolutionizing the construction industry. Building Information Modeling (BIM) and the Internet of Things (IoT) are transformative technologies that impact both the construction process and interaction with the environment.

The synergy between BIM and IoT enables interaction with all building elements, integrating and responding to their changes.

- BIM: A method based on the use of 3D models that provides architecture, engineering, and construction (AEC) professionals with the information and tools necessary for more efficient planning, design, construction, and management of buildings [1].
- IoT: A network of connected devices capable of interacting with each other and exchanging data, thereby enabling real-time monitoring, control, and automation [2].

The seamless integration of information and functionality, data volume, and design that brings buildings to life is what happens when BIM and IoT come together. The integration between the two technologies creates a powerful synergistic effect that improves the construction process. Here's how they interact:

- Data collection and analysis: IoT devices collect real-time data from the construction site, including temperature, humidity, and equipment status. This information is incorporated into the 3D model using BIM, enabling immediate analysis and decision-making.
- Automation and control: The BIM interface allows for the management of IoT devices, enabling the automation of various construction processes. For example, adjusting HVAC or lighting systems based on environmental factors such as occupancy.
- Collaboration and communication: IoT and BIM facilitate efficient interaction among various stakeholders. Real-time information exchange ensures effective coordination, ensuring that everyone receives the necessary information.
- Facility maintenance and asset management: BIM and IoT continue to collaborate in the post-construction management of buildings. IoT devices assist in predictive maintenance by monitoring and managing various systems, while BIM provides a detailed building model.

Energy efficiency analysis: BIM models with integrated IoT sensors can simulate energy consumption, aiding in the design of low-energy buildings.

Construction site safety planning: IoT devices track site conditions, and BIM utilizes this information to plan safe construction methods.

Real-time monitoring: Real-time feedback from IoT sensors is used to update the BIM model on the progress of construction.

Quality control: Integration of BIM and IoT enhances quality control by ensuring adherence to project specifications.

Facility management: BIM and IoT offer a comprehensive view of building systems for effective facility management.

Predictive maintenance: BIM provides the information necessary for maintenance, reducing downtime, while IoT devices identify potential issues.

The integration of IoT and BIM is not just technological progress; it is a value-driven strategy

that aligns with the construction industry's pursuit of quality, collaboration, and innovation. They offer the following:

- Efficiency: Automation, real-time data integration, and process optimization reduce construction time and costs.
- Collaboration: Improved communication among stakeholders fosters collaboration, ensuring a shared vision.
- Innovation: Innovative possibilities in design, construction, and maintenance become achievable through the integration of BIM and IoT.
- Quality assurance: Commitment to quality is demonstrated through real-time monitoring and control, ensuring compliance with standards.

Conclusion

The integration of building information modeling (BIM) and the Internet of Things (IoT) highlights the immense potential of technology convergence. The construction industry is currently experiencing a paradigm shift because of the amalgamation of data integration and model creation, within the harmonious interplay of these analyzed technologies. BIM and IoT collaborate harmoniously to forge intelligent, adaptive buildings that embody the core tenets of energy efficiency, collaborative teamwork, and uncompromising quality across every stage of construction and operation.

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РАЗРАБОТКА БИЗНЕС-ЛОГИКИ ДЛЯ ИНТЕРНЕТ-МАГАЗИНА ОДЕЖДЫ

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Аннотация: в статье рассматривается разработка бизнес-логики для интернет-магазина одежды. Представлен алгоритм добавления пользователем товара в корзину на сайте интернет-магазина. Рассмотрены технологии, применяемые при разработке web-сайта, пользовательского интерфейса и базы данных интернет-магазин.

Ключевые слова: интернет-магазин, Django, React, PostgreSQL, архитектура, веб-разработка, бизнес-логика.

Введение

В современном мире развитие бизнеса, производства и экономики в целом невозможно без применения информационно-телекоммуникационных технологий [1, 2]. Для обеспечения высокой скорости и качества разработки программных продуктов целесообразно использовать актуальные технологии – библиотеки и фреймворки [3]. В статье рассматривается разработка бизнес-логики для интернет-магазина одежды.

Результаты и обсуждение

При разработке интернет-магазина использовались следующие технологии, обеспечивающие функциональность, скорость работы, безопасность и удобство использования: фреймворк Django, библиотека для создания пользовательского интерфейса React, а также система управления базой данных (СУБД) PostgreSQL.

При разработке web-сайта интернет-магазина, следует учесть ряд отличий от